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CAREERS IN MATHEMATICS

CAREERS IN MATHEMATICS 5th edition

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Gateways and Options...

What does quantum physics have in common with DNA, or with the Manhattan project for building the nuclear bomb? What do these have in common with fractional dimension or with Monte Carlo simulations? Or with computing, quantum logic, mathematical economics, game theory or statistics.....?

Perhaps I should have rather asked "who" they have in common, rather than "what".

John von Neumann, like Alan Turing, who became well known for his role in deciphering the decoding of the Enigma coding machine in the end of World War II, has been involved in every single field mentioned above. He was a mathematician in the first half of the 20th century, who not only made substantial contributions all the areas mentioned, but also in many others that affect the way we live and the way we understand the world around us today. Climate change? Yes! Investments? Yes! Nano medicines? Yes! Economics? Yes! Your computer? Yes! Your cellphone? Yes!

If you understood the technical terms above and knew without the aid of Google or Wikipedia who Von Neumann and Turing were, the chances are that you already have a certain level of passion for mathematics. Mathematicians like John von Neumann showed us how mathematics touches on so much of what we take for granted in everyday life. Every aspect of our modern life is touched by mathematics in some way or form. In most fields, mathematics forms the foundation of that field and for young bright minds, many of these fields offer opportunities to study, to work and to develop. Today, like never before, there are endless opportunities to combine an affection for mathematics with real skills and exciting work opportunities. More than ever, South Africa needs more graduates with an ability to solve complex problems – critical thinkers who are in a position to support us in resolving long standing issues of health, climate, technological and social inequalities. Young people who have the ability to synthesise information, extract trends and guide our public and private sector colleagues in building solutions that have far reaching impact on every South African citizen.

South Africa needs you to bring your passion to the table and consider studying one of the many higher education options available in Medicine, Engineering, Mathematical, Computer or Business Science.

This is where gateway comes in – if you love mathematics, this is the entry point you need for success.

There are so many ways you can contribute – and that is where options come in. If you have a view on exactly what you are interested in – you are so fortunate. But if you don't, you cannot go wrong with seeking out a degree that has a combination of mathematics, statistics and perhaps something else that you may be interested in – be it psychology, economics, computer science and the many other offerings available in our wonderful institutions. We mention a few possible options:

Risk Analyst:

Mathematics is widely used in the financial field. Mathematicians build models to help explain and predict the behavior of financial markets in order to minimise a companies' exposure to financial risk.

Academic:

A career in teaching mathematics at university or school is ideal for someone who really loves the subject of mathematics. A university professor teaches mathematics and does research, developing new mathematics. Mathematics teachers introduce primary or secondary school learners to the power and beauty of mathematics. There is a national shortage of teachers and university academics in all the mathematical sciences (mathematics, mathematical statistics and computer science), so employment opportunities are plentiful.

Statistician:

The use of statistics has become widespread in almost every area of human endeavor in the 21st century. Statisticians are in high demand. Statisticians design experiments and surveys, such as opinion polls, to predict patterns of behavior of large groups based on relatively small samples, analysing the resulting data mathematically. In this analysis they make extensive use of probability theory, a branch of mathematics.

Data Analyst:

As a data analyst, you analyse data using mathematical modelling techniques to generate reports and visualizations that provide insights into what the data is 'hiding', as well as to inform an organisation's decisions and to solve problems in financial markets.

Data Architect/Engineer:

A data engineer designs, constructs, implements, tests and maintains the technology that creates the infrastructure to make good data available for informing an organisation's financial activity, as well as driving profitability and making the business future fit.

Actuary:

Actuaries assemble and analyse statistics to calculate probabilities of death, illness, injury, unemployment, retirement and property loss and design insurance which is maintained on a sound financial basis. Actuarial studies are quite challenging. Following a three or four-year degree at a university, you conclude your studies part time over a period of years through a professional body such as the Actuarial Society of South Africa, while working at an insurance company.

Astronomer/cosmologist:

Have you ever looked up at the sky at night and wondered where the stars come from? Or how big the universe is? Cosmology is the study of the structure of the universe and how it changed over time. The theory used to describe the universe depend on mathematical models and equations that are improved as our understanding of the physical universe increases. South Africa is at the forefront of cosmology in

Data Mining:

This is arguably is the fastest growing current field where mathematics plays an enormous role. How to find data and especially how to convert this data into useful information for governments, and business, is a Pandora's Box of opportunities for people with mathematical ability and skills.

