University of British Columbia

PHYSICS & ASTRONOMY NEWS

VOLUME 7 • ISSUE 1 • JANUARY 2009

Message from the Head

This will be my last "Message from the Head", as I will be finishing my five-year term on December 31, 2008. It has been a transitionary period for the Department, and for the university more generally. After decades of very little faculty and staff turnover, there are now only a few in the department who have been here even twenty years. The past five years have seen three Faculty of Science deans, two Provosts, and two Presidents, each with their own priorities and ways of doing business. There have been many new opportunities for bringing human and financial capital into the university (Canada Foundation for Innovation, Canada Research Chairs, growing endowments etc.), while more recently, base funding has been cut and we have been effectively under a hiring freeze for over two years. The abolishment of mandatory retirement fundamentally changes the way one plans Departmental renewal.

Through all of this change, the Physics and Astronomy Department has received more than it's *pro rata* share of "new resources", largely due to the outstanding people we have hired to replace those who established our excellent international reputation in the latter half of the last century. We have more than doubled the number of graduate students and postdoctoral fellows in the Department since 2002. Our undergraduate enrolment in Engineering Physics has increased by approximately 50%, while the enrolment in all of our other undergraduate programs has decreased slightly (~ 15%) over the same period. Our new faculty have received numerous early-career awards, both for research and teaching, and our graduates continue to do us proud in academe and industry.

I predict that it will take another five years for the current complement of faculty and staff to establish a distinct "departmental personality", akin to that which I so distinctly recall becoming a part of some 16 years ago. The process of preparing for the External Review that happened in September 2008 helped to identify some of the areas where we have to develop policies and clear goals; things that will help to define this new "personality". For those of you who are interested, the document we prepared for the External Review committee can be found on our website. It contains a lot of statistics and summaries of all our activities, and attempts to identify priorities for the future.

It has been a pleasure and an honour to have been part of the "old department", and I would like to acknowledge the huge support that many emeriti have provided over the past five years. I consider it a privilege to be one of the few who will spend (I hope!) equal fractions of my career in the "old" and the "new" departments. Finally, thanks to Doug Bonn for taking over as Head: I very much look forward to serving under his leadership.

INSIDE

CONTACT US

Dept. of Physics and Astronomy
6224 Agricultural Road
University of British Columbia
Vancouver V6T 1Z1
604-822-3853
www.phas.ubc.ca

EDITORIAL INFORMATION

Editor: Jeremy Heyl
heyl@phas.ubc.ca

The PHAS News is published once each year. The deadline for submissions to the January 2010 issue is 1 December 2009.

The newsletter is also available electronically at our website, www.phas.ubc.ca*; if you would like to receive your copy electronically, please let us know.*

Undergraduate Studies

During 2008 our undergraduate students in physics and astronomy garnered many honours. Cedric Lin, Alan Robinson and Michael Jansz finished second, third and fourth on the CAP physics exam and several of our students earned scholarships to recognize academic excellence.

Wesbrook Scholar
Carolina Tropini

Faculty of Science Student Achievement Award
Anja Lanz
Carolina Tropini

Thomas and Evelyn Hebb Memorial Scholarship
Peter Gao
Jeffrey Nguyen

Dorothy Gladys Studer Memorial Scholarship
Thomas McLaughlin

Gordon Merritt Shrum Memorial Scholarship
David Fagnan

Physics and Astronomy Undergraduate Scholarship
David MacNeill

CUPC Awards
Firas Moosvi
Ruobing Yang

Engineering Physics

During 2008 our engineer physics undergraduates garnered many honours.

PMC-Sierra Inc. Founders Award
Hardeep Sanghera

Gordon Merritt Shrum Memorial Scholarship
Warren Ung

ENPH 50th Anniversary Scholarship
Hei Wang Chang
Eric Foxall
Ian Moult
Hao Tian Pang

Captain Wu Scholarship
Wesely Chan
Colin Delaney

Elizabeth and Leslie Gould Scholarship
Dorian Gangloff

Donald J. Evans Scholarship
Qu Chen
Milenko Despotovich
Shaina Johl
Andrew Young
Qijin Zhou

Pat and Betty Love Scholarship
Amira Eltony
Brian Mah
Graham Slot
Noel Wu

Banks Scholarship
Audrey Kostin
Edward Liao
Wei Kee Teoh
Matthew Zieleman

Novicov
Inderpreet Singh
Kenneth Wong

Edith Grace Buchan Scholarship
Ruoping Shen
Marco Turcois
Jessily Wong

Robert Quarrington Maxwell Scholarship
Mo Chen

Graduate Studies

This year the department saw its ears and eyes on campus development, Darren Peets, complete his Ph.D. and go to Japan for post-doctoral work. Darren was a figure around the department as well as throughout UBC politics. We wish Darren well, and we doubt that we will ever again be as well informed on what is happening around campus.

We would also like to recognize several of our students who have received faculty-wide awards for research and teaching.

