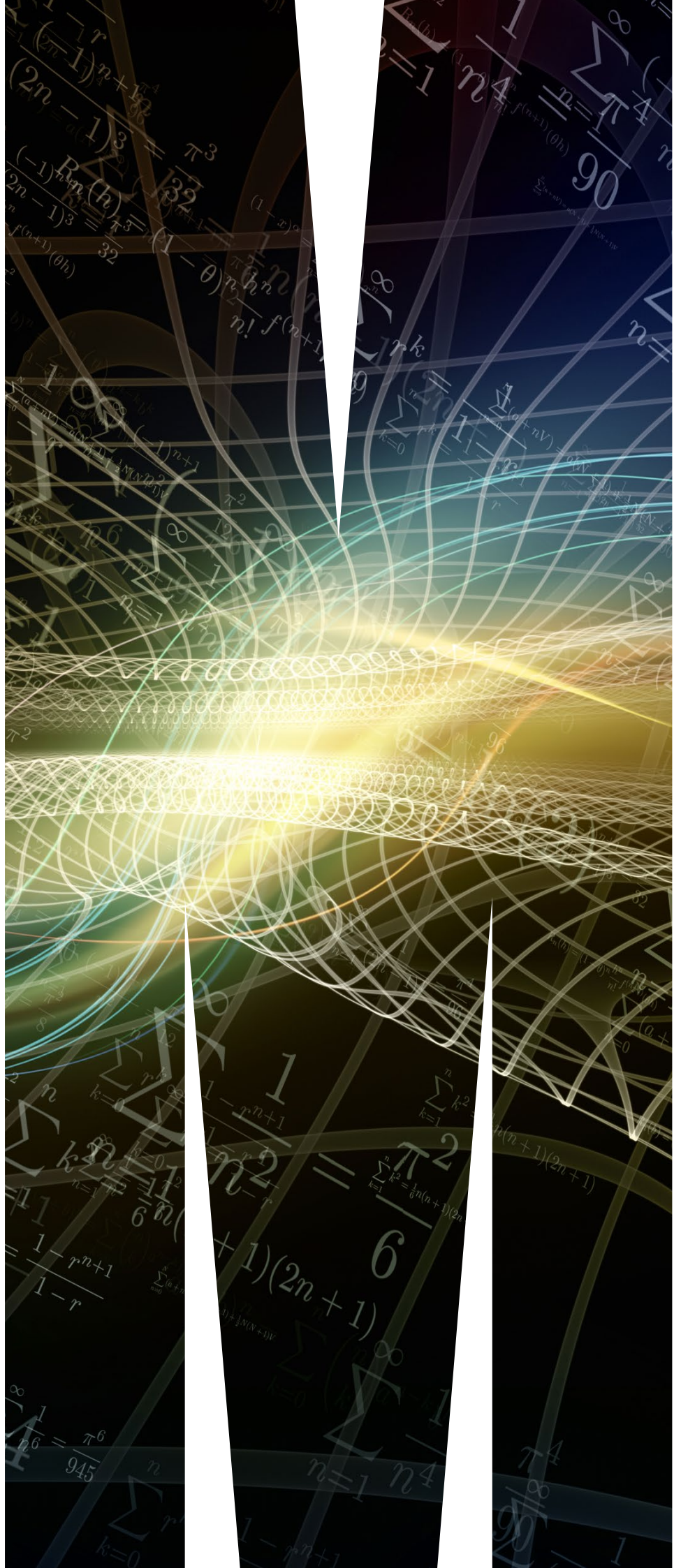