Other areas include:

- Software Architects
- Computer Security Specialists
- Aeronautical Engineers
- Bio-mathematics and Bio-statisticians
- Every engineering fields

In this booklet, we will highlight some of these fields to hopefully trigger some excitement in you. If you are struggling to decide between one or another field, rest assured. John von Neumann even developed game theory, which involves the mathematical study of making proper decisions between two options!

Choosing to study for a mathematics related career is the gateway that will always leave you with many options!

Several of our South African Universities offer degrees in these fields or any other combination that will address your own unique interests and passions. Consistently, our universities rate in the top 5% tertiary institutions globally, so regardless of where you go and what field you select, you will be well served in preparing for an exciting and rewarding career in mathematics!

Prof Kerstin Jordaan Executive Director

South African Mathematics Foundation (SAMF) Cathy Sims **Executive Director** South African Graduate Employers Association

(SAGEA)

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IT SECURITY SPECIALIST



You may assume that as an IT Security Specialist for a big bank, I would have a variety of

university qualifications under my belt. The reality is that I did not attend university! I do, however, hold several qualifications in the IT and Security field, and I have always been passionate about continuing my learning journey in this space.

While I believe that I chose a career in Information Technology, I think my progression into Information Security chose me. I have always had an excellent moral compass, and believe strongly in doing the right thing, for the right reasons, for the good of the organisation and those within it - and that's why I am passionate about this career.

The truth about a role in Information Security is that no day is ever the same, and that's why I love my job so much. Most days, I spend time giving advice on various Information Security issues to those in my team, as well as talking through current initiatives and plans for the future. I do much work with Governance Committees and Forums; brainstorming on best ways to improve the security posture of the bank. I also work closely with auditors, giving them evidence of controls that are in place and working, such as the approval of access requests. I also spend much time investigating breaches and potential misconduct and then reporting on those incidents.

In terms of keeping up to date with developments and trends in the industry, I belong to several industry forums and spend focused time on my continued learning; it is a requirement with many of my qualifications that I undertake at least 20 hours of further learning each year for my accreditation to remain active. I also enjoy engaging with experts in my field, both internally and externally, and that helps to keep my knowledge current.

The thing I enjoy most about my job is that every day is different and challenging in its own way - and that I can add real value to my organisation. On the flip side, my biggest challenge is the reality that this is a male-dominated industry and as a woman I have to prove my expertise and knowledge continually.

Outside of work, I enjoy spending time with my family and friends. I read a lot, and have a passion for cooking. When I can, I love spending time in the bush, visiting game reserves as often as I can.

MATHEMATICS TEACHER



Mathematics is the future. It is why I chose a career in helping and educating others – I

can change a lot of students' lives using numbers and inspiring them to pursue a career in mathematics and related fields.

I grew up in a small town called Illovo in Durban, and obtained an A in mathematics in matric, so I knew I wanted to pursue a career dealing with numbers. I graduated with a BSc (Honours) in Mathematics and Statistics from the University of Kwa-Zulu Natal (UKZN), and then went on to study a PGCE in Mathematics and qualified as a professional mathematics teacher. I am currently finishing my Masters in Statistics, also at UKZN.

My day to day life tends to be hectic, but fun and challenging at

the same time. I teach mathematics from Grade 8 to Grade 12, and also do extra lessons with my students as well as the broader community via my Facebook Page (CSM Mathematics) and a WhatsApp group. My intent with these forums is to explain concepts, as well as offering alternative solutions to questions and problems. While I spend most of my days (and evenings) teaching mathematics, I wouldn't change it for anything - I believe this is the only way for me to further learn, develop my skills in the subject and inspire others along the way.

Outside of work, I enjoy playing chess as I believe that mathematics and chess go hand in hand – requiring you to think, strategise and problem-solve before you can find answers. I am a very active person - I believe in being mentally and physically fit. And lastly, I am a family man who enjoys spending time with his family.

MATHEMATICS LECTURER



If ever there were a story about the convergence of passion, perseverance and problemsolving, then

this is it. Dr Mathebula is a shining example of someone who, despite the odds, has made an outstanding and rewarding career based on mathematics. Her story is inspiring and motivating.

My love for mathematics was born whilst at Muyexe Primary School in Limpopo. I was fortunate to have brilliant mathematics teachers who displayed an innate sense of joy when teaching us mathematics.

