

CAREERS

in applied mathematics

OPTIONS FOR STEM MAJORS

MATHEMATICS AND COMPUTATIONAL SCIENCE ARE UTILIZED IN ALMOST EVERY DISCIPLINE OF SCIENCE, ENGINEERING, INDUSTRY, AND TECHNOLOGY.

New application areas are constantly being discovered while established techniques are being applied in new ways and in emerging fields. Consequently, a wide variety of career opportunities are open to people with mathematical talent and training.

IN THIS GUIDE, YOU WILL FIND ANSWERS TO QUESTIONS ABOUT CAREERS IN APPLIED MATHEMATICS AND COMPUTATIONAL SCIENCE, AND PROFILES OF PROFESSIONALS WORKING IN A VARIETY OF ENVIRONMENTS FOR WHICH A STRONG BACKGROUND IN MATHEMATICS IS NECESSARY FOR SUCCESS.

Mathematical careers outside of academia rarely carry a simple title of “mathematician.” The very idea of a career in mathematics has evolved and diversified and is often coupled with a specialty or area of research interest. Mathematics plays a major role in the bottom line of industrial organizations, and helps companies perform better in today’s data-driven marketplace.

WHERE CAN YOU MAKE AN IMPACT?

Many different types of organizations hire mathematicians and computational scientists. You can easily search the websites of organizations and corporations that interest you to learn more about their

location(s), mission statement and objectives, history, and job requirements. Experience gained through internships and work-study opportunities can help you determine your personal preferences regarding a workplace, such as non-profit or for-profit, large or small, working independently or on a team, and how much customer contact you prefer to have.

WHAT KINDS OF PROBLEMS MIGHT YOU WORK ON?

While careers in mathematics may differ widely by discipline and job title, one thing remains constant among them—problem solving. Some potential problems that someone with mathematical training might encounter are described below.

Which of them do you find most intriguing, and why?

- How can an airline use smarter scheduling to reduce costs of aircraft parking and engine maintenance? Or smarter pricing to maximize profit?
- How can one design a detailed plan for a clinical trial? Building such a plan requires advanced statistical skills and sophisticated knowledge of the design of experiments.
- Is ethanol a viable solution for the world’s dependence on fossil fuels? Can biofuel production be optimized to combat negative implications on the world’s economy and environment?
- How do we use major advances in computing power to incorporate knowledge about interactions between the oceans, the atmosphere and living ecosystems into models used to predict long-term change?
- How can automotive and aircraft companies test performance, safety, and ergonomics, while at the same time lowering the cost of construction and testing prototypes?
- A pharmaceutical company wants to search a very large database of proteins to find one that is similar in shape or activity to one they have discovered. What’s the most efficient way to do so?
- How might disease spread in populated areas in the event of a bioterrorism incident, and how would it be contained?
- Can we measure sentiment change as a result of social media shares, likes and comments?
- How do you design a robotic hand to grip a coin and drop it in a slot?
- How can you mathematically model the spread of a forest fire depending on weather, ground cover and type of trees?
- How can you allocate an investment among various financial instruments to meet a risk/reward trade-off?
- Can mathematical models be coupled with efficient computational implementations to obtain practical, low-cost simulations to guide computer chip design and manufacture?
- Can computational simulations show sufficient detail to capture the effects of the chemicals, but still be fast enough to permit studies of many different chemicals?
- How can genome sequencing analysis help in making clinical decisions based on a personalized medicine approach?
- How can mathematics improve rating prediction performance of e-commerce systems and help enhance the consumer experience based on their past purchases, behavior and interests?
- Can we provide insight to coastal communities about future sea level rise and the risk and likelihood of effects of climate related events on their communities?

HERE ARE SOME EXAMPLES OF ORGANIZATIONS THAT HIRE MATHEMATICIANS AND COMPUTATIONAL SCIENTISTS:

- ACADEMIC INSTITUTIONS AND RESEARCH INSTITUTES
- AEROSPACE AND TRANSPORTATION EQUIPMENT MANUFACTURERS OR SERVICE PROVIDERS
- ANALYTICS AND FORECASTING ORGANIZATIONS
- CHEMICAL OR PHARMACEUTICAL MANUFACTURERS
- COMMUNICATIONS SERVICES PROVIDERS
- COMPUTER INFORMATION AND SOFTWARE FIRMS; ESTABLISHED OR START-UPS
- CONSUMER PRODUCTS COMPANIES
- ENERGY SYSTEMS FIRMS
- ELECTRONICS AND COMPUTER MANUFACTURERS
- ENGINEERING RESEARCH ORGANIZATIONS
- FINANCIAL SERVICE AND INVESTMENT MANAGEMENT FIRMS
- GOVERNMENT LABS, RESEARCH OFFICES AND AGENCIES
- INSURANCE COMPANIES
- MEDICAL DEVICE COMPANIES
- PRODUCERS OF PETROLEUM AND PETROLEUM PRODUCTS

ARE YOU READY?

Part of the preparation for your future is obtaining a solid foundation in mathematical and computational knowledge—tools like differential equations, probability, combinatorics, applied algebra, and matrices, as well as the art of abstraction and advanced computing and programming skills. Preparation for a career in applied mathematics and computational science also involves being able to apply these skills to real-life problems, and achieving practical results. Mathematical and computational skills are a huge career asset that can set you apart and open doors.

WHAT'S OUT THERE FOR SOMEONE WITH YOUR TALENTS, INTERESTS, AND BACKGROUND?

Growing fields to consider and look deeper into:

- **Systems Biology**
- **Data Mining and Data Privacy**
- **Materials Science**
- **Computer Animation and Digital Imaging**
- **Finance and Economics**
- **Ecology/Epidemiology/Environment**
- **Climatology**
- **STEM ethics**
- **Machine learning and artificial intelligence**
- **Personalized medicine**

HOW DO YOU GET STARTED?

Choose a major, or consider a major/minor pairing

Look for degree programs in the mathematical sciences and academic disciplines that require mathematical and computational skills, such as engineering disciplines, applied and natural mathematical sciences, life science related fields, public health sciences, computer and information sciences,

statistical sciences, financial mathematics, earth sciences, and physical sciences. Pairing math with any of these field can be a powerful combination.

Use your university's resources

Many universities offer career services and human resources departments. Services such as career assessments can help you narrow your search to suit your personality and interests. Other resources may include resumé help, interview preparation, and job opening announcements.

Explore internships, summer jobs, industrial research opportunities, and work-study

What better way to determine the range of opportunities and explore possible areas of interest than to actually be in the workplace? Check with your university's career center and online job portals, as well as the career and job resources on the SIAM website at www.siam.org/careers. You may also be able to work with a faculty member and some other students on a research problem that originates from a business in order to learn and to get experience with the approaches needed to solve such problems.

The National Science Foundation and other groups offer programs such as Research Experiences for Undergraduates (REUs) that support active research participation by undergraduate students in many research areas. A directory of active NSF REU sites and contact information can be found at: www.nsf.gov/crssprgm/reu/reu_search.cfm.

Build a network of contacts

Join a professional organization, for example

SIAM. Attend conferences, and meetings to connect with other individuals in your field. Volunteer for committees or community service opportunities.

Practice communication

Learn to communicate ideas in a compelling, concise way to someone unfamiliar with the topic.

Fit for a job?

Don't discount job postings for computer scientists, engineers or other titles that

may not specifically be part of your career preparation. Often a person with training in the mathematical sciences has skills that apply and can pick up the rest on the job. Do you need to have every skill listed on a job description? You should meet at least a few of the criteria well and have ways to demonstrate your depth of skill in those areas. Think of ways to use the skills you have to approach new problems.

POSSIBLE JOB TITLES FOR PEOPLE WITH APPLIED MATH & COMPUTATIONAL SCIENCE BACKGROUNDS AND EDUCATION:

- Actuary
- Analyst
- Analytics Consultant
- Analytics Manager
- Applied Mathematics Researcher
- Associate Editor
- Biostatistician
- Business Analyst
- Business Intelligence Developer
- Claims Specialist
- Consultant
- Cryptanalyst
- Cryptographer
- Data Analyst
- Data Engineer
- Data Operations Associate
- Data Processing Specialist
- Data Scientist
- Director of Math Tutorial Curriculum
- Engineer
- Forecast Analyst
- Functional Analyst
- Game designer/slot game designer/game mathematician
- Geolocation Engineer
- Global Pricing Analyst
- Guidance and Navigation Engineer
- Informatics Scientist
- Information Analyst
- Investment Analytics Quant
- Manager
- Math Curriculum Coach
- Math Curriculum Consultant
- Mathematician
- Modeler
- Modeling Engineer
- Operations Researcher
- Operations Support Specialist
- Pharmacokineticist
- PK/PD Modeler
- Planner
- Principal Scientist
- Product Manager
- Program Manager
- Programmer
- Project Manager
- Quality Systems and Compliance Manager
- Quantitative Analyst
- Quantitative Developer
- Quantitative Pharmacologist
- Quantitative Researcher
- Quantitative Scientist
- Quantitative Software Engineer
- Reporting Engineer
- Research and Development Engineer
- Research Analyst
- Researcher
- Research Scientist
- Risk Analyst
- Risk Strategist
- Scientist
- Simulation Engineer
- Software Engineer
- Staff Scientist
- Statistician
- Strategist
- Supply Chain Analyst
- Systems Engineer
- Technical Staff
- Tutor

Credit: <https://bigmathnetwork.wordpress.com/2017/03/03/big-math-job-titles-hint-usually-not-mathematical-scientist/>

ROHAN SHIRALI / STATISTICAL ANALYST

AFFILIATION

Boston Children's Hospital

LOCATION

Boston, Massachusetts

DEPARTMENT

Computational Health Informatics Program

TITLE

Statistical Analyst

EDUCATION

B.S. Mathematics, minor in Music, 2015, Washington University in St. Louis
M.A. Statistics, 2016, Washington University in St. Louis

CAREER STAGE

Early—2 years post Bachelor's

WHAT HE DOES // Rohan's main responsibilities involve doing analysis on pediatric clinical data in various fields, and working with a team of software developers to make healthcare data more usable and exchangeable. There's a lot of data in disparate systems and formats, and Rohan and his colleagues are trying to bring it together and make it compatible to improve data analytics and forecasting capabilities across the industry.

NECESSARY JOB SKILLS // Rohan regularly applies statistical knowledge and analytic techniques, knowledge of experimental designs, and understanding of various computer programs and software and how they interact. He says soft and social skills are also important for fitting into a team. The heart of what the informatics department does is mathematical and computational.

PROS AND CONS OF HIS JOB // Rohan is most excited about continuing to learn from all the people around him, who constantly inspire him and show him new ways to think about problems. He's energized by people and hopes his role grows to have more face-to-face interaction. The least enjoyable part of his job right now is spending a lot of time at the computer.

WORK-LIFE BALANCE // Not an issue. He is still able to pursue music on the side, performing a few times each month at local venues, spending plenty of time with friends, staying physically active, attending concerts, and traveling to see old friends and new places.

CAREER PATH // After graduating from WashU with a Bachelor's degree, Rohan was hoping to take a year to have some fun—maybe learn to bartend or pursue his hobby of writing and performing music as a singer-songwriter—until he found out about an accelerated Master's program offered to recent grads. Through the program, he was able to get his Masters in Statistics just a year later, and was excited to continue learning and better prepare himself for the job market.

I KNEW I WANTED A POSITION IN HEALTHCARE, ESPECIALLY HAVING GRAPPLED WITH THE DECISION OF WHETHER TO FOLLOW THE PRE-MEDICAL TRACK, AND I JUST APPLIED TO AS MANY RELEVANT JOBS AS I COULD FIND. EVENTUALLY, I LANDED THIS JOB AT BOSTON CHILDREN'S HOSPITAL, AND IT'S PRETTY MUCH EXACTLY WHAT I WAS HOPING FOR.

Rohan says his career “has absolutely been falling into place without much forethought.” He gets excited about a lot of different ideas, but also struggles to commit to them individually. In college, he didn't know if he wanted to focus on business and follow an actuarial path, or apply to medical school, or apply his statistical knowledge otherwise, or just commit more to pursuing music. So far, not committing to a set path has worked out, and Rohan has been happy to seize opportunities as they presented themselves.

SALARY // For someone with the title “Statistical Analyst” probably \$60k-\$90k. At a largely academic institution or hospital, with entry-level or a few years of experience, probably \$50-\$75k.



SOFT AND SOCIAL SKILLS ARE IMPORTANT FOR FITTING INTO A TEAM.

CAREER EXPECTATIONS AND ADVICE // The most important thing is to keep an open mind. Even things that you feel sure about might end up changing. Rohan enjoys his current job, but is open to the idea that he might find something else more gratifying at some point in the future. Planning is important, but staying present and keeping an open mind about how plans can change is key.

