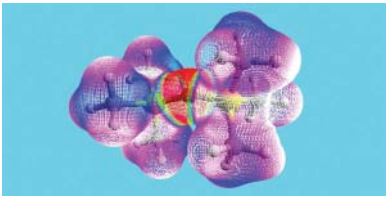
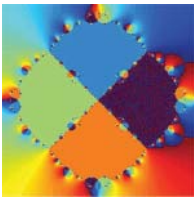
Graduate Studies in Applied Mathematics



Western's award winning faculty members, cutting edge research and interdisciplinary environment give you the tools to engage your imagination.



The University of Western Ontario

Why Western?

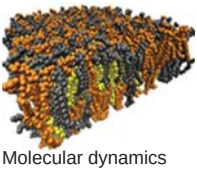
(1) Our 40 graduate students, 14 post-docs and 19 faculty members are engaged in cutting-edge research across the spectrum of Applied Mathematics, including research areas with a rich history, such as theoretical physics, or new, rapidly developing fields. As well as M.Sc. and Ph.D. degrees in any of these areas, we have specific graduate programs in Scientific Computing and Theoretical Physics.

(2) We are truly interdisciplinary. The tools we use and design include computational & numerical methods, applications of massive parallel computers, or simply pen and paper. We use this common toolbox to answer a huge range of real-world questions, in areas such as physics, biology, computation and finance.

(3) We have some of the best research resources for applied math in the world. We are active participants in both The Fields Institute for Mathematical Sciences, and the Perimeter Institute for Theoretical Physics, providing our students with access to programs, workshops, and other Institute activities. UWO has the 4th largest library system in Canada, and our department is the birthplace of SHARCNET, a multi-million dollar initiative that has become Canada's largest academic facility for high performance computing.

Graduates of our department have received numerous national and international awards and gone on to prestigious academic and professional careers. Join us and find out where Applied Math can take you...

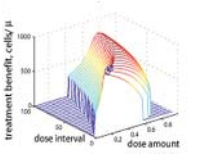
Biological, Materials and Soft Matter Physics



Molecular dynamics simulation of lipid rafts. J. Biol. Chem. 60, 2111 (2006).

Computational physics is characterized by one common working philosophy: compute the large from knowing the small. When modeling a system, we teach our computer codes the rules for the interaction between small units. Such elementary units can range from electrons and nuclei to finite, coarse-grained elements containing billions of atoms. Accordingly, the rules for interaction between such units range from Coulomb's law and the Schrodinger equation to Hooke's Law and other macroscopic relations. Once a model is programmed, we let the computers predict the aggregate behavior of all units. Ongoing research topics at Western include micro/nano-fluidic devices, colloidal systems, nano-tribology, quantum chemistry, liquid crystals, lipid diffusion, membrane proteins, and translocation of DNA.

Mathematical Biology



Optimal drug treatment regimens for HIV depend on adherence, J. Theor. Biology.

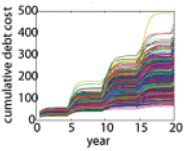
How does the heart deliver blood to some 10^{14} living cells within our body, *individually*? Will a new, emerging disease become an epidemic? Is there a way to control the spread of the disease? Can we predict how long it will take for HIV to evolve resistance to a new drug? Biological systems are highly complex, but our understanding of that complexity is increasing all the time. A century ago, when biological systems were understood in far less detail, simple models of "how things work" were enough to describe our understanding of biology at the time. Since then, however, our understanding of biology has become far more sophisticated, and we therefore need equally sophisticated mathematical tools to describe it. At Western we use mathematics to solve problems in such areas as infectious disease, evolutionary biology, genetics and cardiovascular physiology.

Nonlinear Dynamical Systems

Phase portrait of a Z_10 equivariant vector field of degree 9, Chaos, Solitons and Fractals, 16(7), 2006

Dynamical systems theory is the mathematics of change. The discovery of chaos in the 1960's has led to a new era in how we think about change and predictability in our world. What was a sedate 300-year-old field has erupted into an exciting new research frontier that has shaken up all of modern science to its foundations. Dynamical systems may be represented by ordinary differential equations, partial differential equations, delay differential equations, or combination of differential equations and algebraic equations. They can be discrete, continuous or impulsive systems, or combinations of these. Ongoing research topics at Western include both theoretical studies, including computation of normal forms, bifurcation and chaos control, chaos synchronization, and applications to various areas such as population biology, population genetics, secure communications, controls in engineering and infectious diseases, finance and neural networks.

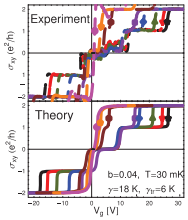
Financial Mathematics



Simulated cumulative debt-charge paths generated using a 2-factor positive interest rate model.

Financial Mathematics is the mathematics of investment, risk, and uncertainty. Examples of financial math questions are: How should a portfolio be selected to balance risk and return? How much is the option to trade a security at a preset price worth? How should a portfolio of options be assembled to reduce the risk in one's business activities? Both analytical and numerical techniques are used to solve these challenging and important problems. In our department we are working on various projects including general pricing and hedging algorithms, public debt management, credit risk, energy finance, and the optimization of power plant operations.