My older sister had also discovered a talent for mathematics. When we did homework together, her delight each time she was able to solve a mathematical equation or arrive at the correct answer was infectious. My good fortune continued through to high school where, again, I had inspirational mathematics, biology, and physical science teachers. These experiences laid a firm foundation for my resolve to build a career using mathematics.

That said, I certainly did encounter setbacks. I registered to write Standard Grade mathematics for my final matric examination only to find that through an error I was given the wrong paper and wound up writing the Higher Grade exam which I failed, despite passing all my other matric subjects. Casting aside my shame at failing and with the encouragement and support of my family, I repeated my matric year, this time, passing mathematics on Standard Grade.

I then registered for a BSc in Mathematics and Computer Science at the University of Venda. Having never switched on a computer or seen, let alone used a mouse before, I was at a huge disadvantage trying to learn to program and did not do well in this first-year course – though I did pass both the mathematics and statistics modules. In my second year, I switched degrees to a BSc in Mathematics and Statistics. There were a few bumps in the road whilst completing my undergraduate degree – I had no mentors, failed a few courses along the way and encountered financial difficulties. There were indeed times that I wanted to give up, however, my parents convinced me that I might be permanently disadvantaged if I did not persevere. I graduated from the University of Venda with a BSc degree in Mathematics and Statistics in 2008 and went on to complete a BSc Honours in Mathematics.

In my mind and the absence of meaningful career guidance, I had always pictured me working as a Statistician for Statistics South Africa, but it was whilst doing my first BSc Honours in Mathematics at the University of Venda in 2008 that the African Institute of Mathematical Sciences (AIMS) invited me to attend a workshop entitled "The annual Clinic on Meaningful Modelling of Epidemiological data (MMED)" where I learned about solving reallife problems such as the spread of infectious diseases through the application of mathematics. It opened my eyes to a far wider range of career options with mathematics as a base. Realizing that mathematics was the father of all STEM (Science, Technology, Engineering and Mathematics) careers, I continued with my studies at Stellenbosch University, graduating with my BSc Honours in Biomathematics in 2009 and MSc Degree in Biomathematics in 2012.

Returning home to Limpopo following my graduation, I began lecturing part-time in Mathematics and Statistics at the University of Venda whilst simultaneously studying to be the first-ever South African to obtain a PhD in Mathematics from the University of Venda where I still lecture today on a full-time basis.

Aside from my lecturing responsibilities, I attend and present at international conferences and workshops and participate in international research groups such as Modelling Health and Environmental Linkages Research Group (MHELRG) and Models of infectious Disease Agent Study (MIDAS). I have presented research output at international conferences in Spain, Dubai and the United States of America. I am an active and empathetic mentor to my students, not wanting them to make the same mistakes I made along the way and sharing my career journey with them for inspiration. I am also a member of the South African Women in Mathematical Sciences Association (SAWMSA), have had research articles published and I am a semi-finalist of the 2020 TechWomen programme. Somehow, I find quality time to spend with my family and friends, listen to gospel music and sing in a gospel choir.

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ASTRONOMER



When you think Cosmologist you probably picture Stephen Hawking. This well-known

expert sets the scene for meeting Dr Michelle Lochner – an Astronomer who is a lecturer at the University of the Western Cape.

"I have a distinct memory from when I was about six years old, of my father and me gazing up at the dark sky on a clear African evening with the stars shining brightly back at us. He pointed out the Pleiades, which is an open cluster of more than 800 stars located about 410 light-years from earth. I recall my fascination with the universe beyond earth, the many questions that came to mind and the inquisitive spark that lit up as I yearned to understand the universe and how it works. Whilst this was not the "aha" moment at which I decided to pursue a career in this field, it was a defining moment in the journey I have since travelled.

I enjoyed Mathematics and Physics at school and took both subjects for A-levels. I flirted with many different career options, not really having a clear sense of what I wanted to do – I decided to enrol for a BSc majoring in Physics, Applied Mathematics and Computer Science which I completed at Rhodes University. During my studies, I attended a talk about the <u>Square Kilometre Array</u> (SKA), an international effort to build the world's largest radio telescope, with over a square kilometre (one million square metres) of collecting area. The fact that this was going to happen in South Africa was the catalysts for my career. I approached the project team and enquired about internship opportunities – which I was most fortunate to be offered.

