A lot has been happening in Physics & Astronomy at McMaster - so much, in fact, that you might not recognize the place. This is why we have decided to begin publishing a newsletter to inform people about these developments. This first issue focuses on new faculty, staff, and students, large grants, recent awards, and new scientific discoveries.

The biggest news has been about hiring new faculty in the past 3 years - twelve of them! After years of contraction through unfilled vacancies, we are finally able to hire, both in anticipation of the long-awaited 'double cohort' of graduating high school students in 2003. We are particularly interested in learning where our graduates are and what they are doing. Any news of this type will be extremely welcome.

With best wishes,

John Berlinsky
Professor and Chair chair@physics.mcmaster.ca

High-performance computing in Ontario. SHARC-Net also provides funding for a SHARC-Net Chair in high performance computing, which allowed us to recruit Erik Sorensen, a condensed matter theorist from the University of太原. Together, Hugh and Erik are working to develop a new undergraduate stream in Computational Physics.

This issue features four of our twelve new faculty, Hugh Couchman and Cecile Fradin, along with An-Chang Shi, a theoretical polymer physicist who came from Xerox in Mississauga and Karen Hughes, from the University of Toronto’s Enidande College, who is responsible for undergraduate labs and who also teaches first year Physics to Science students.

Also in 2002, Wendy Malarek passed the baton as Departmental Administrator to Mara Esposto. Wendy moved to a new position as Administrator for the Health and Medical Physics Unit, which has become separate from Physics & Astronomy.

We are sending you this newsletter because you are a graduate of Physics and Astronomy at McMaster or perhaps just because we think of you as an old-timer. We are sending this newsletter to inform people about opportunities and challenges for recruiting graduate students. New faculty working in forefront research areas make our graduate program more attractive to prospective students. However, recruiting ENOUGH new graduate students to satisfy the needs of our new faculty is a constant challenge. Our goal is to double the size of our graduate program and recruit new graduate students is one of the highest priorities of the Department. This year we held a very successful visiting day for prospective graduate students called "Mac in March", and we plan to hold this again on March 21, 2003. We also continue to host individual visits from prospective students for whom "Mac in March" does not fit into their schedule. I encourage you to take a look at our revised web pages, which now include letters from all the faculty addressed to prospective graduate students, which give summaries of current research projects of the students working with each faculty member.

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On the evening of July 9th, members of the Department and their friends and families converged on the Dundas Driving Park for games, food and chat. Thanks to the entertainment committee (Mike Lewis, Lorra Ryan, Josie Lee, Graeme Luke and Roby Austin) and everyone who came, thereby contributing to the success of the day. An extra-special thanks to Josie Lee for bringing home-made pies, cupcakes and squares.

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ANNUAL DEPARTMENT PICNIC
Hugh Couchman

I grew up in England near Canterbury - the bit which used to be called the Garden of England but which is now mostly concrete, as far away from London to the Continent. I guess that I was always interested in Physics and this persisted despite the rolling eyes of my sisters when I cheerfully anticipated double physics at breakfast on Monday mornings. I was incredibly privileged to have been able to attend the schools that I did, Maidstone Grammar School at the high school level in particular, one of the last Grammar schools. Being able to specialise at age 16 on Maths and Physics suited me perfectly (although it likely didn’t help much in writing this article) and I benefited from wonderful teachers who all had bachelors or advanced degrees in the subjects they taught. They also let me do pretty much what I wanted which included rebuilding the electronic stage lighting and receiving a few 240V shocks which I’m sure would not have pleased the local education authority’s insurers had they known.

I started my undergraduate degree at Cambridge reading Mathematics - largely to avoid doing anything other than Math and Physics - and then switched into Physics in PartIB. It was in my final year that I took a short course from Martin Rees on Cosmology and realised that this was the real physics with the rest being just details. After my degree in 1978, I took PartIII in the Department of Mathematics and Theoretical Physics (DAMTP - confusingly pronounced DAMPT) and then started a PhD with Martin Rees at the Institute of Astronomy in Cambridge on various aspects of the post-recombination universe (the period during which structure grows from tiny density ripples about one hundred thousand years after the Big Bang to the present rich array of structure ten billion years later). The Institute of Astronomy was a fantastic place to work and learn even if I did, perhaps, do a bit too much reading (only once acknowledged by my supervisor). My mother had high levels of eagerness, doing research and becoming an administrator before coming to McMaster in 1999.