KAITLYN BRADY / DATA SCIENTIST

WHAT SHE DOES // No two days are ever the same for Kaitlyn. As a data scientist it is her responsibility to extract and communicate actionable insights from data. Her role centers on understanding her company's customers. Who are they? What are their preferences? Through knowledge of their customer, she may better tailor their experience and in turn increase company performance. Recently she worked on building a personalized product recommendation engine from design to execution, including scoping the problem, building the algorithms, and writing the code.

NECESSARY JOB SKILLS // To be a data scientist you must be well rounded with statistical, programming, and communication skills, in addition to subject matter expertise. Some of these skills may be learned on the job, particularly the latter. Creative problem solving is critical. Each problem is different from the last and won't fit a textbook mold. A data scientist must identify, and sometimes innovate, solutions that aren't always obvious.

Mathematics is important in allowing Kaitlyn to provide concrete, data-supported evidence for the recommendations and answers she provides to business. Rather than making a subjective judgment, she uses statistics to formulate a solution that is based on reason and logic. Examples of concepts she has implemented so far include: time series analysis, logistic regression, and non-parametric measures for hypothesis testing.

PROS AND CONS OF HER JOB // One of the more rewarding aspects of Kaitlyn's job is when she knows that she delivered something new and empowered a business partner to advance their campaign or project—leveraging computer programming to bring a solution to production in an efficient manner. Kaitlyn's least favorite thing is day-to-day reporting.

CAREER PATH // Kaitlyn found her first full-time job as a data solutions engineer through her school's career fair. She was responsible for a lot of ad-hoc analysis and reporting and realized that she wanted to do more statistical-based work. That's when she moved to Staples as a statistical analyst where she became responsible for campaign analysis and experimental design. After some time, her responsibilities once again fell into reporting and so she made the move over to a data science team where the work is more research oriented with longer term projects. Kaitlyn's career path continues to evolve as she learns more about herself every day.

WITH EACH NEW ROLE I PICK UP ADDITIONAL SKILLS AND PASSIONS AND PUSH MYSELF TOWARDS A MORE DEFINED CAREER.

SALARY // An approximate salary range is \$90,000 to \$200,000+ depending on education, experience, and location.

CAREER EXPECTATIONS AND ADVICE // Internships and applied projects are great ways for students to gain real-world experience that will teach them new skills, help them learn what they do and do not like, and to put on their resume. For those just starting their career, don't stress over finding the perfect job right out of the gate—you are still developing and learning and will have plenty of opportunities to move around.

**DON'T
STRESS OVER
FINDING THE
PERFECT JOB
RIGHT OUT OF
THE GATE.**



AFFILIATION
Staples, Inc.

LOCATION
Framingham, MA

DEPARTMENT
Staples Digital Solutions

TITLE
Data Scientist

EDUCATION
B.S. Mathematics and
Psychology, 2011,
Worcester State
University,
M.S. Applied Statistics,
2012, Worcester
Polytechnic Institute

CAREER STAGE
Early—6 years
post Bachelor's



KERISHA BURKE / GLOBAL STRATEGY AND FREIGHT TRADING ANALYST

WHAT SHE DOES // Phillips 66 is an energy manufacturing and logistics company. Kerisha is primarily responsible for analyzing global trade flows, monitoring seaborne imports/exports trends and providing freight market forecasts. Within her group, they use a combination of analytical, technical, and networking skills. Each work day on the trade floor is unique due to the constant changes in market conditions, seasonal trends, and current global activities. The commercial trade floor is an extremely fast paced environment. Within the Marine Department, the objective is to use marine knowledge and experience to manage the safe, reliable, and cost effective seaborne transportation needs of the corporation. We're constantly working on new and exciting projects.

NECESSARY JOB SKILLS // Kerisha uses mathematics and business skills to resolve real-world problems or to improve existing processes. By using her analytical and logical skillset that she gained from studying applied mathematics, she has the ability to approach problems with a unique perspective and to find a solution in a quick and accurate manner.

PROS AND CONS OF HER JOB // It's rewarding when a trader, charterer, or manager expresses that they are pleased with a project that you've completed or report that you've created. Kerisha gets to work collaboratively with various people each day. By working with others, she learns something new or teaches something new. The constant flow of knowledge keeps her engaged. She also enjoys attending various industry-related networking events.

WORK/LIFE BALANCE // One of Kerisha's favorite benefits is that employees can get a "19/30" day—a day off each month for working an extra 30 minutes each day! Other perks: an on-site gym, dental office, mailroom, Starbucks, putting green recreational area, a soccer field on the rooftop of the parking garage, and multiple picturesque views of the city—it's truly an exciting work environment.

CAREER PATH // Kerisha was recruited by Phillips 66 during her senior year at Howard University. Phillips 66 values training and mentorship and truly cares about developing new employees, making sure they establish a solid foundational knowledge of the oil and gas industry. Kerisha's first role after completing the three-month training program was a Trade System Configuration (TSC) Analyst. She learned how the company uses various trade systems to capture its daily business transactions.

Her second role was a Risk Analyst, responsible for the risk assessment, reporting, and position control of physical and financial portfolios within the Heavy Fuel Oil Group. Mathematics has been used daily in each of her roles—whether providing a simple historical analysis that requires percentage calculations and short-term trend analysis, or creating automated models, using probability for forecasting analysis, working with large data sets to analyze market trends, creating/publishing reports, or preparing presentations.

GLOBAL EVENTS AND ACTIVITIES CAN HAVE A HUGE IMPACT ON MARKET TRENDS THAT INFLUENCE DAILY DECISIONS WITHIN MANY INDUSTRIES. IF YOU WORK IN SUCH AN INDUSTRY IT'S IMPORTANT THAT YOU FOLLOW THE NEWS CLOSELY.

CAREER EXPECTATIONS AND ADVICE // Have an open mind and coachable attitude. For students who are pursuing a math degree, it's vital to participate in a Research Experience for Undergraduates (REU) or internship before graduation; by doing so you'll be able to enhance your mathematical skill set while gaining experience. Also, learn as much as you can about various industries and have an understanding about the value of mathematics within those industries because there are so many opportunities out there.



HAVE AN OPEN MIND AND COACHABLE ATTITUDE.

AFFILIATION
Phillips 66

LOCATION
Houston, Texas

DEPARTMENT
Commercial
Organization, Marine

TITLE
Global Strategy and
Freight Trading Analyst

EDUCATION
B.S. Mathematics,
Minor in Economics,
2013, Howard University

CAREER STAGE
Early—4 years
post Bachelor's

DAVID BARAFF / PRINCIPAL SOFTWARE ENGINEER

WHAT HE DOES // David's main responsibilities are the development, maintenance, and evolution of the physics software simulation tools at Pixar that allow automatic animation of elements such as clothing, hair, fur, or water.

NECESSARY JOB SKILLS // Getting his job done requires a lot of applied mathematics (numerical analysis, solution of large systems of equations, knowledge of differential geometry) as well as proficiency in computer engineering in many areas (UI pipelines and interfaces, data representations of all kinds, parallel computing, just to name a few). At the same time, he has worked on "back-end support" for the studio having little to do with computer simulation but also requiring wide-ranging computer engineer skills; areas include efficient disk storage methods, federated asset systems development and management, distributed server/client frameworks and policies, and novel backend communications architectures and software deployment systems.

PROS AND CONS OF HIS JOB // David most enjoys the wide-ranging areas he's been able to work with, and seeing things he has worked on being displayed far beyond his work environment. (Seeing aspects of a computer animated character I worked on in the grocery store on a cereal box for the first time was a novel experience.) What is perhaps least enjoyable is the inevitable inertia involved in being at one place for a long period of time.

CAREER PATH // David became interested in computer graphics early on and he had the opportunity to work on computer graphics at Bell Laboratories in Murray Hill, New Jersey, during high school and college. His graduate field of study at Cornell was in computer graphics (specifically animation/computer simulation), and after graduating he joined the computer science faculty at Carnegie Mellon University (CMU) where he continued this research. In 1998 he was invited to join Pixar, and he has been there ever since.

SALARY // Salary truly depends a lot on the company and its focus and size. However, I would expect the lower end of the salary range for a position where this title is truly appropriate to be \$150K; the upper end depends a lot on how big the company is and whether or not the title is given to only one individual, or can be given to several people.

AFFILIATION
Pixar Animation Studios

LOCATION
Emeryville, California

DEPARTMENT
Studio Tools

TITLE
Principal Software Engineer

EDUCATION
B.S. Computer Science and Engineering, 1987, University of Pennsylvania; Master's, 1990, and Ph.D., 1992, Computer Science, Cornell University

CAREER STAGE
Late—30 years post Bachelor's



**FIND PROBLEMS/
AREAS TO WORK
ON THAT REALLY
CAPTURE YOUR
ATTENTION.**



CAREER EXPECTATIONS AND ADVICE // Find problems/areas to work on that really capture your attention; you need that kind of focus and (occasionally) single-mindedness to have a truly successful career and/or make an impact.



LIZ DAILEY / ACTUARIAL CONSULTANT**AFFILIATION**

Aon Hewitt

LOCATION

Boston Massachusetts

DEPARTMENT

Retirement & Investment Practice

TITLE

Actuarial Consultant

EDUCATION

B.S. Actuarial Mathematics, Minor in Management, 2011, Worcester Polytechnic Institute

CAREER STAGE

Early—6 years post Bachelor's

WHAT SHE DOES // As a consultant, there is no typical work day for Liz, as every day brings different challenges with her clients. She spends much of her time talking with clients or meeting with other members of teams. Her main responsibilities include determining the value of future retirement income benefits that companies have promised, either to determine the amount of funding the plan sponsor is required to make or for financial accounting disclosures. She also helps companies understand the liability of welfare benefits for retirees and disabled employees.

NECESSARY JOB SKILLS // In actuarial consulting, the most important skills are verbal and written communication. It is also important to have a strong background in mathematics, analytical skills, and the ability to interpret financial results. Liz uses Excel for most of her work, as well as some coding in Visual Basic and a proprietary valuation software. Mathematics is the backbone of the actuarial profession. In order to consult on results for her clients, Liz has to have a deep understanding of probability, statistics, modeling techniques, and financial accounting.

PROS AND CONS OF HER JOB // What Liz enjoys most about being an actuarial consultant is the dynamic, challenging work environment that she's in. Market fluctuations and updates to legislature cause the work that she's doing to be ever-changing, and she likes knowing that there will always be something new and exciting to get involved in. One of the most exciting and rewarding aspects of Liz's job is being in contact with leadership at other companies. Many meetings include the executives at her clients' companies, including the head of HR, CFO, CIO, and even CEO. The most challenging part of her profession is the time commitment. Serving her clients well involves long hours at times, since others are often relying on her work product to make significant decisions or to finalize disclosed results.

WORK/LIFE BALANCE // Though being a consultant requires long work hours at times, there is a lot of flexibility with work hours and location, as long as you are getting your work done. Liz's company has several employees who work from home or from a different location. Liz appreciates that she can choose the work hours that work best for her.

CAREER PATH // Liz has been working at Aon Hewitt since she graduated college. At WPI, she began as a pure mathematics major, unsure of what life after college would hold. She learned about actuarial mathematics during freshman year and really enjoyed seeing a business application of the subject that she had always loved. After taking some courses about the time value of money and models for life contingency, she took the first actuarial exam and passed on the first try. During college, Liz had two internships: both experiences utilized her strong analytical skills, but the consulting position encouraged her to focus on presenting her results to others. She decided that was more challenging and engaging for her career.

Some aspects of Liz's career were well-outlined, like completing the exams and other education requirements to become a Fellow of the Society of Actuaries, but she also grew in her career because of opportunities like campus recruiting activities that led to a promotion to manager.

SALARY // A fully credentialed actuary (FSA) in the pension field with 5-10 years of experience receives around \$125,000 to \$150,000.

CAREER EXPECTATIONS AND ADVICE // Companies often begin recruiting for internship candidates in the fall for the following summer, and being able to show your commitment to the field by including a passed exam on your resume will give you a big advantage. Early in

your career, take on projects that might be outside your typical work or comfort zone—they could provide opportunities later in your career and will give you different insights and perspectives.

One thing that surprised Liz when she first started as an actuarial consultant was the structure of a typical client meeting. They usually occur in an informal setting, with all members sitting at a table, and are more of a "discussion" than a "presentation" with the client interjecting often to provide insight, ask questions, or refine what results they need. Prepare your results and explain that information, but be ready to cover topics that you didn't expect to discuss; this makes for a more interesting and informative experience for both parties.

TAKE AN ACTUARIAL EXAM AS EARLY AS YOU CAN IN YOUR COLLEGE CAREER.



**INTERNSHIPS
EXPOSE
STUDENTS TO
A FULL RANGE
OF CAREER
OPTIONS.**



DONALD STEPHENS / OPERATIONS RESEARCH DIRECTOR

WHAT HE DOES // Donald leads a team of software developers and research analysts that examines processes, procedures and systems to facilitate an in-depth understanding of the operations of a global financial services organization in order to enhance efficiency, risk controls, cost expenditures and innovation. They employ both qualitative problem-structuring techniques and advanced quantitative methods to measure and identify options for innovative and pragmatic solutions.