SKA later offered me a scholarship to continue my studies – I joined the <u>National Astrophysics and Space Science Programme</u> (<u>NASSP</u>) which is a multi-institutional initiative between the University of Cape Town (UCT), North-West University and the University of Kwa-Zulu Natal. As part of this programme, I completed my Honours in Astronomy and went on to do my Masters which I later upgraded to a PhD, all through UCT. I focused my research on the application of statistics in Astronomy and Cosmology. Once qualified, I took up a post-doctoral research position at University College London, where I spent two years. I then returned to South Africa and worked as a researcher for the <u>African Institute for Mathematical Sciences (AIMS</u>) and the South African Radio Astronomy Observatory (SARAO). As of 2020, I have joined the University of the Western Cape as a senior lecturer, while maintaining a joint appointment with SARAO. So, what does a career in this field look like and how do I spend a typical day? The quest of an Astronomer is to deepen our understanding of the universe, the space beyond our world. Much of what we do is data-driven, and I investigate techniques to analyse terabytes of data using Artificial Intelligence and statistical methods. Sometimes referred to as "blue skies science" and, contrary to the picture Hollywood paints of space exploration, we do not often stumble upon discoveries like aliens or life on other planets. Instead, we improve our understanding of the universe. Astronomy is a field that has driven innovation – space travel being a primary example of this. CCDs in cameras, x-ray scanners at airports and GPS technology wouldn't have happened without astronomy.

South Africa has a significant competitive advantage when it comes to Astronomy. Our dark skies, wide-open spaces, and areas where a lack of radio interference is protected by law, provide ideal conditions for both SKA and MeerKAT. The MeerKAT radio telescope, situated 90 km outside the small Northern Cape town of Carnarvon, is a precursor to the Square Kilometre Array (SKA) telescope and will be integrated into the mid-frequency component of SKA Phase 1. MeerKAT has been designed, engineered and built in South Africa to be at the cutting edge of the advancement of the human species. Much of the work that I do entails working with data obtained from MeerKAT, and I am excited to be part of an incredible and ambitious international project.

A typical day will involve working on programming and scientific investigation. I have, in collaboration with colleagues, developed an algorithm that quickly detects anomalies in vast sets of data. Astronomy is a collaborative field, so I attend regular meetings and work with colleagues all around the world. I am also involved in writing journal articles, reading papers, and giving or attending presentations. I have attended conferences or been on research visits to New York, London, Paris, Sydney, and Geneva.

If you are considering a career in this field, I can assure you that it is a great area to work in. Ideally, it would be best if you have a passion for Mathematics and Science, enjoy problem-solving and be curious. South Africa's government is investing in Astronomy, and our involvement in MeerKAT and SKA have resulted in growing interest and opportunities for Astronomers. No day is the same for me, and I am empowered to pursue aspects of research that are of interest to me.

There is a misconception that careers in the sciences do not pay – I can assure you, however, that anyone graduating with a BSc in Physics will have many career options to choose from, Astronomy being but one of those. If you can learn to program (look on the internet, there are lots of resources to teach yourself and it is enjoyable), can think and question or analyse large sets of data, you will have fun and, probably be employable.

Work-life balance is essential to me, so I do not spend all day in front of a computer screen. I play the piano and enjoy socialising – gaming is also a hobby (more screentime). In 2017 I founded the <u>Supernova Foundation</u> – an international mentoring programme for women in Physics. Today we have around 70 mentors who work with more than 180 mentees in different countries. We connect senior women in Physics with women students for personal mentoring, run quarterly webinars, and help our mentees with everything from selecting PhD research topics to career options and dealing with issues in the workplace.

STATISTICS LECTURER



I chose Mathematics and Statistics as my career, as it's the one field of study that allows me to apply my knowledge to

a broad range of applications. The methodologies of these two interrelated fields are applicable in most, if not all sectors and, therefore I am not limited in my research fields as an academic.

My journey to becoming a lecturer was not as straightforward as it would seem. I started my academic studies in Computer Science, and during my 2nd year I decided to switch to Mathematics and Statistics – a decision I have never regretted. I have now gone on to complete my PhD in Statistics, and my current research is on the topic of Factorisation Machines. Recommender Systems use Factorisation Machines where data is sparse but contains many observations and features (these can sometimes range into the millions). For example, Netflix uses a Recommender System to suggest movies based on

previous movies that a user has watched, taking into account the genre, and so on. of the film.