My primary research interest has remained the formation of cosmic structure. After my PhD it had quickly become apparent that the gravitational and hydrodynamic interactions of matter are complex enough that numerical simulation is a key tool. The subjects that I have been referred to as the grandest of the environmental sciences - or, alternatively, mud-wrestling. The last decade has seen dramatic advances in our understanding of cosmic structure largely driven by the incredible wealth of data coming from large ground-based and space telescopes.

Given the heavy dependence of my research on computing, it is perhaps no surprise that a significant amount of my effort has been directed towards establishing adequate computing facilities. (This direction would have been a surprise to my graduate supervisor: he didn’t even want to sign the contract for a computer account believing that computing was a great way to waste a lot of time - he’s probably right.) After a truly dismal record, high-performance computing in Canada has finally picked up over the last three years with the injection of funds from several federal and local social agencies. Given the rapid obsolescence of computing equipment, it is clear that this issue will require constant vigilance however.

That brings things pretty much up to date. We had a son in 1993 who so far has little interest in Physics but has a vocabulary to put me to shame - well see. I have managed to wangle myself into a Department full of smart and energetic people - a Department which really works - and so I look forward to the last few years before retirement.

Kari Dalnoki-Veress reprised his popular bubble-making demonstration for this year’s "May at Mac" - a university wide open house and recruitment day held on May 25. The Department of Physics and Astronomy featured demonstrations on subjects from bubbles to holograms, from Bernoulli-effect soap films to superconductors. Thanks to the enthusiastic efforts of undergraduate and graduate students, faculty and staff, the day was a great success - and a lot of fun for all involved!

"May at MAC"

I was born in France into a scientific family; my dad is a math teacher, and she had a huge influence on my life orientation, although my earlier scientific interests came mostly from reading through the large number of journals that my parents subscribed to. Perhaps, do a bit too much rowing (only once acknowledged by Astronomy was a fantastic place to work and learn even if I did, my earlier scientific interests came mostly from reading through the large number of journals that my parents subscribed to. Perhaps no surprise that a significant amount of my effort has been directed towards establishing adequate computing facilities. (This direction would have been a surprise to my graduate supervisor: he didn’t even want to sign the contract for a computer account believing that computing was a great way to waste a lot of time - he’s probably right.) After a truly dismal record, high-performance computing in Canada has finally picked up over the last three years with the injection of funds from several federal and local social agencies. Given the rapid obsolescence of computing equipment, it is clear that this issue will require constant vigilance however.

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Cecile Fradin

I especially enjoyed Jeux et Stratégie (which was full of mathematical puzzles) and Science et Vie (a French equivalent of Scientific American). But my favorite publication (which I keep reading to this day) was uncontestedly La Houlette, a small periodical whose every issue is devoted to the comprehensive description of a small, amusing animal.

After high school I briefly considered studying painting, but then wisely followed my art teacher’s advice to go into science instead. Biology didn’t appear to me as an exact science, so I went for a mathematics/physics/chemistry curriculum instead, and attended a class preparatory at the lycée Henri IV in Paris, a two year program preparing students to take the competitive exams required to enter any scientific or engineering school in France. At the end of this preparation, I decided to study physics at the École Normal Supérieure in Paris, a school training students for scientific research. It is always hard to pinpoint the reasons for such a choice, but it had to do with a very inspiring physics teacher, with reading a couple of Feynman’s books, and with the location of the École Normale: right in the middle of Paris.