Donald and his team are typically asked to work on projects that involve complex implementations. Recently, they were asked to investigate techniques related to construction of optimal investment portfolios meeting certain characteristics from a large list of financial assets. Other examples include consulting engagements to help clients develop economic stress-testing software platforms.

NECESSARY JOB SKILLS // Operations research is a multidisciplinary field employing techniques from computer science, statistics, numerical analysis and mathematical optimization. Tasks often require collecting large amounts of data and drawing insights to make more effective decisions. Some of the more common techniques utilized are mathematical modeling, stochastic processes, meta-heuristics, machine learning, and artificial intelligence.

PROS AND CONS OF HIS JOB // One of the more difficult aspects of Donald's role relates to the actual collection and processing of information. There are times when even structured information (i.e. information with a higher degree of organization) presents some challenges requiring highly subjective interpretation. Unstructured information often requires more attention and possibly the use of machine learning algorithms for collection and interpretation.

The best parts of the role entail investigating options in an attempt to solve a complex problem or at least make a problem more tractable.

CAREER PATH // While pursuing his undergraduate degree, Donald interned at a very well-known financial services firm. It was through this internship that he was first exposed to an environment that utilized applied mathematics and computer science for finance and economics. Prior to that internship, his presumption was that mathematicians remained in academia and computer scientists worked at software firms. That internship helped fuel a desire for him to pursue both fields in depth. He also learned the importance of exposing students to a full range of career options.

SALARY // The salary range can be very varied. In the U.S., many practitioners of operations research enter into public policy, health care, financial engineering, technology, academia or government. Depending on the specific industry and qualifications, salary can range from \$50,000 to \$150,000+.

AFFILIATION

Moody's Analytics

LOCATION

New York, New York

DEPARTMENT

Economics and
Structured Analytics

TITLE

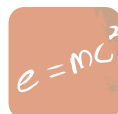
Senior Director-
Operations Research

EDUCATION

B.S. Computer Science,
Minor in Mathematics,
2001, Sacred Heart
University;
M.S. Mathematics, 2014,
St. John's University;
Quantitative Methods
certificate, 2017,
Columbia University;
Artificial Intelligence
certificate, 2018,
Stanford University

CAREER STAGE

Mid-16 years
post Bachelor's



CAREER EXPECTATIONS AND ADVICE // One of the best pieces of advice for a student planning to pursue any technical or engineering based field would be to continually develop your communication skills. More often than not, you will be asked to communicate very important information to non-technical audiences.

LINGKE WANG / CO-FOUNDER and CTO

AFFILIATIONS

Ovid
Ethos Technologies

LOCATION

San Francisco, California

TITLE

Co-founder and CTO

EDUCATION

B.S. Applied Math/
Economics and
B.S. Mechanical
Engineering, 2012,
Brown University;
MBA, 2016, Stanford
Graduate School of
Business

CAREER STAGE

Early—5 years
post Bachelor's



**DON'T SETTLE FOR
AN "OKAY" JOB.**

WHAT HE DOES // Lingke is co-founder of a life insurance technology company—a life settlement exchange—that helps senior citizens sell life insurance policies they no longer want for upfront cash payouts. At Ovid, Lingke helps seniors fund their retirement by providing them a way to leverage an otherwise illiquid asset. At Ethos, they bridge the protection gap by making life insurance more accessible to consumers. Lingke's responsibilities include software development, growth, and hiring, and he also oversees the company's growth strategies—figuring out how to generate revenue and grow the company.

NECESSARY JOB SKILLS // Lingke's training in applied math was key to understanding how life insurance works. Insurance is priced via actuarial science which is heavily based on applied math and statistics. Although he never specifically studied to be an actuary, Lingke was able to learn many of the key basics quickly because of his applied math training.

PROS AND CONS OF HIS JOB // It is great to be huge consumer advocates and to lead a team that builds products that will change people's lives. Having to let people go is Lingke's least favorite responsibility.

WORK/LIFE BALANCE // Lingke has a lot of flexibility in his day-to-day schedule but, as a founder, he finds that it's sometimes hard to have a great work/life balance because there's so much work to be done.

CAREER PATH // After graduating from Brown, Lingke went into finance as an investment banking analyst where he honed his financial modeling skills. Although it was a great learning experience, he quickly realized investment banking and finance were not the right fit for him. He left and became a "full-stack" developer—knowing or at least having experience in the most used programming languages. Lingke's training in math and engineering helped him to quickly learn CS. And while it was an entirely different subject, it relied on the core underlying logic and problem solving skills he had previously developed.

During Lingke's first year of MBA studies at Stanford, he and his roommate started a life insurance technology company called Ovid. As they ran Ovid, they learned about other inefficiencies and opportunities in the life insurance space and so they started their second company, Ethos, which is an application programming interface (API) for life insurance. Their goal is to build the next phase of distribution for the industry.

I KNEW THAT AFTER I LEFT INVESTMENT BANKING, I WANTED TO START A COMPANY. SO I ACTIVELY WORKED TOWARDS FINDING A GOOD CO-FOUNDER, DEVELOPING THE RIGHT SKILLS, AND EVALUATING DIFFERENT BUSINESS IDEAS. THAT WAY, WHEN THE RIGHT PARTNER AND OPPORTUNITY CAME ALONG, I WAS READY.

SALARY // Startup founders can have a salary from negative income (you're spending savings to start your company) to infinite. There is no standard salary range.

CAREER EXPECTATIONS AND ADVICE // When Lingke first graduated, he spent a lot of time planning out and thinking about the next five years. The biggest surprise was how far he ended up deviating from it. Even so, the process of planning is crucial. Figure out what you think you want, go out and try it, and even if you quickly realize you don't want to spend your life doing that, that clarity—knowing exactly what you don't want—will allow you to move in a direction that avoids all of those things.



RUTH GRISWOLD ABRAMS / SENIOR SCIENTIST

WHAT SHE DOES // Ruth develops and utilizes quantitative systems pharmacology (QSP) models to better inform clinical trial design and decisions. QSP models encompass the important aspects of the disease biology needed to capture the drug's mechanism of action and to connect this action to clinical outputs measured in patients. Typically, she works on models for 2-3 drugs over the same period. Each of these drugs can be at different stages of development, and there are different objectives for the models based on the clinical questions of interest. Ruth's responsibilities vary over the course of a model's development, but include programming the model, researching the literature to resolve questions about what biology the model must include, discussing the model with other model developers and members of the clinical team to get feedback, running and analyzing simulations of the model, and helping to develop of a technique for creating virtual patient populations to use in model simulations.

NECESSARY JOB SKILLS // Communication is very important in Ruth's job, both to other model developers as they create the model, and to the clinical team, to make clear how the model predictions are useful. Programming skills in Matlab and R are important for implementing the model and running simulations. Some knowledge and background in both math and biology are needed so that she can understand how the biology works, and how to mathematically represent this biology.

Applied mathematics allows her group to represent the key components of a biological system in one framework, utilizing data on initial conditions and parameter values from different literature sources, so that they can systematically test the importance of each component in this larger context. Applied mathematics is also key to developing the methods needed to identify different patient subpopulations in clinical trial data, and to optimize the model to data from these subpopulations.

PROS AND CONS OF HER JOB // Ruth loves thinking about how biological ideas can be translated into mathematics, and what one representation vs. another would really mean. She loves being able to answer questions with a model that feel like solving a mystery and are very satisfying. On the negative side, it is a lot of work to handle such large models and requires long hours at times. Additionally, unlike in academia, your research focus is determined by the demands of the company and not your own preference.

WORK/LIFE BALANCE // Most people at Ruth's company have families and value their time with them. Employees have company laptops, so they can sometimes work from home 1-2 days a week.

THE COLLEGES I DIDN'T GET INTO AND JOBS I DIDN'T GET FORCED ME TO EXPLORE OPTIONS I WOULDN'T HAVE CONSIDERED OTHERWISE. I WOUND UP GETTING INTO A FIELD AND POSITION BEST SUITED FOR MY SKILLS AND WHERE I AM VERY HAPPY.

CAREER PATH // Math was always Ruth's favorite subject and was an easy choice for a college major, but figuring out how to use it after college was challenging—she accepted a job at a company that created statistical reports for clinical trials. This work, along with a college internship that exposed her to mathematical modeling of tumor growth, shifted her interest to the field of computational biology.

Early in her career, Ruth took several classes after work, to supplement her knowledge of biology, bioinformatics, and computer programming, and did some independent research in bioinformatics with one of her professors. In graduate school, she collaborated with a math and a biology advisor for her thesis work on mathematical modeling of tumor growth.

CAREER EXPECTATIONS AND ADVICE // Don't go into grad school without being sure that it is the field you want to work in and that it will be worth it to you to get through the challenges of completing the six years of your PhD.

Ruth did not expect to end up in computational biology. She took one biology class at Caltech and left with the impression that it was just about memorization. However, her attitude towards the field drastically changed as she gained exposure to biology, its various uses, and the diversity of biology research.



TAKE THE TIME TO FIGURE OUT WHAT YOU REALLY WANT TO DO.

AFFILIATION
Sanofi

LOCATION
Bridgewater, New Jersey

DEPARTMENT
Translational Informatics
(Quantitative Systems
Pharmacology)

TITLE
Senior Scientist

EDUCATION
B.S. Applied Mathematics
with Minors in Economics
and Political Science,
2005, Columbia University
(attended Caltech first
two years);
Ph.D. Computational
Biology, 2015, Icahn
School of Medicine at
Mount Sinai and
Courant Institute of
Mathematical Sciences at
New York University

CAREER STAGE
Mid-12 years post
Bachelor's (four spent
in a different field)

CARLA COTWRIGHT-WILLIAMS / COMPUTER SCIENTIST / IT FELLOW

WHAT SHE DOES // As an IT fellow, Carla has supported efforts to develop analytics to aid in the prevention and mitigation of fraud; worked on the product management team supporting the launch of SSA's Enterprise Data Warehouse; and most recently, she's worked with SSA's Analytics Center of Excellence to solve the agency's diverse business problems using analytics. In her current rotation, she is working to develop analytics to help prevent financial cybercrime.

Her position is a rotational leadership development fellowship for persons with advance degrees in fields related to Information Technology. From her academia experience, she is keenly aware of the many connections between mathematics and computer science—she likes to say “mathematics is the language of computers.”

NECESSARY JOB SKILLS // Applied math and computational science are important to her work because much of what Carla does is related to data and complex systems/processes. Her primary research area was in a branch of combinatorics called matroid theory. The skills she developed over the years provide her with the tools necessary to work with various types of operational challenges—like abstracting key aspects of a process to better understand the root causes of problems—ultimately becoming equipped to solve a variety of business questions.

During one rotation, she recalls developing a model to determine potential cost savings as the result of the implementation of a particular program. She developed a probabilistic model to estimate the savings under a limited set of variables. However, often times, real world problems are not complete, and in this case, time constraints imposed by leadership and other factors prevented having all the information necessary to inform the work. However, models can be updated and tested, as more information is gathered.

PROS AND CONS OF MY JOB // One thing which she particularly enjoys about her line of work is that she is able to join her mathematical/computational background and policy experience to understand and improve the “big picture.” On the other hand, she has found that overcoming perceptions that mathematicians only do math to be challenging (but not impossible to overcome). She believes the problem solving skills possessed by mathematicians enable them to be effective in many different sectors of work.

CAREER PATH // As an undergrad, Carla was only focused on careers in education/teaching—she expressed she didn't know anything different. She thought only engineers did engineering work or scientists only did science. Carla quickly discovered mathematics touches so many areas. All types of engineering and science (including social science) use math to answer the most complicated questions in these fields.

Carla was in a tenure track position when she learned about several positions in science policy. She began to take graduate classes in public policy while in her tenure track position and participated in faculty research experiences to broaden her applied mathematical experiences. She decided she wanted to do more outside of the classroom—good teachers are critical, but she wanted to use her math to have a broader impact on society. She found her leadership and technical skills could be used for the public good.

As her career path continues to fall in place, Carla has taken steps to prepare for subsequent stages of her career based on things she has learned about the larger math/science community and the world around us.

WORK/LIFE BALANCE // Many federal agencies allow flex work hours and telework. Employees utilizing flex hours, complete their 8-hour workday anytime between 6 am and 6 pm with core hours. Also, employees accumulate annual leave hours every paid period.