While I did not necessarily seek out becoming an academic, it is something that came naturally to me. While I was completing my MSc degree at UWC, the opportunity arose for me to join the Statistics and Population Studies department and I remember thinking, "well why not?" and I couldn't think of a better career path for myself.

My research interests are in the areas of big data analytics and the application of statistical learning methodologies. The fields of Mathematics and Statistics are gaining more attention and becoming increasingly prevalent with the advent of the 4th Industrial Revolution, and as businesses start to realise the value in the application of various methodologies of these fields. A lot of the knowledge I have originates from my student years, but - as with any specialisation - I need to keep up with the latest developments, methodologies and their application.

To keep up with the latest trends, I read a lot of articles and conference proceedings. I also try to attend a minimum of one local and one international conference rooted in Statistics every year. By attending these conferences, I keep abreast of what fellow researchers in the field are focussing their minds on and gain insight into what the next 'big thing' might be.

As an academic, my day is divided between lectures and consultations with students or staff. I spend the rest of my time working on research projects either as part of a team or individually. My greatest joy is witnessing students enjoying what they are studying but also, and more importantly, seeing them excited when they are working and enjoying applying their knowledge and skillsets at work.

The job of an academic is demanding, so whatever spare time I have, I spend socialising with my family and friends.

SOFTWARE ENGINEER





I come from humble beginnings. Growing up in Chatsworth, KZN, I looked around me

and knew I wanted to do more in my life and achieve what seemed unachievable. I was never a straight-A student, nor a spectacular athlete, but that didn't mean I didn't try. In the classroom, I was desperate to achieve that A but it wasn't easy to get there until I came across Computer Science. Perhaps it was all the time I spent playing Mario Brothers and other TV games, but for some reason everything that I learned just made sense - it came effortlessly. I was around 12 years old when I wrote my first lines of code in basic, and I was hooked – that was it for me.

I completed a Bachelor of Science Degree at the University of KwaZulu-Natal. Since then, I have obtained additional qualifications related to my field in software engineering. Despite traditionally gaining my qualifications, I truly value and support online learning which has progressed so much over the last few years. Now, in this digital age, there's an abundance of options including Udemy, Coursera, and LinkedIn Learning. My degree has allowed me to open doors to various work opportunities, my ability to perform, and quickly solve problems in an ever-changing technological landscape.

As the practice lead for Software Engineering at Standard Bank, I am responsible for ensuring modern engineering practices are embedded and adopted across the organisation. I lead a team of technical coaches, and together we train, develop, and coach teams on practices related to Continuous Integration, Continuous Deployment, Continuous Testing and Monitoring. Essentially, we help teams get better at and excited about Software Engineering. I love my job because I get to challenge the status quo, I get to experiment, and I get to connect with like-minded engineers across the group. I am a firm believer in continuous learning. My best insight comes from connecting with people and listening to their journeys and stories.

What I love most about my job is that I get to connect with people, I get to learn, and challenged to grow. Highlights include setting up high performing teams and developing a dashboard that pulls in insights from across the CI/CD Pipeline. We essentially took a Gartner report, leveraged open source code, and made that report practical and easy to consume. In terms of challenges, I work in a male-dominated industry where the real growth is not just about doing a good job. It's about partnering and creating a network, continuously



learning, and using every opportunity to grow people. I am also a mother of two young boys, and I feel it is my duty to ensure they feel empowered, but at the same time fuel a fire for hard work and dedication. I want them to understand who they are and the privilege of the democracy they were born into.

Outside of work, I love being outdoors, and we love taking time out on 4x4 trails - getting dusty and muddy. My other hobbies include watching any supernatural or Sci-Fi movies – I am a huge Harry Potter fan.



DATA ENGINEER

I have always had a passion for mathematics. For me, it is not only about learning the theories, but

also developing problem-solving and critical thinking skills which can be applied through all facets of life. I have studied a BSc Mathematical Sciences degree with majors in Mathematics and Mathematical Statistics. I've completed my honours in Mathematical Statistics, and I'm currently pursuing my Masters in Mathematical Statistics.

I joined the FNB Graduate Programme in 2019, and later promoted to Data Engineer within the Computer Vision and Analytics team. Our main focus is on building analytical models using computer vision and machine learning. I spend most of my day using the available data to build models that business can use in their decision processes. I'm challenged with new problems almost every day, which allows me to learn and grow continuously.