Elementary Particles, Field Theory & Gravitation



Relativistic-like dynamics in quantum Hall effect in graphene Phys. Rev. B *74*, 195429 (2006).

Our research group is active in a wide number of areas in elementary particle physics, addressing research topics ranging from the phenomenology of elementary particle interactions, investigations within quantum field theory, and the dynamical breakdown of quantum field theoretical symmetries, to the quantization of gravity, string/brane models underlying known-interaction physics, and the unification of fundamental interactions of nature. Our group has strong ties with other research institutes, including Affiliate and Associate Member linkages with the Perimeter Institute for Theoretical Physics in nearby Waterloo, Ontario, as well as an institutional linkage with The Bogolyubov Institute for Theoretical Physics in Kiev, Ukraine.

Symbolic Computation

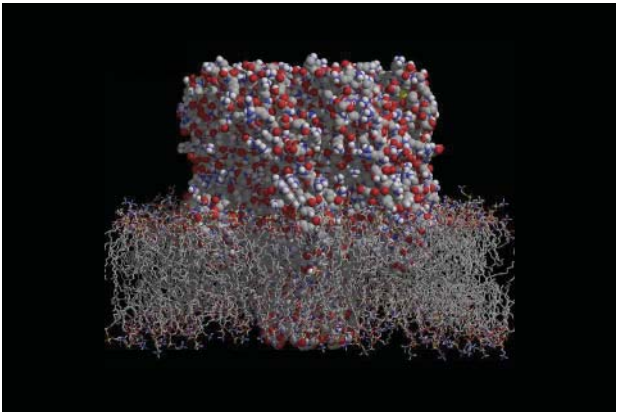
Lambert W function

Symbolic Computation (also known as Computer Algebra) is the study of algorithms and their implementations for computations involving mathematical symbols, not just numbers. Its' success is evident in the influence computer algebra systems, such as Maple and Mathematica, have in most areas of science and engineering.. At Western, the packages are all under continuous development and their capabilities are being extended to solve industrial problems. These include the analysis of mathematical models used in the pulp and paper industry or in robotics, car parts manufactured with the help of Computer Aided Geometric Design, and solution of equations arising in mathematical biology (specifically to do with pigment regeneration characteristics in the human eye).

Application Procedures

Applications may be made at any time during the academic year. The Department responds to complete applications promptly; notifications being issued at any time during the year.

An absolute minimum grade average of a B+ (78%), calculated on courses taken in the last two years, is required for admission to our graduate programs. However, please note that most successful applicants have averages above 85%. Students indicate on their application which research group they wish to join (see research topics on reverse). For complete, up-to-date information, please visit our website at www.apmaths.uwo.ca/gradprogram.shtml. Successful applicants are then assigned a temporary research supervisor from that group, with final supervisor decision made once the student is here and has a chance to talk to the group members. Note, however that some supervisors may not accept students in a given year -- if you have a specific person you wish to work with, please feel free to contact them directly. Finally, an application fee of US$60 or CAN$65 is in effect for all of our graduate programs. (Please make cheque/money order payable to The University of Western Ontario.)



An online application is available at https://fgsonlineapp.uwo.ca/app/instructions.asp. Alternatively, a package containing all necessary information and application forms may be obtained by emailing akager@uwo.ca or writing to:

Graduate Affairs Chair
Department of Applied Mathematics
University of Western Ontario
Middlesex College
London, Ontario, Canada N6A 5B7

or you can download the UWO Entrance Application Form (www.apmaths.uwo.ca/application.pdf), two Reference Letter Forms (www.apmaths.uwo.ca/ref.pdf) and the Research Interest Form (www.apmaths.uwo.ca/res.pdf) and send these to the address above.
Two copies of Certified Transcripts from all post-secondary institutions are required. These must be in sealed envelopes from the post-secondary institution. For international transcripts, we require an official transcript in the native language and an official translation.

Foreign students from non-English speaking countries are expected to provide TOEFL (Test of English as a Foreign Language) examination scores [minimum acceptable score is 550 (paper based score) and 213 (computer score). The GRE is NOT required.

Financial Support

All successful applicants receive a guaranteed minimum level of financial support sufficient to cover tuition fees and living expenses in London. Specific amounts are listed on our website at www.apmaths.uwo.ca/gradprogram.shtml. International students are given additional support to compensate for higher tuition fees. Significantly higher levels of support are also available for students holding external scholarships, such as NSERC and OGS awards, and exceptional international students (e.g. in 2007 NSERC award holders will receive $15,000 in addition to their NSERC award). It is also worth noting that the cost of living is relatively low in London. Based on www.homefair.com comparison, if you are offered a funding package of $24,000 from Western, you would need to be offered a funding package of $38,180 from a university located in Toronto and $36,164 from a university located in Vancouver to have the same standard of living. Inquiries regarding financial assistance should be directed to the Graduate Secretary (akager@uwo.ca), Department of Applied Mathematics.

Contact Us:

Department of Applied Mathematics
Middlesex College Room 255
The University of Western Ontario
1151 Richmond Street, North
London, Ontario Canada N6A 5B7
Phone: (519) 661-3649
Fax: (519) 661-3523
Email: akager@uwo.ca
Web: www.apmaths.uwo.ca

www.apmaths.uwo.ca/gradprogram.shtml

Western
Science