**GET OUT AND TALK
TO PEOPLE AND
LEARN NEW THINGS!**

AFFILIATION
U.S. Social Security
Administration (SSA)

LOCATION
Baltimore, Maryland

DEPARTMENT
Office of Information
Security, Security Integrity
Center

TITLE
Computer Scientist/
IT Fellow

EDUCATION
B.S. Mathematics,
2000, California State
University-Long Beach;
M.S. Mathematics, 2002,
Southern University
and A&M College;
M.S. Mathematics, 2004,
and Ph.D. Mathematics,
2006, University of
Mississippi;
Graduate Certificate in
Public Policy Analysis,
2010, Old Dominion
University

CAREER STAGE
Mid–17 years
post Bachelor's

CAREER EXPECTATIONS AND ADVICE // Don't limit yourself to what you see in print. Carla learned about the AAAS Science and Technology Policy Fellowship after attending a conference and meeting a former fellow. Just simply knowing of this program changed the trajectory of her career. In 2012, she was awarded the American Mathematical Society (AMS-AAAS) Congressional Fellow. This and other opportunities have exposed her to countless traditional and non-traditional careers for mathematicians.

MICHAEL PARKS / COMPUTATIONAL MATHEMATICS DEPARTMENT MANAGER

WHAT HE DOES // Michael manages a department of approximately 20 computational mathematicians, including staff, postdocs, and student interns. They perform cutting edge research, driven by the needs of the Department of Energy (DOE), to develop the mathematical foundations and the algorithmic and software advances to enable accurate, predictive, and scalable computational simulation methods. He also serves as a program manager for fundamental research projects, mission-driven projects, and industrial partnerships. Michael is also the hiring manager for Sandia's John von Neumann Postdoctoral Fellowship, and he coordinates his center's summer intern program. He participates in funding decisions for laboratory-directed research and development projects, helping to determine the lab's technical research directions.

NECESSARY JOB SKILLS // Computational science is considered a third pillar of scientific investigation, along with theory and physical experiment. In many cases, a complete descriptive theory does not exist, physical experiments are too expensive or simply impossible to conduct, leaving computational simulation as the only option. Science and engineering research challenges driven by the missions of the DOE require us to push the frontiers of computational simulation.

PROS AND CONS OF HIS JOB // Michael's job offers him the opportunity to work directly with some of the best applied mathematicians and computational scientists at Sandia, other national laboratories, universities, and industry. I can't imagine working in a more intellectually stimulating environment.

CAREER PATH // Around the time he finished his Ph.D. at the University of Illinois, Michael was recruited by Sandia National Laboratories as a postdoc, and was converted to a member of the technical staff a couple of years later. Many years later he moved into technical management, as it presented the opportunity to do not just his own research, but to enable others to do impactful research as well.

As a graduate student, the national laboratories were not on Michael's radar as a possible place for employment. During his studies, though, he read a lot of journal articles written by staff at Sandia Labs. He didn't know what Sandia was at the time, but found their research activities really compelling. When the possibility of a postdoc opened up for him at Sandia, he thought he'd move to the southwest for a couple of years to check out the place before moving on. He found Sandia to be such a wonderful research environment that he's been there ever since.

SALARY // From \$100,000 to \$200,000, depending on education and experience.

CAREER EXPECTATIONS AND ADVICE //

The most impactful computational scientists are those who can start from an application problem, understand the relevant physical and mathematical models, develop a discretization and numerical solution, and finally interpret the results back to the driving application problem in an impactful way. This requires skills in mathematical analysis, numerical analysis, computer science, as well as expertise with physical and engineering sciences. In general, no one person has this much breadth and depth—this is why we work in teams. However, it's helpful to have at least some expertise in all of these areas.

AFFILIATION

Sandia National
Laboratories

LOCATION

Albuquerque,
New Mexico

DEPARTMENT

Computational
Mathematics

TITLE

Manager

EDUCATION

B.S. Computer Science,
B.S. Physics, Minor in
Mathematics, 1998,
Virginia Tech;
M.S. Computer Science,
2000, Virginia Tech;
Ph.D. Computer Science,
2005, University of Illinois
at Urbana-Champaign
(CSE degree option)

CAREER STAGE

Mid–19 years
post Bachelor's

**PURSUE A
MULTIDISCIPLINARY
EDUCATION
AND TAKE SOME
COURSES OUTSIDE
YOUR DEGREE FIELD.**



KRISTIN LAUTER / CRYPTOGRAPHY RESEARCHER**AFFILIATION**

Microsoft Research

LOCATION

Redmond, Washington

DEPARTMENT

Cryptography

TITLEResearch Manager/
Principal Researcher**EDUCATION**B.A. Mathematics, 1990,
M.S. Mathematics, 1991,
Ph.D. Mathematics, 1996,
University of Chicago**CAREER STAGE**Late—27 years
post Bachelor's

**COMMUNICATION,
CREATIVITY, AND
PLANNING ARE
KEY SKILLS.**

WHAT SHE DOES // Kristin manages a team of researchers, serves on the leadership team for the lab (~200 researchers), and does tons of external leadership in the mathematics community, especially for women. Her days are filled with team meetings, collaboration meetings on projects with researchers, and meetings with potential customers and business groups. Kristin leads interdisciplinary project teams that include mathematicians, computer scientists, developers, bioinformatics researchers, and business people. Her team won the 2015 and 2016 Secure Genome Analysis iDASH international competitions sponsored by NIH.

And giving back and supporting her community? She just finished a two-year term as President of the Association for Women in Mathematics (AWM).

NECESSARY JOB SKILLS // Communication, creativity, and planning are currently key skills. Research competence, creativity, hard work, and clarity of thought have been key skills to build her career. A training in mathematics trains the mind in clarity of thought, an important asset in the business world. Mathematics is the foundation of all public-key cryptography solutions which secure our e-commerce infrastructure and many other aspects of privacy and security in our society, including national security, and healthcare privacy. Mathematics is used in many other parts of the IT high tech sector: signal processing, machine learning, algorithms for routing, scheduling, storage, ad pricing and placement, determining business models, etc.

PROS AND CONS OF HER JOB // The most rewarding aspect of Kristin's job is collaborating with other researchers, developers, and scientists to solve big problems—she has the ability to change the world through opportunities to research exciting topics and find new solutions. The thing she likes least about her job is the inherent competition in both the research and business worlds.

WORK/LIFE BALANCE // Kristin is able to make her own schedule. She works hard but can work from home much of the time. She works a lot at night, but it allows her some flexibility during the day if needed.

CAREER PATH // Kristin had no idea she would end up in industry—U Chicago did not even have an engineering school! After earning her PhD in Mathematics at the University of Chicago, Kristin took the traditional step of accepting a position as Hildebrandt Assistant Professor of Mathematics at the University of Michigan. She developed and taught a new math course there, on coding theory and cryptography, which attracted many students from engineering. Getting to know these students and their professors in engineering caused her to become interested in the practical applications of coding theory and cryptography. This is what led Kristin to apply for a job in cryptography at Microsoft Research (MSR), where she went after three years at Michigan. She loves the stimulating research environment at MSR and has been there ever since.

I WAS SURPRISED AT THE BROAD LEVEL OF INTEREST IN MY MATHEMATICAL WORK AND APPLICATIONS FROM MY CO-WORKERS. IN MY FIRST FEW MONTHS AT MICROSOFT, I WAS ASKED TO SPEAK TO EVERYONE FROM LAWYERS, TO DEVELOPERS, TO EXECUTIVES ABOUT MY RESEARCH. SO I IMMEDIATELY REALIZED THE VALUE OF GOOD COMMUNICATION SKILLS, WHICH WAS A SKILL THAT WAS EASY FOR ME TO TRANSFER FROM MY TEACHING CAREER.

SALARY // 200K+

CAREER EXPECTATIONS AND ADVICE // Do an internship in industry or government while in graduate school, or even better do it during undergraduate years. Graduate students in mathematics can easily acquire or brush up on their development skills so that they can write code in C, C++, java, or Python. The ability to write good code and ramp up on sound engineering practices makes a mathematics student extremely valuable in industry—a unique asset to a company!

ERIN SELIGSOHN / PRODUCT DEVELOPMENT ENGINEER



TAKE EVERY OPPORTUNITY TO LEARN OR TRY SOMETHING NEW.

AFFILIATION

Caterpillar Inc.

LOCATION

Peoria, Illinois

DEPARTMENT

Virtual Product Development

TITLE

Senior Associate Engineer, Product Development

EDUCATION

B.S. Mechanical Engineering, 2014, and M.S. Mechanical Engineering, 2016, Georgia Institute of Technology

CAREER STAGE

Early—3 years post Bachelor's

WHAT SHE DOES // In her “home” group (where she started and where she will return upon finishing her rotations), Erin helps develop new tools and methods to expand Caterpillar’s simulation capabilities in regards to engine mechanics. Caterpillar has many internal simulation tools that are critical to their design processes. Currently, she is rotating in a group that does core engine component simulation, which means that they use a number of simulation tools—including the ones that her home group develops—along with finite element analysis to predict engine performance and durability before prototyping and testing. It is much easier to fix problems if you catch them before you ever start building anything in iron.

NECESSARY JOB SKILLS // Erin’s whole job is mathematical modeling. Her group creates a variety of different models of engines and components to predict their behavior before prototyping and production. Some models are “one-dimensional” in that you simply input a number of engine parameters and get an output of various performance metrics. Other models are “three-dimensional” such as those where you divide a modeled geometry into tiny pieces called finite elements and model how they respond when forces or thermal loads are applied. These models are physics-based, meaning that they rely on what is known about the physical properties of materials and their responses to various load conditions.

PROS AND CONS OF HER JOB // It is really cool how you can take a very complex situation - something that you could never solve with hand calculations—and create a model to predict the behavior.

WORK/LIFE BALANCE // Erin works at a job she really enjoys and still has plenty of time after work and on weekends to enjoy hobbies. The rotational program she is in promotes social activities (skiing, trivia, art crawls, etc.) so she gets to know the other young engineers in the company.

CAREER PATH // Erin’s career is just beginning. She knew she wanted to be an engineer because she liked using math to solve problems. She took a survey class in college that introduced her to all kinds of engineering. That helped her choose mechanical engineering, and to help narrow down her options within ME, she interned for a few different companies while in school, taking on different roles in different industries. Her last internship, with Caterpillar, resulted in an offer to join the Engineering Rotational Development Program, working in three or four different groups within Caterpillar over a year or two.

IT SURPRISED ME A LITTLE TO SEE HOW MUCH IS LEFT TO LEARN. I THOUGHT “WELL, I’VE GOT TWO DEGREES NOW, SO I’M READY TO BE AN ENGINEER. SURE, I’LL LEARN SOME APPLICATION-SPECIFIC THINGS, BUT I MOSTLY KNOW WHAT’S GOING ON.” IT’S NICE THAT NOW I CAN IMMEDIATELY APPLY WHAT I’M LEARNING TO REAL PROBLEMS AND SEE THE RESULTS.

SALARY // A starting mechanical engineer with a Bachelor’s degree can expect to earn in the \$60,000 to \$80,000 range. A Master’s degree raises that up by about \$10,000, and a Ph.D. raises it up another \$10,000 or so. These numbers can vary by location and industry.

CAREER EXPECTATIONS AND ADVICE // If you’re a student, do internships, get involved in research, join a club where you get to design and build things. Internships provide a variety of experiences and help you figure out what sort of work you like to do. If you’re already in the workforce, take every opportunity to learn or try something new. The options aren’t quite as plentiful as they are in school, so you need to make a little extra effort to find them, but they are still very much worth it.



KEHINDE RILWAN SALAU / MARKETING DATA SCIENTIST**AFFILIATION**

JPMorgan Chase & Co
(JPMC)

LOCATION

Columbus, Ohio

DEPARTMENT

Decision Sciences

TITLE

Marketing Data Scientist

EDUCATION

B.A. Mathematics, 2007,
St. Mary's College
of Maryland;
M.S., 2009, and
Ph.D., 2013, Applied
Mathematics, Arizona
State University

CAREER STAGE

Early–10 years
post Bachelor's

WHAT HE DOES // Kehinde works as a data scientist within marketing decision sciences to support the mortgage banking division of JPMC. He collaborates with fellow team members to help the firm make informed decisions about mortgage production by providing quantitative support in the form of volume sizing and forecasting, customer propensity models, and developing test designs for the efficacy of marketing tactics.

PROS AND CONS OF HIS JOB // One wonderful thing about JPMC is the plethora of departments needing advanced analytics support (e.g. mortgage banking, asset management, business banking, consumer banking, fraud, etc.) and the ability to work across those departments. Professionals, can grow their technical expertise while learning to communicate results to stakeholders across a variety of internal business units.

THE MOST IMPORTANT THING, I FOUND, IS BEING IN AN ENVIRONMENT THAT'S RIGHT FOR YOU IN TERMS OF PERFORMING TASKS THAT ALLOW FOR PERSONAL ENJOYMENT AND PROFESSIONAL GROWTH.

CAREER PATH // Kehinde was on the verge of graduating with his Bachelor's degree in 2007 but had no plans for the next phase of his life. Two summer internships with the Mathematical Theoretical Biology Institute convinced him that the next stage of his learning lay in the field of applied mathematics. The internships led to an opportunity to continue his development as a funded research and teaching applied math graduate student.