One thing I knew from the start is that I liked to see what I was doing, so when faced with the choice of choosing labs to complete undergraduate projects, I always considered two aspects: doing experiments involving optics and staying in an interesting place. That’s how I ended up going first to Pisa, in Italy, in the group of Pr. Ennio Ammondo, to work on laser cooling experiments, and second to Bell labs, in the New area, in the group of Pat Cladis, to study liquid crystal convection. This second time, I had considered a third aspect: I wanted to work with a woman, because it was starting to puzzle me that I knew so few of them who were well established scientists. After observing that it was indeed possible for a woman to be a very successful scientist while being part of a happy family, I became less worried.

Before starting my PhD, I took a one year course in theoretical physics. It was a very instructive and inspiring year, and I greatly enjoyed learning about field theory. But I never after felt the same enthusiasm for that, all the more when I was meant to be an experimentalist. I took up a PhD project under the supervision of Jean Dallant, a young researcher at the Commissariat à l’Energie Atomique in Saclay. My job was to study the height fluctuations of a lipid monolayer at the surface of water, using grazing incidence x-ray scattering to measure the amplitude of capillary waves. We started by measuring this amplitude for the bare water interface, and to our surprise found out that, at very short wavelengths, the capillary waves were much higher than expected. Almost at the same time, a German theorist, Klaus Mecke, predicted this effect by taking into account the non-locality of long-range van der Waals forces.

When the time came to decide where to go for a post-doc, I considered changing fields. I enjoyed soft condensed matter a lot, but I couldn’t help having the feeling that my training was too heavy to be relying on costly technical achievements: our capillary wave experiment, for example, had required no less than the use of a third generation synchrotron. On the contrary, I found that biologists were using somewhat simpler techniques to study something tremendously important and exciting: the cell machinery. And it seemed that biology, when studied with a physicist’s approach, could be an exact science after all. So I decided to start a biophysics project, consisting in studying the transport of proteins inside cells, using fluorescence microscopy, in the group of Michael Elbaum at the Weizmann Institute of Sciences in Israel. Taking up biochemistry as a post-doc was not always an easy task, and there were many frustrations along the way. But, finally, I felt I had found the right subject for me to investigate. And when I started looking for a permanent position, there was no question that I wanted to keep on using fluorescence to study cellular dynamics. So I set out to try and find a place where I could set up such a research program, and that’s how I discovered Hamilton, Ontario, and McMaster University, where I now live and work.

Karen Hughes

I was born in Port Arthur, Ontario on the north shore of Lake Superior. It was a nice place to grow up, but mostly I saw too much and it was small enough, with beautiful clear night skies. I remember fondly the evenings spent on the front steps of the house with my dad, looking up at the sky, picking out the constellations, talking over algebra and whatever was in the latest issue of Popular Mechanics .

I think that I always wanted to study physics, but I didn’t know it until I visited the local university, Lakehead, just near the end of grade 13. I distinctly remember sitting in the office of one of the biology faculty when his graduate student came in, all excited about finding some insect living on another insect. Yik, I thought, and moved on to the chemistry tour, where I had a similar experience. After grade 14 (?) the physics faculty were all on holiday that day, and there was no one available. When I returned in the fall, I signed up there.

Department of Physics and Astronomy

New Faculty Profiles

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Department of Physics and Astronomy

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exams and that enabled me to obtain a Scholarship at the University of Illinois at Urbana-Champaign (UIUC). I joined the graduate program at UIUC in 1983, and carried out research under the guidance of Michael Wortis. The problems I worked on included a theory of grain boundaries, adsorption effects on equilibrium crystal shapes, and the shape transitions of NaCl crystals.

I learned a lot about condensed matter physics and developed a strong interest in statistical mechanics at UIUC. Another good thing that came to me at UIUC is that I met Xi Shan, a fellow graduate student in chemistry. We married in 1988.

After getting my Ph.D. from UIUC in 1988, I went to McMaster University as a postdoctoral fellow of John Berliny. Among other things, I worked mainly on the dynamics of flux pinning at that time. This is the period of time when I got to know the people at McMaster and the living environment in Hamilton.