A typical day for me is one filled with fun, and - as one might expect - a lot of brain work. I developed most of my problem solving and analytical skills throughout my university career - studying a mathematical and statistical degree trained my brain to think in a certain way, and I find myself looking for patterns and identifying trends regularly. Part of my job is to build new models that involve a lot of new theories and methodologies (machine learning and Artificial Intelligence (AI) is a growing science), and this allows me to conduct research and continuously gain knowledge. While my work is challenging, I work in a great team that's willing to help whenever needed – they are like a second family to me.

I enjoy expanding my knowledge base, and by learning every day, I feel myself growing as a person. The highlight of my career at FNB thus far is the recognition I have received for the hard work I put into my role – it's a great motivation to keep going. It isn't to say there aren't challenges. I have had to learn to accept things that are not in my control, for example, the dependency of a platform not being able to execute specific tasks, or moving data from one environment to another. Sometimes these processes don't go as smoothly as one might expect, and you have to learn to take setbacks in your stride.

I spend my time outside the office researching and reading journal articles about machine learning and AI and how it is being used in the world. It's where my passion lies, and that's why I love my job. I also have a significant interest in medicine, and even though a lot of it grosses me out, I enjoy learning about the medical world. Lately, I've dedicated most of my free time to my studies and to spending time with family and friends.

DATA ANALYST TRAINEE



I wanted to study the most challenging degree I could think of so started out doing

Actuarial Science – but soon gravitated towards Finance and Coding so switched my UCT studies to a BCom with Economics and Finance.

Today, I am part of Sanlam's Data Analytics Graduate Programme, where I learn and grow my skills daily. The program involves a series of rotations as well as a combination of real and project work. My first rotation was a lab project for one of Sanlam's subclusters. I was responsible for producing dashboards which connect the models my team were building with meaningful information and data fed to the client. Working on this project introduced me to the opportunity to learn SQL coding and how to work on databases, both of which I enjoyed.

Since this initial project exposed me to many more facets of the business, including data integrity and quality, and I have gained many new skills such as data modelling, machine learning and sentiment analysis. Through my broadened exposure to the business, I have also developed new soft skills.

A typical day starts at 8 am. Because I am on the graduate programme, I meet with the other graduates, and we compare notes on how our work and projects are going. There is muchcollaboration which helps us to learn from one another.

Adjusting to the world of work means learning to balance priorities – I spend four days of the week doing real work with deliverables, with one day a week spent working on projects with the other graduates. Both are challenging, interesting and fun.

To keep pace with the learning curve, I watch a lot of tutorials and YouTube clips, as well as doing a bit of forex trading in my spare time. Keeping fit and active is key to my success and, being quite tall I am an adept basketball player. I am always eager to challenge myself, using initiative to take on tasks in my team, writing board exams (I have enrolled in writing an Actuarial board exam), to trying new and efficient ways of optimising the things I already know how to do such as developing my very own trading algorithm.

ACTUARY



When reflecting on my learning and career journey thus far, it is clear that mathematics

NOKGATI MOKGATI

has guided the path to my achievements. While I was good at mathematics from a young age, it was only around Grade 7 that I realised my love of numbers and solving problems could take me places. My teachers had noticed my flair for problem-solving, and soon I found myself involved in provincial mathematics competitions - and winning them. I continued taking part in contests in high school, where I became part of the South African Mathematics Team between Grades 10 and 12. The sense of achievement from winning competitions continued to drive my passion and ultimately, my decision to pursue a career in mathematics.

Deciding what to study at university was reasonably straightforward, especially after the South African Mathematics Team sponsor put out an advertisement encouraging careers in Actuarial Science as a gateway to an exciting and diverse career. I embarked on a degree in Actuarial Science at the University of Cape Town, and upon completion of my degree I knew that a job as an Actuary was for me. Being an Actuary is all about making financial sense for the future, equipping people to make better-informed decisions, and finding solutions to complex problems.

My current role has exposed me to a different side of a career as an Actuary. I am now in a client-facing position – so instead of sitting at my computer and analysing data - I typically spend time with clients; discussing problems and working on solutions. I spend much time working on spreadsheets, reading and writing reports, and updating the executive team on how the business is doing. The great thing about my job is that no day is ever the same – there are always new problems and challenges for me to grapple with, and the skills I have developed over the years have helped me to have a measurable impact on our clients and their businesses.