Six years later Kehinde is a Ph.D. in applied mathematics focusing on topics in mathematical ecology, optimal control, natural resource economics, and network theory. He took a postdoc position that allowed him to further his studies and build a bigger network of collaboration. Though enjoyable, a lot of Kehinde's work was theoretical and he started to yearn for some practical experience tackling more immediate real-world issues with quantitative, data-driven techniques. So he began tilting his studies towards statistics and data science. He taught Introductory Statistics courses as a postdoc, enrolled in online data science courses, and learned to use new statistical programming tools.

Numerous entities in the academic, industrial, and government sector are working to make sense of growing pools of data and leverage this information for insight and decision-making. For a data scientist, gainful research can be found in any one of these sectors or at their intersection. Kehinde wanted hands-on experience (1) with the kinds of products people interact with every day and (2) collaborating with individuals of diverse background developing statistical models with actionable output. This desire led him to the financial services industry and to his current position as a member of a marketing decision sciences team.

SALARY // Between \$85,000 and \$120,000 depending on academic degree and years of experience (postdoctoral appointments may count as post academic experience).



DIVORCE YOURSELF FROM THE THINKING THAT THERE ARE DISTINCT BOUNDARIES BETWEEN ACADEMIA, INDUSTRY, AND GOVERNMENT.

CAREER EXPECTATIONS AND ADVICE // The joy of applied math is it allows practitioners to be immediately effective as quantitative contributors, and then opens doors to allow individuals to deepen their knowledge of a chosen applied field (finance, biology, policymaking, you name it). Don't be bashful about walking through as many doors as you want in any field you desire, don't be bashful about switching careers between the three sectors and/or choosing careers at the intersection. When searching for a career that will keep you happy and engaged for 2-30 years it's acceptable and encouraged to cast a wide net and explore the contents. Finally, it is at times helpful to chart 5-, 10-, or 15-year goals, but that may crumble if you don't enjoy the day-to-day processes necessary for attaining those timed goals. So enjoy yourself as best you can as you grow.

LAURA SLIVINSKI / RESEARCH SCIENTIST / MATHEMATICIAN

WHAT SHE DOES // Laura's main responsibilities include producing an improved historical time series of the global weather (known as "reanalysis"). A typical day is mostly spent at a computer, either writing code to run experiments or writing code to analyze the resulting data. She also regularly meets with colleagues to discuss the results of her analysis and to determine the best path forward.

NECESSARY JOB SKILLS // The underlying methods used to generate a reanalysis dataset rely heavily on probability and statistics. Weather estimates, and estimates of uncertainty, must be as accurate as possible. Scientific communication skills enable efficient and clear presentation of results and ideas to colleagues.

WHAT I LIKE BEST ABOUT MY JOB IS KNOWING THAT WHAT I DO MATTERS.

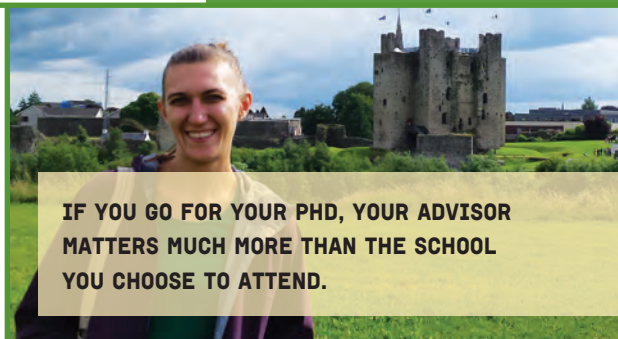
PROS AND CONS OF HER JOB // The process of generating datasets can lead to improvements in weather and climate predictions. One downside to Laura's profession is that her salary depends on grants, so while she has the flexibility to work on any project she chooses, she first needs to write a successful proposal in order to have funding.

WORK/LIFE BALANCE // Laura ensures that she has a good life/work balance by working 40 hours a week (on average), and trying not to take on too many projects at once. University of Colorado employees get fairly good vacation time, so they have lots of opportunities to take advantage of living in Boulder. The opportunities she's had to travel for work are one of the best perks of her career.

CAREER PATH // When Laura started her undergraduate degree, she was fairly sure she wanted to do math or science, but she really had no idea beyond that. She took classes in math, physics, and some basic programming, and decided lab work wasn't really for her, so she stuck with math. When she started her job search post-PhD, she realized that there were many opportunities to continue research outside of academia.

THE ONE CONNECTING THREAD THROUGHOUT MY CAREER HAS BEEN THAT I ENJOY PROBLEM SOLVING, ESPECIALLY IF THE SOLUTION HAS REAL-WORLD IMPACTS.

SALARY // \$55k and up, depending on level (Research Scientist I, II, III, or Senior Scientist).



IF YOU GO FOR YOUR PHD, YOUR ADVISOR MATTERS MUCH MORE THAN THE SCHOOL YOU CHOOSE TO ATTEND.

AFFILIATION
University of Colorado's
Cooperative Institute
for Research in
Environmental Sciences,
at the NOAA Earth
System Research
Laboratory

LOCATION
Boulder, Colorado

DEPARTMENT
Physical Sciences Division

TITLE
Research Scientist /
Mathematician

EDUCATION
B.S. Mathematics,
University of Maryland
at College Park, 2009;
Ph.D. Applied
Mathematics, Brown
University, 2014

CAREER STAGE
Early—8 years
post Bachelor's



CAREER EXPECTATIONS AND ADVICE // You want a mentor—both for research and networking, and for travel support to workshops and conferences. Try to explore your potential careers through internships while you're still a student. Particularly in graduate school, many departments assume that students will continue on the academic track, so if you're interested in a non-academic career, you may need to search out non-traditional summer opportunities. While your fellow students may be continuing work on their thesis research, you might want to work on a side project at a nearby company or research lab instead.

JAMES SNYDER / SUPPLY CHAIN CONSULTANT

WHAT HE DOES // James has two primary responsibilities. One is to lead the development of individual business cases that improve Coca-Cola's supply chain. This can include investment in new package capabilities, improving current operations, and building new operations. It involves extensive modeling of the supply chain, financial analysis, and work within Excel. His other primary responsibility is to assist in developing the long-term (5-10 year) network plan for optimal production and distribution of Coca-Cola beverages. This requires a detailed knowledge of Coca-Cola's supply chain modeling software and project management skills.

NECESSARY JOB SKILLS // James' job involves significant amounts of cost, production, and shipment data. A detailed understanding of data relationships is necessary to execute projects. He also utilizes a linear programming/multi-integer programming tool to run optimization models of the supply chain. And since most of the financial analysis is performed using Excel, having a full understanding of Excel capabilities is very important.

LEARN ABOUT FINANCIAL PRINCIPLES. I LEARNED A TON ABOUT ACCOUNTING AND FINANCIALS ON THE FLY WHEN I STARTED WORKING AT COCA-COLA. I COULD HAVE BENEFITED A LOT FROM HAVING MORE BACKGROUND IN THIS.

PROS AND CONS OF HIS JOB // The best part of James' job is using data and analytics to develop solutions to real-world supply chain opportunities and the most rewarding part is implementing projects that lead to improvements in Coca-Cola's cost, service, and quality of their beverages. Working on projects that involve new production capabilities is particularly rewarding once you see a new package being produced in a facility that you worked with. The least favorite aspect for James is the complexity! Inevitably there are multitudes of scenarios to be assessed for a single project and it is often difficult to manage multiple complex scenarios.

I WAS SURPRISED BY THE AMOUNT OF RELIANCE PEOPLE PUT ON ME EARLY ON IN MY CAREER. AS A NEW SUPPLY CHAIN ANALYST I BEGAN WORKING ON REAL IMPACT PROJECTS VERY EARLY ON, WHICH WAS EXCITING AND ALSO QUITE INTIMIDATING.

WORK/LIFE BALANCE // Coca-Cola puts a lot of value in work/life balance and treats employees very well.

CAREER PATH // James joined Coca-Cola at an entry level position as a Supply Chain Analyst and over the last four years he has been promoted twice within the same team (Supply Chain Analyst, Senior Supply Chain Analyst, Supply Chain Consultant). They interact with multiple parts of the business, providing ample opportunity to learn and discover interests. James and his manager had a plan for James to grow and learn within his team, which is a great place within Coca-Cola to start a career and grow, both internally and externally within Coca-Cola.

SALARY // Entry Level \$55-65K. Consultant \$75-85K



WORK HARD TO DEVELOP PROJECT MANAGEMENT SKILLS.

AFFILIATION
Coca-Cola North America

LOCATION
Atlanta, Georgia

DEPARTMENT
National Product
Supply Group

TITLE
Supply Chain Consultant

EDUCATION
B.S. Applied Mathematics,
2013, Virginia Military
Institute

CAREER STAGE
Early—4 years
post Bachelor's

CAREER EXPECTATIONS AND ADVICE // Being good at managing multiple projects with many different stakeholders is a real and under-appreciated skill.



BRIAN J. KUTSOP / SOFTWARE DEVELOPER

WHAT HE DOES // At Epic, Brian is a software developer on the release team, which is involved with the work associated with deploying software releases. His primary responsibility is developing tools that allow system and database administrators to install Epic products on their company's servers and create the infrastructure necessary to update potentially thousands of machines. The team also works on algorithms for performing data conversions, determining dependencies between software updates, and engineering ways to shift time-consuming installation processes to fall outside of the required inoperative duration. The healthcare organizations that rely on Epic's software function 24/7, so Brian and his team must do everything in their power to ensure such updates and installations cause as little downtime as possible so that patient care and patient's lives are not affected. This is what makes the job so meaningful.

NECESSARY JOB SKILLS // Computational science and applied mathematics are important both to Brian's individual job and to the industry as a whole. In order to reduce customer downtimes, Brian's team must understand the algorithms being used to perform upgrades and data conversions, analyze these algorithms and new processes for potential performance bottlenecks, and work toward creating more efficient and reliable systems. They must have a good understanding of security fundamentals like cryptography, data integrity, and authentication, in order to ensure systems are properly secured and not prone to attacks.

WORK/LIFE BALANCE // The Epic company culture provides a bolstering and understanding atmosphere. When the opportunity for a new, exciting, and high-priority project came his way, Brian committed to dedicating a lot more time to work to see the project through to fruition, which he feels is often necessary if you really want to push yourself to doing the next great thing.

CAREER PATH // Brian knew he wanted to be in a profession that would make a significant impact in the world, and he saw chemical engineering as the door that could lead him to helping make the next pharmaceutical breakthrough or assisting to revolutionize the energy industry. After interning at Shell and GE, and taking some computer science courses and thoroughly enjoying them, he realized the software industry moved at a much faster pace and better fit his personal drive to see rapid innovation and improvement. Moreover, when he discovered Epic in the electronic medical records industry, he became confident that he could still make a big difference in people's lives by improving healthcare.

LEARN TO COMMUNICATE! YOUR IDEAS WILL NOT HELP MANY PEOPLE IF YOU CANNOT SHARE THEM. AND THE MORE YOU TALK WITH DIFFERENT INDIVIDUALS, THE MORE OPPORTUNITIES YOU WILL FIND, AND THE MORE YOU WILL BE INSPIRED BY OTHER IDEAS AND BRILLIANT CO-WORKERS HOPING TO MAKE THE SAME DIFFERENCE IN THE WORLD AS YOU.

SALARY // Typical salaries for software developers early in their careers range from \$80,000–\$120,000 per year. This can grow towards \$120,000–\$150,000 as you prove yourself, begin leading projects, and have a key role in large, more important, and more complex projects.

CAREER EXPECTATIONS AND ADVICE // Get practical industry experience early through internships and job opportunities! The real world can be quite different than the idealistic academic world. For example, developing at a large company with many integrated and well-established products, you must constantly be thinking about how you could inadvertently break functionality for a feature on another team, or how you must be backwards-compatible with a customer on an older version of the software. Industry experience significantly pushed my decision to move from chemical engineering to computer science, and even for those who plan on staying in academia, it can reveal what practical applications can benefit from innovative research. Knowing an important end goal is a huge motivator.