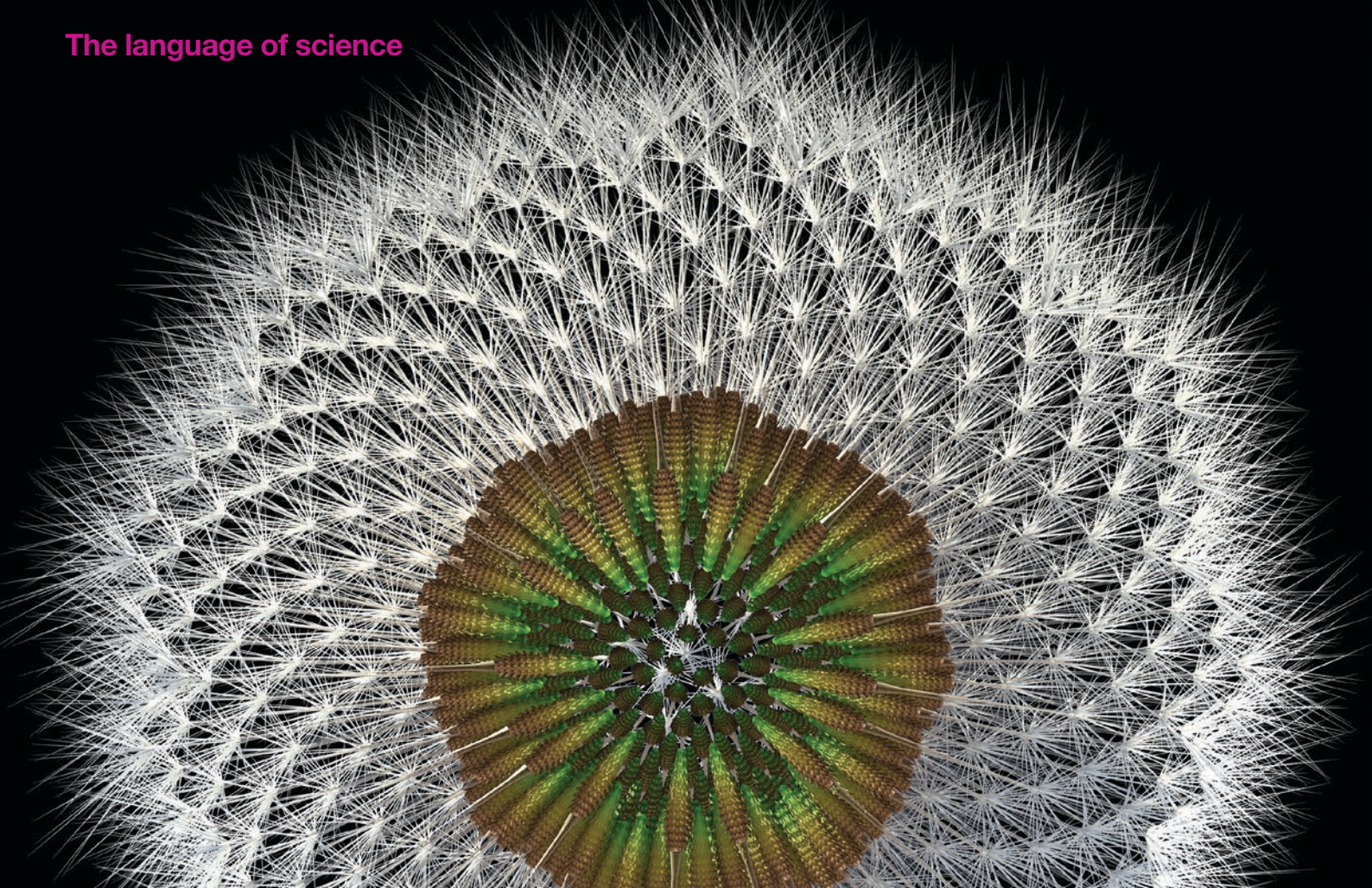MONASH
University