In 1992, I joined Xerox Research Centre of Canada as a Member of Research Staff, working initially with Jian Noolandi. At Xerox, my main responsibility was the modeling and simulation of materials problems related to xerographic technology. At the same time I turned my interests to polymer physics and discovered that polymers are wonderful materials. I maintained a fruitful research program in theoretical polymer physics at Xerox.

I joined McMaster University in 1999 as an associate professor. I was attracted to McMaster because of the interactive, interdisciplinary environment they provide in macromolecular science. In particular, the Brockhouse Institute for Materials Research brings together faculty members working on polymers from physics, chemistry and chemical engineering. Added to all this are my previous experiences at McMaster and the living environment in Hamilton.

I graduated in 1988 and took a position as lecturer at Erindale College, University of Toronto. I was given a large first year class and made first-year lab coordinator. When I eventually found the lab (about a year later) I fell in love with it. There were so many interesting things to see and do. If only my students could see it that way! Because we were a small group, I had a fair amount of autonomy over the handling of the course. I experimented with McMaster's Peer Instruction style and with using the lab as a more direct teaching tool.

In 2000, I left Erindale to come to McMaster. I am currently involved in teaching the introductory physics courses. Here, the introductory course is delivered in small classes, of 30 or 40 students, resulting in livelier and more interactive sessions. I still dream that one day students will actually enjoy coming to physics lab, and have maintained my involvement there. When I arrived, the Department had just purchased a computer interface data collection system for the lab and we have since modified the lab format significantly to take advantage of the teaching/learning potential of the system.

The first turning point in my life occurred in 1982. I was born in a small village in Jiangxi, China. The first turning point in my life came in 1978. In that year, I passed the National Entrance Exam for universities and was accepted into the Physics Department of Fudan University in Shanghai. I enjoyed the four years of study in Fudan very much, learning physics as well as Mandarin and a bit of English. At Fudan, I was attracted to theoretical physics and decided to continue my study along that direction.

The second turning point of my life occurred in 1982, the year I graduated from Fudan. I was invited to participate in the China-U.S. Physics Examination and Application (CUSPEA) program initiated by Professor T.D. Lee at Columbia. I passed the CUSPEA
McMaster alumni Russell Donnelly won the 2002 Fritz London Memorial Prize. The London Prize, awarded every three years, is considered the highest award in the field of low temperature physics. The 2002 Prize was presented at the 23rd International Conference on Low Temperature Physics in Hiroshima, Japan.

Russell Donnelly was born in Hamilton in 1930 and received his B.Sc. (1951) and M.Sc. (1952 with Martin Johns) in Physics from McMaster, before moving south to obtain his Ph.D. (1956) from Yale. He has been Professor of Physics at the University of Oregon for the past 36 years. In 1996, Donnelly received US$5 million from the NSF and established the Oregon Cryogenic Helium Turbulence Laboratory to develop a cryostat to explore previously immeasurable aspects of turbulence at low temperatures.

For the London Prize, Donnelly was cited for his recent research in superfluid turbulence and high Rayleigh number convection experiments at low temperatures. Walter Hardy and Allen Goldman are two other recipients of the 2002 London Prize. Walter Hardy, from UBC, is a long-time friend and collaborator of several members of our Department and was cited for his studies of electron pairing mechanisms in the high temperature superconductor YBCO.

McMaster alumnus Walter Hardy, a Fellow in the Superconductivity programme, has been awarded the 2002 London Prize. The London Prize is awarded every three years to an internationally recognized scientist for work in the field of low temperature physics. This year’s recipient is Walter Hardy, who won the prize for his research on superfluid turbulence and high Rayleigh number convection experiments at low temperatures. His work has made significant contributions to our understanding of the properties of superfluids, which are of great interest to both physicists and engineers.

Almost 30 undergraduates from across the country, ranging from first to fourth year (and even one high school student), invaded the halls this summer. These students spent their summer learning what it is like to be a professional physicist or astronomer, and got to see first-hand how the students worked on research projects ranging from simulations of stellar collisions to polymer crystallization to the theory of electrons in materials and the theory of everything.

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