AFFILIATION
Epic Systems Corporation

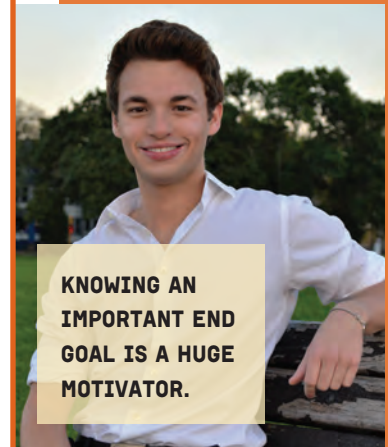
LOCATION
Madison, Wisconsin area

DEPARTMENT
Release Team

TITLE
Software Developer

EDUCATION
B.S. Computer Science,
Minor Business for
Engineers, 2014, and
M.E. Computer Science,
2015, Cornell University

CAREER STAGE
Early–3 years
post Bachelor's



**KNOWING AN
IMPORTANT END
GOAL IS A HUGE
MOTIVATOR.**

CAROLINE WU / SOFTWARE ENGINEER**AFFILIATION**

Amazon

LOCATION

Boston, Massachusetts

DEPARTMENTAWS/ Storage,
Automation,
and Messaging**TITLE**

Software Engineer

EDUCATIONB.S. Electrical
Engineering, Minor in
Computer Science, 2016,
McGill University**CAREER STAGE**Early—1 year
post Bachelor's

**TRY AS MANY THINGS AS POSSIBLE
TO BROADEN YOUR PERSPECTIVE.**

WHAT SHE DOES // Caroline works primarily on the design, programming, testing, and deploying of software into production. Often what she does changes wildly from sprint to sprint (set periods of time during which specific work has to be completed and made ready for review). She might be working on a server-side issue, making changes on the website, or adding new fields to their API (set of routines, protocols and tools for building the app). Her group also deploys new features, comes up with robust tests, and answers customer issues. It's quite challenging (before I started this job I didn't know half these things even existed), but that's also part of the fun and it definitely never gets boring!

NECESSARY JOB SKILLS // Caroline has found that a lot of the fundamentals that she'd only learned about abstractly in university are extremely critical at work. Things like estimating how much time it takes to run your code and why certain methods are better than others, didn't seem very important when she was in school, but at work, she deals with millions of lines of code! Better designs could mean the difference between running something for a few seconds or waiting for it to finish for minutes or even hours. All these better designs are based in a lot of computational science research.

PROS AND CONS OF HER JOB // Caroline's favorite part of her job is how many people she impacts on a daily basis. They make software that improves the day-to-day operations of a lot of companies and universities. Her team has thousands of customers worldwide, and they process over one petabyte of data a month. And because they work on all aspects of the product, they often get to see their work through, from server-side to client-side to website to deployment, which she finds incredibly satisfying. One of the things she is not so fond of is how often product criteria change, to give people a clearer sense of what they want once they see the prototype, but for an advance planner, it's been a frustrating but informative experience.

WORK/LIFE BALANCE // Because they work in sprints, they get to dictate their own schedules, as long as they complete all of their tasks in a sprint. Caroline has co-workers who come in really early and leave mid-afternoon, and others who make it just in time for the daily stand-up meetings. Employees also are able to work remotely.

CAREER PATH // Caroline never planned to go into software engineering—she almost chose statistics as her major because she had been interested in math-based modeling in high school.

IN MY FIRST YEAR OF UNIVERSITY ONE OF MY REQUIRED CLASSES WAS INTRO TO COMPUTER SCIENCE, AND HONESTLY I'VE BEEN HOOKED EVER SINCE. IT WAS SO MAGICAL TO ME TO COME UP WITH AN IDEA, TRANSLATE THAT INTO CODE, AND SEE IT COME TO LIFE ON MY SCREEN.

SALARY // Around \$100k

CAREER EXPECTATIONS AND ADVICE // Try out a computer science class. Software and programming are important in so many fields. It's a versatile skill. Caroline is glad that she got to work on so many different parts of her product so far, because it has really opened her eyes to the different kinds of software and programming out there!

PAMELA WILLIAMS / CONSULTANT

AFFILIATION

LMI

LOCATION

Tysons Corner, Virginia

DEPARTMENT

Math Modeling Group

TITLE

Senior Consultant

EDUCATION

B.S. Mathematics,
Minor in Spanish/
Economics, 1991,
University of Kentucky;
M.A. (1997) and Ph.D.
(1998), Computational and
Applied Mathematics,
Rice University

CAREER STAGE

Mid–20 years
post Bachelor's

**HONE YOUR
COMMUNICATION
SKILLS SO THAT YOU
CAN PRESENT TO
TECHNICAL AS WELL
AS NON-TECHNICAL
AUDIENCES.**



WHAT SHE DOES // LMI is a consulting firm whose major clients are the U.S. Department of Defense and Department of Health and Human Services. Pamela is the project lead for a team that develops algorithms to solve inventory management problems. They help clients decide when to buy and how much to buy. There is no typical workday: she has managerial/administrative tasks such as reviewing project schedules and budgets, writing reports, presenting results to clients, and developing project proposals, as well as providing technical direction to the team, analyzing data, reviewing analytical results, and debugging simulation software.

NECESSARY JOB SKILLS // The problems that Pamela and her team solve require expertise in programming (C++, Python, and R), statistics, and data analysis, as well as modeling and simulation. Without a strong background in mathematics or programming it would be impossible to solve inventory management problems.

WORK/LIFE BALANCE // Most weeks, Pamela works 40 hours. Over the years, she has made time to tutor middle school students and teach math courses at Northern Virginia Community College. LMI has a flexible telecommuting policy that allows employees to work remotely when personal needs dictate.

CAREER PATH // During college, Pamela interned at AT&T Bell Laboratories, which gave her the opportunity to see mathematics in use in the telecommunications industry. Statistical analysis, queueing theory, and data visualization were used to solve complex problems. In an exit interview, one of her mentors, suggested that she apply to graduate school. Knowing that she preferred industry as opposed to academia was the extent of her career planning. After graduation, she took a post-doctoral position at Sandia National Laboratories—the on-the-job training there required learning multiple programming languages (C++, JAVA, Perl, Python, and Ruby) and working in variety of application areas ranging from public transit operations to hydrogen energy to biology.

SALARY // According to Glassdoor, entry-level consulting salaries start at \$60,000.

CAREER EXPECTATIONS AND ADVICE // Students should seek summer internships prior to graduation to gain valuable work experience, take multiple programming classes, and become lifelong learners.



GENETHA ANNE GRAY / ANALYTICS RESEARCH SCIENTIST**AFFILIATION**

Intel Corporation

LOCATION

Folsom, California

DEPARTMENT

Data Center Group

TITLEAnalytics Research
Scientist**EDUCATION**

B.S. Mathematics, 1993,
University of CA. Davis;
M.A. Mathematics, 1997,
California State University,
Sacramento;
M.A. Computational
and Applied Math, 2001,
Rice University;
Ph.D. Computational
and Applied Math, 2002,
Rice University

CAREER STAGEMid–24 years
post Bachelor's

**TO ENTER DATA
SCIENCE OR AI OR
A RELATED FIELD,
MAKE SURE YOUR
MATH, STATS AND CS
SKILLS ARE STRONG—
YOU WILL NEED THEM
TO BE SUCCESSFUL,
AND THEY MAY HELP
YOU STAND OUT FROM
THE CROWD.**

WHAT SHE DOES // Genetha is part of an artificial intelligence (AI) solutions group that is studying problems related to autonomous vehicles and other data-rich Internet-of-Things (IoT) devices—internet-connected objects that are able to collect and exchange data using embedded sensors. Her team is working to create a platform for the ingestion, labeling, assessment, and modeling of the 4000 TB of heterogeneous data produced by each autonomous vehicle each day. In a typical day, Genetha may have a meeting or two and may attend a talk or training (usually virtual). The rest of her time is spent reading, writing, and working with code.

NECESSARY JOB SKILLS // Applied math is the basis for all the work Genetha does. Her work is based on robust theory. She needs to understand why algorithms fail or succeed.

PROS AND CONS OF HER JOB // The fact that data science, machine learning, deep learning, and AI have become a hot field is both a blessing and a curse, according to Genetha. She appreciates the recognition of the work that she does and the investments that companies are willing to make to move the field ahead. She also appreciates all the sharing of findings from academia and industry and the new focus on AI at many conferences. The downside is that, because it is such a hot area, there are people pushing to get into the field who do not have the necessary mathematical, statistical, or computer science basics needed to be successful.

WORK/LIFE BALANCE // Intel is an international corporation with offices in more than 50 countries, therefore, the infrastructure is in place to attend meetings and talks from your laptop. Intel also provides transportation between its main sites, which allows Genetha to live in the town where her husband works and their son goes to school, but still easily have regular in-person meetings with her manager and teammates at other sites.

CAREER PATH // Genetha started out studying pure mathematics but then switched to applied math as she became interested in the applications of math to biology. After grad school, she wasn't sure if she wanted to enter an academic or corporate career and opted to take a post-doc position at a national lab where she could both work on large projects with multi-disciplinary groups but also work with students. It also gave her the chance to publish and present results at conferences. Genetha was offered a regular position on the technical staff and ended up staying for over 10 years.

THE FIRST STEP OF MY CAREER WAS WELL THOUGHT OUT. AFTER THAT, THE STEPS I TOOK WERE A COMBINATION OF NEED AND OPPORTUNITY. CHANGING JOBS IS NOT EASY—EVEN WHEN IT IS A POSITIVE CHANGE—AND I NEVER WOULD HAVE PLANNED TO DO IT TWICE IN SIX MONTHS, BUT IT WAS THE RIGHT THING FOR ME AT THE TIME.

When the government shut down in 2014 and many projects were cut, she left Sandia and went to a small software company. After one week, she realized that it was not a good fit. Intel was looking to hire a data scientist for their HR team, and despite having no experience working in people analytics, Genetha decided that it sounded interesting and made a second job change just months later.

SALARY // According to salary.com, the salary of a data scientist ranges from \$105,000 to \$135,000, depending on geographical location. There are often large yearly bonuses or lucrative stock options offered by companies in competition for the best talent.

CAREER EXPECTATIONS AND ADVICE // Study what interests you most, not what you think is the hot area. Things change quickly and you never know what will be the next big thing or where your skills will end up taking you.

In grad school, you will probably be told the importance of networking, but you might not believe it until you get started in your career. You will be surprised by how often you come into contact with your grad school peers, friends of friends, or people that you casually meet at conferences. They can help you advance in your career and give you opportunities to collaborate on interesting projects, attend workshops and conferences, give talks, bring in new teammates, and find interesting new career options.

STEVEN STATES / DATA SCIENTIST

WHAT HE DOES // Stephen is a survivability analyst for Surface to Air Missiles (SAMs) who helps develop engagement level models and simulations to help determine performance and survivability of SAMs. These models are physics based, using differential equations, probability, and matrix theory. In addition to running these models, data visualization is extremely important. Being able to summarize results concisely in a few charts is one of the more challenging aspects of the job.

NECESSARY JOB SKILLS // Mathematics is extremely important in Stephen's work at APL as he models problems that might not have well defined parameters or extensive system intelligence. He and his colleagues must use what they do know, along with their mathematical knowledge, to solve these problems.

I GOT GOOD GRADES IN COLLEGE. I THOUGHT I WAS SET. HOWEVER, THERE ARE SO MANY THINGS I NEEDED TO LEARN TO EVEN BEGIN USING MY DEGREE.

PROS AND CONS OF HIS JOB // I am continually fascinated with the application of math in everyday problems. Being able to use what I've spent years learning (and continue to learn) is the best aspect of my job.

WORK/LIFE BALANCE // Stephen has a great work-life balance—as long as his work is being done, he is pretty flexible.

CAREER PATH // After high school, Stephen accepted an Army ROTC scholarship to attend the Virginia Military Institute. Initially, his major was civil engineering, however, after a few semesters, he realized he was enjoying his math courses more than his engineering courses, so he decided to switch his major to applied mathematics. Even after he changed his major, his plan was to serve in the Army after college, but during his senior year, he was offered a job at JHU/APL. The opportunity to continue his math education was extremely appealing, so he decided to accept the offer and an Army Reserves Commission instead of serving in the active duty Army. He considers himself fortunate to be part of the strong alumni network at VMI.

SALARY // Beginning Career: \$70,000-\$80,000 / Mid Career: \$100,000-\$110,000 / Late Career: \$120,000-\$160,000



IF YOU DON'T UNDERSTAND SOMETHING, ASK ABOUT IT.

AFFILIATION
Johns Hopkins University

LOCATION
Laurel, Maryland

DEPARTMENT
Applied Physics Lab

TITLE
Data Scientist

EDUCATION
B.S. Applied Mathematics,
Virginia Military Institute,
2014; M.S. Applied
Mathematics, Johns
Hopkins University, 2017

CAREER STAGE
Early—3 years
post Bachelor's

CAREER EXPECTATIONS AND ADVICE // If you do not understand something, ask about it—most people are willing to share their knowledge with you. Also, find a mentor; they can answer some of these questions for you.



KARIN BERGERON / DERIVATIVES TRADER

WHAT SHE DOES // Karin runs the XVA trading desk at Scotiabank. Her team is responsible for making sure all derivatives are correctly valued, quantifying the Valuation Adjustments (VAs) necessary to take them from pre-crisis traditional derivatives valuation to post-crisis standards of pricing derivatives which account for more risks and managing all the risks inherent in these VAs.

Traditional derivatives valuation relies on pretty complicated mathematics. The math behind modern derivatives valuation, which prices in all the VAs, is even more complicated as it needs to look at expected values over the lifetime of the portfolio of trades.