MONASH
MATHEMATICS

monash.edu/maths

MATHEMATICS

The language of science

Mathematicians make it possible to harness and improve technology, explore space, shop online, bring animation to our screens, model climates, and solve complex logistic and traffic issues.

In physics, mathematics describes our understanding of matter, from the smallest scales of atoms and subatomic particles, to the structure of the universe.

In engineering, the language of mathematics is used to understand fields as diverse as the aerodynamics of flight, the destructive power of waves and the design of telecommunication networks.

In the biological sciences, the growth of populations, be they rabbits or viruses, and the sequencing of the human genome are investigated using mathematics.

In finance, the trading on stock exchanges and economic modelling are reliant on mathematics.

Mathematics can also be studied for its own sake, with the bonus that many results in pure mathematics find important applications years after their initial discovery.

Studying mathematics develops a wide range of transferable skills from problem-solving to critical analysis and Monash students majoring in mathematics graduate into diverse and interesting careers.

The School of Mathematics offers a variety of units and majors designed to meet the diverse needs of students at Monash. We also offer an exceptional level of student support in maths, with a drop in help centre open every day and during exam periods.

Our enthusiastic mathematicians love finding the true magic and beauty in maths and pass this passion on to their students.

Visit monash.edu/maths for more.

ELLENA MOSKOVSKY
Bachelor of Science

"Much of the work in today's pure mathematics fields have very strong applications to work in other fields like DNA, physics, even string theory. When I finish my honours year, I will go on to do a PhD; I love maths and I love learning. Ultimately, I want to be able to make a real contribution to our understanding of the world around us."

APPLIED MATHEMATICS

Maths solves problems

Applied mathematics is concerned with utilising mathematical techniques and models to obtain practical solutions to concrete problems. This may help explain observations, or predict what may happen in the future. Applications of mathematics span most branches of modern science, engineering, information technology and commerce. In particular, biology and medicine are important emerging areas where a mathematical approach can reveal new knowledge.

Applied mathematicians do not just rely on existing mathematical theories and techniques – often they need to modify or mould them to the specific application. They try to view problems in an abstract form, so they can identify links with other applications and build upon the existing approaches and knowledge. They use computational techniques to understand the solution better to reveal its properties. Sometimes they need to develop new theories.

Applied mathematicians develop and use mathematics to improve our lives.

FINANCIAL MATHEMATICS

Maths reduces risks

Financial Mathematics is the area of mathematics concerned with financial risk management. It has numerous applications in the world of business and finance, including quantitative investment, derivatives pricing and hedging, long-term life-insurance policies and more. One of its iconic results is the work of Black, Scholes and Merton on derivatives pricing, which was awarded a Nobel Prize in Economics in 1997. Financial Mathematics is a multidisciplinary area of mathematics, as it involves a range of mathematical tools including partial differential equations, stochastic analysis, computational mathematics, statistical learning and optimisation. A degree in financial mathematics opens up many exciting job opportunities in global financial markets, investment banking, insurance, hedge funds, in Australia and abroad, as well as successful careers in academia.

PURE MATHEMATICS

Maths is perfection

Pure mathematics is concerned with the abstract, the rigour and the beauty of perfection. Although pure mathematics constructions are motivated by reasons other than applications, such constructions often become the basis for applied mathematics.

Pure mathematicians imagine the unimaginable. This includes imaginary numbers and impossible figures such as Klein bottles. And, magically, such wonderful constructions become the basis of the most practical of mathematics applied to solve the most concrete of problems: the theory of prime numbers is fundamental to the security systems in electronic banking; notions of the curvature of space and time are applied in designing global positioning systems; imaginary numbers are used in everything from signal processing to the analysis of fluid flow. The examples are endless.

Pure mathematicians don't just dream the impossible – they make the impossible real.

STATISTICS

Maths makes decisions

There are two important parts of statistics – the mathematical theory and the applications of this theory in the real world. Mathematical statistics is the branch of mathematics that deals with models involving a random, unpredictable component. Real world applications are many and varied, and allow the making of informed decisions in the face of uncertainty.

Applications include testing of new drugs, drug testing in sports, risk evaluations in health, DNA testing, and designing and interpreting sample surveys such as TV and radio ratings. Other applications include actuarial mathematics and financial mathematics, where people deal with mathematical models in finance, insurance and economics.

A statistician's job is always interesting, with nearly every project involving a degree of innovation.

The School also offers a major/extended major in Mathematics, which covers a combination of the topics listed above.

Mathematics is the basis of most of modern science and engineering

WHY STUDY MATHEMATICS?

To complete your science studies and continue your career in science you must have suitable mathematical training. Mathematics and statistics will help you to:

- think logically and clearly, and apply a range of problem-solving strategies
- use data and other quantitative information effectively
- understand our world and universe
- model, analyse and improve systems
- appreciate the beauty and perfection of theory in nature and the sciences
- obtain employment at a good starting salary.

STUDYING MATHEMATICS AT MONASH

The School of Mathematics offers a variety of units and major sequences designed to meet the diverse needs of students at Monash.

The School offers mathematics units at all undergraduate levels. These are offered across a wide range of areas of modern mathematics, from mathematical methods to statistics to pure mathematics, as well as demonstrating the utility of mathematics across a variety of applications.

Majors and/or extended majors are offered in each of the following areas:

- Applied mathematics
- Financial and insurance mathematics
- Mathematics
- Mathematical statistics
- Pure mathematics

Minors are also offered in mathematics and statistics.