As with all industries, it is crucial to keep my skills sharp and remain up-to-date with industry trends. It is imperitive in my current role, engaging with clients, where often they look to me to understand the "technical" side so that I can help them make better financial decisions. I do this by attending industry-focused conferences, seminars, and events, and I also spent much time reading. CNBC and Bloomberg are two of my favourite platforms to keep up to date with news and trends in our industry. I think it is essential to focus on not

YOU HAVE TO BE ODD TO BE NUMBER ONE. - Dr. Seuss



An actuary is a professional who applies analytical, statistical and mathematical skills to financial and businessproblems. Thisis especially valuable when facing real-world problems that involve uncertain future events or financial risk.



INSURANCE PENSIONS HEALTHCARE **RISK MANAGEMENT**

Given the set of skills that actuaries have developed, many have also branched into wider business fields, e.g data analytics, capital projects, environmental issues, etc.

From the definition above, three key areas of focus can be highlighted:

1. Statistical and mathematical skills | 2. Solving business problems | 3. Being a professional



- Based on these areas, the following subjects are required:
- Mathematics & English

While the subjects below are recommended:

- Computer Science:
- Advanced Programme Mathematics:
- Accounting and/or Economics:
- Physics:

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It is important to remember that actuarial science courses generally have higher entrance requirements that also consider your average results. This should

be considered when choosing your additional subjects.

The next step after school is to enrol into an actuarial science course at an accredited university.

For further information on each university's programme, please visit their respective websites.



being a specialist in only one area - we need to be able to look at the broader picture too.

When I consider the highlight of my job, I would have to say it's the heartwarming feeling I get when the work I do for a client has a positive impact on their business - and the gratitude they show for this. The biggest challenge of my job is to effectively communicate 'technical insight' to a potentially 'non-technical' audience. I have to be cognizant of the fact that they may not understand the terminology or the methods we use, so patience is key.

Outside of work, I enjoy spending time with my two young kids, friends, and singing at my local church. I also enjoy reading and watching a series on TV, and when I need to get the blood pumping, I play squash.

RISK ANALYST



There are more brilliant mathematicians out there than you think, and they are in-

volved in exciting and diverse careers. I grew up with a passion for mathematics and problem solving which led me to study a BSc in applied and pure mathematics at the University of the Witwatersrand, followed by Honours and Master's in applied mathematics (Operations Research) at Stellenbosch University.

Although I did not have a clear plan of how I would use my qualifications, I knew that I would have the tools to work in any field requiring mathematics and problem-solving. Whilst at University, I applied to several graduate programmes and in the end, chose to join Rand Merchant Bank's programme. My key responsibility is to ensure that RMB, through its derivatives trading activities in Africa and South Africa does not take on more credit exposure than they should. I work closely with the organisation's traders to understand their intended trade-flows and to ensure that they know what limits they should be operating within. To do this well, I make sure that I stay abreast of what is happening not only in the South African economy and regulatory environment, but in all countries where RMB has trading activities. I enjoy attending conferences and short courses that contribute to my knowledge and understanding of global markets, risk, regulations and big data.

Always needing to be leaps ahead of the Traders, my day starts early with reading up on global market movements and trends which is usually followed by detailed discussions with Trader's and risk managers to understand their expectations and planned position for the day's trading. I then monitor trading credit exposure and capital reports throughout the day and may attend several meetings.

Managing RMB's trading desks across the continent and abroad, including those situated in London and India, is challenging but keeps me on my toes. I regard this as one of the critical highlights of my role – interacting with multidisciplined and diverse colleagues from around the globe who have a wealth of knowledge and experience to share.

When I am not wrapping my head around the world's economic ups and downs, I am a Manchester United fan who loves spending time with my family.

CLIMATOLOGIST



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The Butterfly Effect was introduced by Edward Lorentz in the context of

atmospheric

predictability. The idea behind the effect is simply explained by the analogy of a butterfly flapping its wings in Tokyo, leading to a tornado in Tennessee. The chances of this occurring are improbable, but the concept is really that a small event can have large and far-reaching consequences in the future. Not only is the Butterfly Effect directly linked to the field of climatology, but it also accurately describes what climatology is. Climatology uses partial differential equations and the laws of physics to make both short- and long-term predictions of weather conditions and patterns based on atmospheric changes. My career journey further personifies the Butterfly Effect starting with a small mathematical

equation I have had a major impact on international climate change negotiations via the 2015 Paris Agreement. But more about that later.....