Karin is currently sponsoring a project to rewrite the bank's XVA models to be faster and more coherent. This will put together some cool mathematical methods such as using adjoint algorithmic differentiation as well as leveraging some relatively new technologies such as using GPUs and cloud computing.

PROS AND CONS OF HER JOB // Being able to use models to make smart trading decisions, (and make money!) and being involved in exciting new projects like this one are some of the most rewarding aspects of Karin's job. Running a trading desk is stressful as you have a very high level of accountability, and are expected to make money, and optimize your use of the resources given to you all while providing top level customer service. However, it is a very measurable job since metrics are usually very transparent and provide an easy way to get fast feedback on your success.

I WAS SURPRISED ABOUT HOW EMOTIONAL THE JOB OF A TRADER CAN BE. MAKING MONEY FEELS AMAZING. LOSING MONEY FEELS TERRIBLE. LEARNING HOW TO MANAGE THESE EMOTIONS WAS AS AN IMPORTANT LESSON THAT DID NOT COME EASILY FOR ME.

CAREER PATH // Karin has always had an interest and an aptitude for problem solving and playing with numbers. She knew she would end up doing something quantitative, but was not sure what that would be, so her undergraduate studies were very unfocused. She took a variety of math courses with no particular goal in mind—just what seemed interesting at the time. With some timely mentoring she realized that there were lots of opportunities for mathematicians in capital markets and that this was something that interested her, so she took a highly specialized Master's program that focused on quantitative finance.

Karin's first job after graduating was as a "quant" (quantitative analyst). She was part of a team responsible for developing the derivatives pricing models for Scotiabank. One of the models she became involved with was the one that was referred to at the time as Credit Deferral—a way to adjust derivatives valuations to take into account the possibility that counterparties may default (which was an early example of a Valuation Adjustment). Through the aftermath of the financial crisis of 2008, the market changed the way it thought about derivatives valuation and in particular counterparty credit risk. So, as someone with a strong quantitative background who understood how these risks were modeled, Karin moved to the trading side to help the bank build out their capabilities and modernize their platform.

SALARY // Salaries vary widely based on demand for your skills and experience, as well as the current market conditions. Compensation is usually composed of a base salary, a bonus that is linked to your individual performance and that of your desk and business line as well as the institution as a whole.



**AS A TRADER,
YOU HAVE
TO LEARN TO
MANAGE YOUR
EMOTIONS.**

AFFILIATION
XVA Trading, Scotiabank

LOCATION
Toronto, Canada

DEPARTMENT
Global Banking
and Markets

TITLE
Derivatives Trader

EDUCATION
B.A. Music, 2000, Queen's
University, Canada;
B.A. Mathematics, 2001,
Queen's University,
Canada;
M.A. Mathematics, 2003,
York University, Canada;
Graduate Diploma in
Financial Engineering,
2003, York University,
Canada

CAREER STAGE
Mid—16 years
post Bachelor's

CAREER EXPECTATIONS AND ADVICE // Think of your career as long term. Try always to think beyond the problem as it is presented to you. People will often ask you to solve a problem that does not make sense or does not really accomplish what it is they are looking for. The best interns and students take the time to think about what the correct and full problem should really be before looking for the solution, rather than actually doing the work as it is asked for.

CHARLOTTE HALEY / POSTDOCTORAL APPOINTEE

WHAT SHE DOES // On a typical workday, Charlotte carries out analyses of time series and spatial datasets, writing programs to process and visualize these datasets, and synthesizing her results into technical presentations and academic papers. The most rewarding part of my job is the satisfaction I get from the creative process of searching the literature, investigating various avenues of interest, forming hypotheses, carrying out simulations, gathering and analyzing the data, and synthesizing the results in a document for peer review and publication. She also acts as a mentor to junior members of the technical staff. Her research is in an area nestled between statistics and electrical engineering, in the processing and analysis of digital signals by means of spectrum analysis. Her current research focuses on quantifying emergent statistical properties of three dimensional fluid dynamics simulations, as well as detecting and estimating oscillatory artifacts in power grid measurements.

NECESSARY JOB SKILLS // A doctoral degree in applied mathematics or statistics is required along with advanced knowledge of digital signal processing techniques, spatiotemporal statistics, statistical/machine learning. A broader knowledge of applied mathematics, optimization, numerical methods of solution for systems of partial differential equations, advanced scientific computing, and uncertainty quantification is also required.

PROS AND CONS OF HER JOB // The best part of her job is the flexibility and possibility of creative expression in research. Charlotte's least favorite aspect is the location in a Chicago suburb sufficiently far from public transportation.

WORK/LIFE BALANCE // The lab provides a friendly work environment, with on-site gym, plenty of social clubs, clean and modern facilities, and is in the middle of a beautiful nature preserve. Occasionally senior staff will have to work with tight deadlines on grant proposals, and all postdocs and staff tend to publish at an ambitious rate.

CAREER PATH // Charlotte's current job was her first job after she finished her Ph.D. at Queen's. She learned about Argonne National Lab from an email sent throughout the math department advertising a postdoctoral research position. She was attracted to the position because it allows her to concentrate all her creative efforts on research and academic writing. She had assumed that she would migrate to industry after her doctoral work but was pleasantly surprised at the gamut of opportunities that presented themselves after graduation.

SALARY // Postdocs may earn between \$75 and \$95k. Staff positions are even better remunerated.

AFFILIATION
Argonne National
Laboratory

LOCATION
Lemont, Illinois

DEPARTMENT
Mathematics and
Computer Science
Division

TITLE
Postdoctoral Appointee

EDUCATION
B.S. Mathematics, 2008,
Dalhousie University,
Canada; M.S. Statistics,
2009, Queen's University,
Canada; Ph.D. Statistics,
2014, Queen's University,
Canada

CAREER STAGE
Early-9 years
post Bachelor's



CAREER EXPECTATIONS AND ADVICE //

Research is a creative activity, and sometimes it's hard to make the shift from taking classes, where the assignments ask questions like "Show xyz," to doing research where the creative process tends to be incremental. It comes more from asking questions like: "Can we do better?" or "What would be the natural/useful extension to this?" or "Can we combine these two techniques in two different fields?" By asking yourself questions like these, you can go from having relatively few research questions to having more ideas than you can use.



RON BUCKMIRE / PROGRAM DIRECTOR

AFFILIATION

National Science Foundation

LOCATION

Alexandria, Virginia

DEPARTMENT

Division of Undergraduate Education

TITLE

Program Director

EDUCATION

B.S. Mathematics, 1989,
M.S. Mathematics, 1992,
and Ph.D. Mathematics, 1994, Rensselaer Polytechnic Institute

CAREER STAGE

Late—28 years
post Bachelor's

WHAT HE DOES // There is no typical day in Ron's job at the National Science Foundation. As a program officer, he spends a significant amount of my time interacting with the public. These interactions are either with people who have already submitted proposals for funding and have received a funding decision or those who are waiting for a funding decision. He also interacts with people who are thinking about submitting a proposal in the relatively near future. He also spends some portion of his day processing proposals that have previously been submitted. One of the most rewarding aspects of his job is being able to tell an investigator that the funding for their project has been approved.

NECESSARY JOB SKILLS // In order to evaluate proposals that are geared towards improving undergraduate mathematics education Ron needs to have a firm grasp on the mathematics. This is where his 20+ years of experience as a faculty member teaching courses primarily in applied mathematics and conducting research in numerical analysis and mathematical modeling plays a valuable role in his job.

PROS AND CONS OF HIS JOB // The best part of Ron's job is giving people positive news about a funding recommendation he has made. The worst part is realizing that he's going to have to decline at least 80% of the proposals that are on his (virtual) desktop. Ron also enjoys doing outreach to the community at conference and universities to demystify the NSF and to help people get federal financial support for innovative ideas to improve undergraduate mathematics education.

WORK/LIFE BALANCE // The federal government has programs in place to try to help employees maintain work/life balance and there are many aspects of the job that help Ron be able to work for the National Science Foundation while sustaining a household in Los Angeles.

CAREER PATH // Ron's career just fell into place. Being a professor just sort of happened after he received a postdoc at a small liberal arts college (Occidental) to expose recent PhDs to a teaching-centered environment.

SALARY // Federal government AD-4 salary range is \$119,776 to \$169,686

THERE ARE JOBS OUT THERE WHERE MULTIPLE ASPECTS OF WHAT YOU ARE GOOD AT CAN BE COMBINED FOR A REWARDING CAREER.



CAREER EXPECTATIONS AND ADVICE // Students who are interested in and good at mathematics but who are also interested in public policy and communication should realize that there are jobs out there where multiple aspects of what you are good at (technical facility with mathematics and clear expression of ideas in written and oral communication) can be combined for a rewarding career.

LAINA MERCER / RESEARCH STATISTICIAN

FIND PEOPLE WHO HAVE THE JOB YOU THINK YOU WANT AND ASK THEM QUESTIONS ABOUT HOW THEY SPEND THEIR DAYS AND WHAT THEY LIKE ABOUT THEIR JOB.

**AFFILIATION**

Institute for
Disease Modeling

LOCATION

Bellevue, Washington

DEPARTMENT

Polio group

TITLE

Research Statistician

EDUCATION

A.S. Geology, Skagit Valley
College, 2004

B.S. Mathematics,
Minor in Chemistry, 2008,
Western Washington
University;

M.S. Biostatistics, 2011,
University of Washington;

Ph.D. Statistics
with certificate in
Demographic Methods,
2016, University of
Washington

CAREER STAGE

Early–9 years
post Bachelor's

WHAT SHE DOES // One of the things Laina likes most about her job is the day-to-day variability: an average day could include discussing analyses with colleagues, meeting with collaborators, working on analyses, communicating results through presentations, or writing reports or scientific manuscripts. The most rewarding part of her job is when the results of an analysis lead to or help guide action. The recent work she is most proud of is the incorporation of their polio risk modeling work into the National Emergency Action Plan for Polio Eradication in Pakistan. The analysis helped tier districts in terms of risk and prioritize them for vaccination campaigns and special interventions.

NECESSARY JOB SKILLS // Mathematics is the foundation of all the statistical and mathematical models that are used to estimate things about populations of interest and learn about disease dynamics, and computational science allows us to implement these models accurately and efficiently on a large scale. Solid math skills and computer skills are necessary to help develop models.

I WAS SURPRISED BY HOW IMPORTANT THE ABILITY TO COMMUNICATE MATHEMATICAL CONCEPTS TO PEOPLE FROM DIFFERENT DISCIPLINES WOULD BE AND HOW MUCH I WOULD ENJOY DOING SO.

PROS AND CONS OF HER JOB // Laina's favorite thing about being a statistician is the variety of applications. In her current position, she uses statistical approaches to help answer challenging public health questions. It was important for her to find a position that wasn't too isolated from other scientists or the impact of their work. The opportunity to travel has been a bonus.

WORK/LIFE BALANCE // Laina's job has quite a bit of flexibility in terms of what hours employees work and where they work them. The most important thing is that they do high quality work and meet their commitments.

CAREER PATH // Laina's plan was to pursue a Master's degree in teaching and become a high school teacher, but her path changed entirely during the summer before her senior year of college, when she participated in a research experience for undergraduates (REU) funded by the National Science Foundation. She spent that summer working with three other undergraduates on estimating false discovery rates, a biostatistics method used when conducting multiple statistical comparisons simultaneously. This was her introduction to applied statistics and statistical research, and it turned out to be a great fit for her. After completing a Master's degree in biostatistics, Laina worked for two years with a group providing biostatistical consultation and collaboration at a children's hospital. During this time, she met statisticians in a variety of professional roles with varying levels of education, which provided her with a sense of non-academic career options for statisticians with Ph.Ds. When she returned to school for her Ph.D. she focused on methods that would be applicable in public health settings, so she concentrated on survey sampling, spatial statistics, and demography. Now a big part of her job is using spatial models to predict the risk of polio cases for sub-national regions of Pakistan and Nigeria.

I HAVE ALWAYS BEEN A "PLANNER", BUT I HAVE FOUND THAT IT IS IMPORTANT TO BE FLEXIBLE AND KEEP AN OPEN MIND ABOUT UNFORESEEN OPPORTUNITIES.

Laina heard about the NSF REU program by talking to upperclassman in the math department, learned about the field of biostatistics from her REU advisor, and found her current job by responding to a job announcement sent to her department. It may look like it all "fell into place," but it certainly felt more like a random walk to Laina.

SALARY // The starting range for a statistician in a non-profit research or public health is \$100,000–\$120,000.

CAREER EXPECTATIONS AND ADVICE // Find people who have the job you think you want and ask them questions about how they spend their days and what they like about their job. More importantly, try to get experience outside of the classroom. Internships and research opportunities will tell you a lot about what type of work you will enjoy.

MASON VICTORS / DIRECTOR OF DATA SCIENCE, DISCOVERY AND RESEARCH**AFFILIATION**

Recursion
Pharmaceuticals, Inc.