Details of the individual mathematics units are provided in the Monash University Undergraduate Handbook at monash.edu.au/pubs/handbooks

You can take a mathematics major at Monash in the following courses:

- Bachelor of Science
- Bachelor of Science Advanced – Research (Honours)
- Bachelor of Science Advanced – Global Challenges (Honours)

A major in mathematics can also be taken as part of a double degree.

HONOURS STUDIES

Following their first degree, students can apply to do honours. The honours program involves the completion of a research project and coursework options that cover a broad range of topics selected by the student in conjunction with the coordinator.

POSTGRADUATE STUDIES

After honours, students wishing to become research or academic mathematicians can undertake MSc and PhD studies. These degrees involve coursework options and a research project or thesis.

MASTER'S DEGREES

MASTER OF FINANCIAL MATHEMATICS

The Master of Financial Mathematics is a mathematics course designed for graduates with an aptitude and passion for mathematics and statistics, as well as a keen interest in finance and insurance. This is a highly specialised degree for students seeking a future in the world of professional quantitative finance.

For more information visit:
monash.edu/master-financial-mathematics

MASTER OF MATHEMATICS

In 2019 the Faculty of Science will be offering the new Master of Mathematics – an expert master's degree designed for graduates with a bachelor's degree and a strong foundation in mathematics.

Graduates of the program will gain advanced knowledge and skills that will prepare them for employment in industry or for doctoral studies.

For more information visit:
monash.edu/master-mathematics

For information on pathways from VCE maths to maths at Monash and more detailed course planning information, visit: monash.edu/science/schools/school-of-mathematics

WHERE MATHEMATICS CAN TAKE YOU

**GRADUATES IN MATHEMATICS HAVE VARIED AND DIVERSE CAREER OPTIONS**

ACTUARY
ASTRONOMER
ASTROPHYSICIST
BANKING AND FINANCE
COMPUTER ANALYST
CRYPTOLOGIST
DATA ANALYST

FINANCIAL ANALYST
MATHEMATICAL MODELLER
MEDICAL RESEARCH/ SCIENCE
METEOROLOGIST/ WEATHER FORECASTER
OCEANOGRAPHER

OPERATIONS RESEARCH ANALYST
QUANTITATIVE ANALYST
SCIENCE JOURNALISM
STATISTICIAN
TEACHER

OUR PEOPLE

The School conducts research within the broad areas of applied mathematics, pure mathematics and statistics.
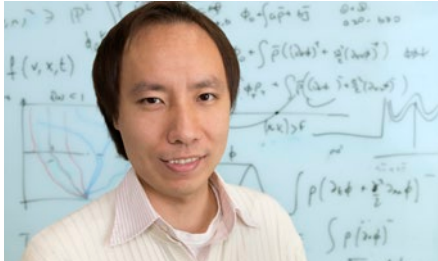
IVAN GUO

Mathematics is the study of patterns and behaviours. By thinking deeply and learning from each other, mathematicians are constantly discovering new things. It is a rewarding process that allows us to develop and understand many complex yet beautiful ideas, combining logic and rigor with creativity and imagination. Many of these ideas play a pivotal part in our modern way of life, from the cellphones in our pockets to the forces driving our economy.

Mathematical problems can be quite challenging, but that is not necessarily a bad thing! My favourite part of working on a problem is to transform it into a playground full of ideas for exploration. By viewing the problem from different perspectives and looking for new approaches, we can often gain valuable insights towards a solution. Finding an elegant solution to a difficult problem is always an immensely satisfying experience.

JESSICA PURCELL

I am a mathematician working in the field of geometry. Through my research, I study shapes and spaces that haven't been studied before, and I find new ways to investigate both complicated and beautiful geometric worlds.

Mathematics gives us a way of working on problems in a careful, logical way. It helps us to discover patterns and find answers that are sometimes surprising. As a mathematician at Monash, I work on interesting problems every day, and I get to share the beauty of mathematics with students and colleagues.

JANOSCH RIEGER

Some practical problems demand mathematical tools that are not readily available. Spotting such problems, creating the appropriate tools and applying them to obtain solutions is what I like to do most.

In particular, I like to work on all kinds of problems involving sets and shapes. Finding the optimal geometry of an object or the optimal shape of a mining pit is challenging. For that reason, I am creating new approaches to representing sets which better our understanding of such problems and form a solid basis for efficient numerical computations.

For more information on the research happening in mathematics at Monash, visit: monash.edu/maths.
For more stories about research and teaching staff, visit: monash.edu/science-stories

Further information

monash.edu/maths

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