Whilst I admit that when I finished school, I had no clear career plan (not many 18-year old's do!) I did know that I had a talent for Maths and loved Applied Maths as well as having an interest in Geography, specifically Climatology. To pursue a tertiary education, I was dependent on obtaining a bursary and was, fortuitously, offered one by the South African Weather Bureau. I completed my undergraduate degree in Meteorology, Maths and Applied Maths at the University of Pretoria, going on to complete my Master's and PhD in Numerical Meteorology with the same Institution.

A large component of my knowledge and skill comes from my academic pursuits. I was fortunate to have a strong foundation of Applied Maths from my undergraduate studies and, whilst completing a PhD occupied a significant portion of my younger life, I was studying and learning about a subject I am passionate about, under the significant mentorship of an Australian supervisor, with whom I still maintain a close relationship.

What is really fascinating and exciting about my career is the variety I experience on a daily basis, together with the ability this career affords me to make an impact on matters which could, literally, save our planet in the long term. There are three components to my work; they are climate modelling, the communication of science and post-graduate training.

Climate modelling – I work with big data and highperformance computing to develop code which assists in the development of accurate climate models. Data is gathered from several sources which gives me the opportunity to interact with meteorologists, atmospheric chemists, oceanographers carbon specialists and ecosystem specialists. I have performed instrumental work on developing code that led to the development of the first African-based climate or earth system model. The application of this model is assisting the Global Change Institute (GCI) to generate projections of future climate change for Africa.

Communication of Science – the communication component of my knowledge and research is, of course, critical. There is a strong interface between the work performed by the GCI and the formulation of government and inter-governmental policy on climate change. A paper that I published in 2018 addressed the effects of a 1.5°C increase in global temperatures and was a strong component of the Paris Agreement on climate change which affected 197 nations around the globe. Whilst scientists do not prescribe policy, they are responsible for providing data and information that is policy relevant. This means that I regularly interact with South Africa's Climate Change Directorate, I attend climate change negotiations and I communicate with numerous stakeholders such as the agricultural sector, water authorities, municipalities and even financial institutions who have an interest in understanding the risks associated with climate change.

I have a deep passion for what I do, and I am keen for students to experience the amazing work I do and the opportunities I have encountered in my career. I love the outdoors, describe myself as an environmentalist and, I also have a passion for butterflies! This is certainly a fascinating and rewarding career option – and one which few people would have enough knowledge to pursue. My role is "hands on". And I love the idea that I can analyse data and develop models that will predict events that you can see coming to life. We are the last generation who can really make a difference to saving our precious planet. Now, who wouldn't want to do that?

AERONAUTICAL ENGINEER



I have always loved mathematics. Throughout my school career it was my favourite subject, and

I know that whatever academic and career journey I would embark on later in life would have mathematics at the core. When it came to choosing what to study at university, Engineering seemed like the obvious choice as I enjoyed solving problems. The science behind aeronautics intrigued me even further. Hence, I studied Aeronautical Engineering.

I obtained a Bachelor of Science in Aeronautical Engineering, as well as a Master of Science Engineering from the University of the Witwatersrand. I am currently enrolled for a PhD, researching urban air mobility, which involves looking at passenger or cargo air transportation services in a specific metropolitan using various degrees of automation.

While a degree in Aeronautical Engineering provides a wide range of career opportunities, at the end of the day, it comes down to what you want as an individual. For example, I kicked off my career as a junior engineer, performing stress analysis on aircraft structures. I then got involved in research projects of crewless aerial vehicles (UAV) which investigated controlling an uncrewed helicopter in the event of engine failure. I then left the Aviation industry entirely and became a financial modeller for a management consulting firm. But I have gone full circle and am now back working in the aviation industry and loving it.

I work for the South African Civil Aviation Authority as a Certification Engineer focusing on exemption applications and regulatory development. The aviation industry can apply to be exempt from any regulation and my job is to evaluate such an application to ensure it will not pose any serious or imminent risk to air safety and security.

As you can imagine, I must keep up-to-date with trends and research in my field. I do so by frequently attending training covering a wide range of topics, including aviation safety, civil aviation management, and learning on the job through my involvement in various projects.

What I enjoy most about my job is that my days are always varied, so I am continuously being challenged and stretched. I enjoy drafting aviation regulations which ultimately have an impact on the industry.

Outside of work, I live an active lifestyle and exercise as often as I can. I also love attending comedy shows for a good laugh.



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