LOCATION

Salt Lake City, Utah

DEPARTMENT

Data Science

TITLE

Director of Data Science,
Discovery and Research

EDUCATION

B.S. Mathematics, 2011,
and M.S. Mathematics,
2013, Brigham Young
University

CAREER STAGE

Early—6 years
post Bachelor's



**SURE, START-UPS FAIL...
BUT THAT DOESN'T MEAN YOU
FAIL. YOU LEARN A TON!**

WHAT HE DOES // Recursion takes high resolution, fluorescent microscopy images of cell populations, treated with different diseases and drugs, and focuses on finding treatments for rare genetic diseases. It's the data team's job to extract the relevant information from these images to determine which drugs are potential treatments for which diseases. Mason coordinates projects and priorities on his data team, determining what tasks will bring them closest to achieving its goals, with respect also to the goals of the company. He also works with biologists and technicians to design the experiments to generate the most useful and valuable data. He is also responsible for improving their representation learning to extract the most useful information from the microscopy images. This involves heavy amounts of deep learning on images, while mixing in their own knowledge of biology to better inform the model representations.

NECESSARY JOB SKILLS // Mason's team is on track to generate between 10 and 20 TB of image data per week. Due to the volume, they need a way to represent each image mathematically, sometimes via deep convolutional neural networks, and to identify relationships between various drugs and diseases, which involves a whole lot of linear algebra. Add in to the mix the need for well-designed experiments (requiring fundamental statistical knowledge) and it becomes clear how critical the applied mathematics and computational skills are here at Recursion.

PROS AND CONS OF HIS JOB // Mason loves working on a problem that will change lives rather than just increasing the profits for some company. Not only is it satisfying from a societal impact perspective, it's also incredibly technically interesting and challenging.

WORK/LIFE BALANCE // As a data scientist, a lot of work can be done remotely, in addition to the collaborative atmosphere when a whole team is present. That made it easier for Mason to take paternity leave after the birth of his third daughter and to work from home two days a week when he had a two-hour commute.

CAREER PATH // Mason bounced between physics and astronomy as a college major, but finally settled in mathematics. The only area of applied mathematics that interested him was cryptography so he planned on working for the NSA when he finished. Instead, the graduate chair at BYU convinced him to stick around and work with him on computational mathematics. During his Master's program, Mason realized that he wasn't really doing math, and it wasn't really statistics or computer science either. The term data science had only recently been coined, and it took me a while to realize that that is what I was doing. I loved it, so I embraced it completely. It was definitely accidental, but I'm grateful I stumbled into it!

After finishing his Master's degree, Mason joined a start-up building intelligent call center software that heavily used machine learning. When it was acquired a year later, he found himself working for another data analytics company on numerous problems, ranging from natural language processing to agent-based simulation studies for workforce management. After a couple of years, he decided to get back into the start-up scene and joined Recursion Pharmaceuticals.

I THINK THE SINGLE BEST CAREER DECISION I MADE WAS TO JOIN A START-UP RIGHT AFTER MY MASTER'S DEGREE. PEOPLE TOLD ME "IT'S RISKY!", "MOST START-UPS FAIL!", "GO GET A PH.D. INSTEAD AND YOU'LL BE BETTER OFF IN THE LONG RUN!" BEING IN A POSITION WHERE YOU HAVE TO WEAR MANY HATS AT A VERY SMALL START-UP FORCES YOU TO STRETCH AND GROW IN A WAY THAT YOU'LL NEVER EXPERIENCE IN ACADEMIA OR AT A LARGER COMPANY.

SALARY // \$100K for starting data scientists to over \$250K for researchers at top institutions.

CAREER EXPECTATIONS AND ADVICE // Mason's graduate advisor told him "The important math problems in the 20th century were largely analytical in nature. Today, they are all algorithmic" and he couldn't agree more. While he still works through problems on a whiteboard now much like he did in college, that's just the set-up and planning. In the end, the solutions come through computational power coupled with mathematical knowledge and modeling. Most of the time, the importance and value of answering a question is in the decision made as a result of the mathematical/computational study of data.

CAROL MEYERS / MATHEMATICIAN

WHAT SHE DOES // National labs serve a role between academia and industry, solving problems too large and/or too applied for academia, and insufficiently profit-driven for industry. Lawrence Livermore National Lab strengthens national security by developing science and engineering solutions to problems in defense, counterterrorism, and weapons/nonproliferation. The areas in which Carol has worked include: energy grid modernization, nuclear counterterrorism, cyber security, stockpile stewardship, and supercomputing. She loves the diversity of the work and feeling like she is always learning. In a typical day Carol usually has a mix of several team meetings and individual work.

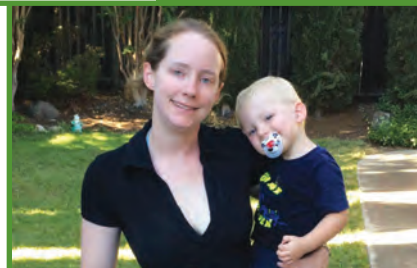
NECESSARY JOB SKILLS // Carol's mathematical background is in optimization and she is often brought in as a consultant offering mathematical modeling expertise. This usually involves working with teams of other scientists, including engineers, physicists, and computer scientists, and often in collaboration with other national labs and academia.

WORK/LIFE BALANCE // National lab employees are encouraged to pursue a reasonable work-life balance. Carol has two young kids and she is co-chair of the new moms' group at her workplace, which has provided her with a great group of co-worker friends for support.

WE HAVE A LAB-AFFILIATED DAYCARE, WHICH IS FANTASTIC, AND I AM NOT AT ALL ASHAMED TO SAY THAT I ENTHUSIASTICALLY NETWORK THROUGH DAYCARE.

CAREER PATH // Carol knew as an undergrad that she liked proofs and pure math, but she also really wanted to solve real-world problems. She applied to "way too many" grad schools in three different fields, eventually choosing operations research in the hopes it would allow her to do both things—fortunately, this was true! The national labs were a great fit for Carol because they have a blend of research and applications, and she finds working on problems in the "national interest" very motivating.

SALARY // According to the Bureau of Labor Statistics, the median annual wages for operations researchers working for the federal government is \$108,500, across all degree types. A Ph.D. in the field can expect to earn substantially more.



NETWORKING CAN BE AS SIMPLE AS BEING FRIENDLY AND ENGAGING WITH PEOPLE ON A PERSONAL LEVEL.

AFFILIATION
Lawrence Livermore
National Laboratory

LOCATION
Livermore, California

DEPARTMENT
Computational
Engineering Division

TITLE
Mathematician

EDUCATION
B.A., Mathematics, 2000,
Pomona College;
Ph.D. Operations
Research, 2006,
Massachusetts Institute
of Technology

CAREER STAGE
Mid-17 years
post Bachelor's



CAREER EXPECTATIONS AND ADVICE // Networking doesn't have to be about starting up technical discussions with strangers. Networking can be as simple as being friendly and engaging with people on a personal level—in fact it is often a lot more effective that way. On a related note, working hard does not lead to career growth on its own—the best way to find new opportunities is for people to know who you are and what you do (so don't skip those department socials).

RACHEL LEVY / PROFESSOR OF MATHEMATICS AND ASSOCIATE DEAN

WHAT SHE DOES // As an academic, Rachel works to bridge the gap between research, education, and industry. She spends most days interacting with her students and colleagues. Her applied math research focuses on mathematics related to fluid mechanics, often in biological contexts. She promotes engagement in mathematical modeling from kindergarten to graduate school. She especially enjoys communicating her love of mathematics with the general public, usually through interdisciplinary connections. Rachel is a founder of the BIG Math Network, which connects mathematicians in business, industry, government, and academia.

NECESSARY JOB SKILLS // Problem solving and communication. Willingness to learn and use new mathematical, computational and teaching tools. Curiosity, patience and perseverance in research.

PROS AND CONS OF HER JOB // Rachel loves connecting with people in a learning context and mentoring students and junior faculty. She enjoys team teaching and has been very lucky that in addition to mathematics, she has had the opportunity to team teach art and writing at Harvey Mudd College. She likes giving students feedback, but doesn't like assigning letter grades. Rachel hopes the mathematical sciences community will draw a diverse group of people into the profession to develop rich new mathematics based on multiple perspectives.

WORK/LIFE BALANCE // Teaching well is demanding. It requires long hours of preparation, and a lot of energy. Research can be all-consuming. To solve new problems requires deep thought and perspective. Life as a professor also usually involves service to the institution outside of the classroom. Rachel gets a lot of satisfaction out of all of these aspects of her job, and so she finds herself spending a lot of time working and traveling. At the same time, she has a tremendous amount of choice about how she spends her time and what projects she initiates or joins.

I WAS SURPRISED THAT MY DESIRE TO GO TO GRAD SCHOOL ONLY GREW OVER TIME. YOU CAN ALWAYS GO BACK IF YOU WANT TO!

CAREER PATH // Rachel always wanted to be an educator. During summers as an undergrad and beyond she worked teaching math and running a math summer program. After graduating with a B.A. in math and English, she tutored college students for a year and then took a job teaching a variety of subjects to middle and high school students, which she truly loved. During this time Rachel decided to leave teaching temporarily to pursue a Master's degree in educational media and instructional design. Afterward, she returned to the same school, where she taught for four more years, spending her afternoons and summers working on educational software and professional development for teachers. But she wanted to learn more mathematics, so she returned to grad school, this time with a focus on applied mathematics. After graduating, she did a postdoc before becoming a professor at Harvey Mudd College.

SALARY // Professor salaries depend on many factors, such as the size and type of institution, department, and rank (assistant, associate, full). It can also depend on the type of position (such as visiting, adjunct or tenure-track).

AFFILIATION
Harvey Mudd College

LOCATION
Claremont, California

DEPARTMENT
Mathematics

TITLE
Professor of Mathematics
and Associate Dean for
Faculty Development

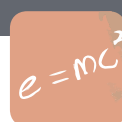
EDUCATION
B.A. English and
Mathematics, 1989,
Oberlin College
M.A. Education Media
and Instructional Design,
1996, University of North
Carolina at Chapel Hill
M.S. Applied
Mathematics, 2003,
and Ph.D. Applied
Mathematics, 2005, North
Carolina State University

CAREER STAGE
Late—28 years
post Bachelor's

**BE OPEN TO
OPPORTUNITIES
THAT ARISE AND
CHOOSE THEM
WISELY.**

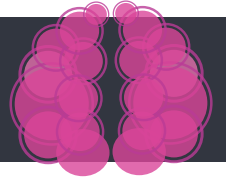


CAREER EXPECTATIONS AND ADVICE // Whatever interests you in the mathematical sciences, get broad training. Learn lots of math. Try an industrial internship. Learn to code. Practice writing and public speaking. These skills will serve you well in any career.



**MATHEMATICS IS NOT JUST A SYSTEM OF NUMBERS AND CALCULATIONS;
IT PROVIDES A FRAMEWORK FOR COMPLEX REASONING.**

— Donald Stephens (p. 9)



ABOUT SIAM

The Society for Industrial and Applied Mathematics (SIAM), headquartered in Philadelphia, Pennsylvania, is an international society of more than 14,000 individual, academic and corporate members from 85 countries. SIAM helps build cooperation between mathematics and the worlds of science and technology to solve real-world problems through publications, conferences, and communities like chapters, sections and activity groups. SIAM was incorporated in 1952 as a non-profit organization.

SIAM's goals are to:

- Advance the application of mathematics and computational science to engineering, industry, science, and society;
- Promote research that will lead to effective new mathematical and computational methods and techniques for science, engineering, industry, and society;
- Provide media for the exchange of information and ideas among mathematicians, engineers, and scientists.

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- concise updates on cutting-edge research;
- announcements about relevant events, policy updates, and education.

Nuggets and Insights under the Research tab point to interesting applications for career considerations.

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**TAKE EVERY
OPPORTUNITY
TO LEARN OR TRY
SOMETHING NEW.**

— Erin Seligsohn (page 15)

FOR THE PURPOSES OF THIS PUBLICATION, "CAREER STAGE" IS DEFINED AS FOLLOWS:
Early: 1-10 years post Bachelor's // Mid: 11-25 years post Bachelor's // Late: 26+ years post Bachelor's

FOR MORE INFORMATION ON CAREERS, JOBS, INTERNSHIPS, AND MORE:
www.siam.org/careers
bigmathnetwork.wordpress.com

FOR MORE INFORMATION ON SALARIES:
Glassdoor and **Salary.com** provide comprehensive salary information for a wide range of professions. Many governments offer data on their employees' salaries and there are many societies and agencies that do compensation studies in their fields and make the information accessible. Try a few specific search terms and see what you find for current salary information.

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SOCIETY FOR INDUSTRIAL AND APPLIED MATHEMATICS

3600 MARKET STREET, 6TH FLOOR
PHILADELPHIA, PA 19104-2688 USA

WWW.SIAM.ORG / SIAM@SIAM.ORG