Faculty of Science Graduate Prize
Lionel Brits

Faculty of Science Graduate Teaching Awards
Sandy Martinuk
Mya Warren

Erich Vogt

Katy Hally and Patrick Bruskiewich

Dr. Erich Vogt is an internationally renowned theoretical physicist and one of Canada's preeminent scientists. On 4th May 2008, three Nobel laureates and dozens of other scientists, family, friends and past students converged on the Hebb Theatre at UBC to honour Dr. Vogt, who is soon to turn 80 years old. Dr.Vogt joined UBC in 1965 and spent a decade as a professor in the Department of Physics before becoming a UBC Vice-President. In 1965, Dr. Vogt also joined the TRIUMF Study Group that would see the establishment of TRIUMF. During the design, construction and commissioning of the TRIUMF 500 MeV cyclotron, Dr. Vogt would play a pivotal role, particularly in the proof of concept of using negative hydrogen ion beams. As Canadian Nobel laureate Dr. Richard Taylor described of his friend, "I think he tried harder than anyone else to get Canada into big particle physics."

In 1981, Erich was named director of TRIUMF and served as its head for 14 years, longer than any TRIUMF director. Despite his busy professional life, Dr. Vogt, never neglected his passion for teaching physics and continues to teach undergraduate courses at UBC. It is estimated that Erich has taught over 5000 students over his 43 year career. Many of his students have described his first year physics class as being a "life changing experience." Dr. Erich Vogt, Director Emeritus of TRIUMF and Professor Emeritus of Physics at the University of British Columbia was interviewed in his office at TRIUMF on Thursday 12th June 2008.

Katy: To begin with, could you tell us a little bit about yourself?

Erich: Yes, well, you know, I am very ancient now. I was born in 1929 in Manitoba, in a little Mennonite village, about 40 miles outside of Winnipeg. And I grew up in this village of about a thousand people; it was a homogeneous village with everybody speaking a German dialect.

Katy: How did you become interested in physics?

Erich: I think I had a general interest in nature. I came to physics as a naturalist, not as a person seeing it as a profession. I was growing up on the prairies, so I was aware from the time before I went to school about the Milky Way. Because the village had very few lights, the sky was very brilliant – you even could see things like Andromeda, the nebula in the Milky Way – and I wondered what it was all about. And you know, one of the biggest gifts we have – as I said in my summer student lecture – is the human sense of wonder. I had a great deal of pleasure growing up in a rural community in which you were close to the forest and the birds and the stars, and that's what got me interested in nature.

Katy: How did this interest in nature lead to a career in physics?

Erich: I was not focussed on a career in physics because it seemed a remote occupation at the time. In fact, until I was in third year university, I was majoring in honours English. I was keeping my options open by taking extra subjects, but switched over to physics in third year and never regretted the decision. In Canada, fortunately, we don't have to specialize too early. I was a reasonably good student and went to this school in a little village called Steinbach, which was surrounded by Ukrainian communities, and then to the University of Manitoba. At the University of Manitoba, I began to understand what physics was about and who did it. I had one or two very good professors as a student, and I decided to go to graduate school at Princeton, which was then the foremost school – still probably is in North America – for physics. There were so many people there. Einstein was alive and was at the Princeton Institute for Advanced Studies. I heard his last lecture and saw him frequently.

Katy: What was that like?

Erich: Well, he was a very good lecturer, but actually at the time, he was working on things which didn't seem very productive. He wasn't in the main stream of physics at the time any- more, although we all knew what he had done 50 years earlier. He had become a legend, of course, because of General Relativity. He was famous as a celebrity and he deserved fame. But he was also, I think, a very interesting person, a terrible husband and father, but he knew it. You know, the world is full of terrible husbands and fathers, but unlike most, Einstein knew he was a terrible husband and father. And, at Princeton, at the time there were, of course, people who were brighter than me. I knew John von Neumann, who started computers. He was just so much brighter than anyone else around that people thought he was from Mars, he was so very very intelligent. And I had worked with Wigner, who was also a very impressive person, and I knew most of the found- ers of Quantum Mechanics; Pauli was around, and Bohr.

Patrick: So how did you become Eugene Wigner's PhD student?

Erich: Well, I came to Princeton on fellowship and told them I was going to do my PhD in theoretical physics. I expressed interest in my correspondence with Princeton in what he was doing, and he looked at the crop of students and fortunately he decided that I should be the one who worked with him that year. We had a very close association; I worked there for three years.

Katy: What did you work on?

Erich: I worked with him on nuclear physics. It was just the time when nuclear physics as we know it today was emerging. The big question of the day was "how could you have a model, called the shell model, as simple as the model which you had for electrons around atoms?" As a matter of fact, my thesis with Wigner was on that subject, about why the shell model orbits last as long as they do.

Katy: Of all these remarkable people that you met, was there one who stood out as a really interesting character?

Erich: Well, they all had different personalities and one could tell interesting stories about them all. The most terrible man among them was Pauli. Pauli liked to be rude to people. When I was at a seminar he spoke at in Britain, a graduate student asked a question, and he said, "I don't mind answering stupid questions, but I won't answer stupid questions from fools." Which was enough to make one not ask another question right away. But they weren't all that way; the range of personalities was the same as it is in everyday life. Probably the one that had the wildest character was George Gamow. He was usually drunk, even early in the day. He was well-known as a wonderful person at writing popular books in science, as well as a very gifted physicist. Von Neumann was simply so quick and intelligent, he never seemed to work more than about an hour a day. At that time, he had just started working on the hydrogen bomb and was very busy with it. He did all his work in the morning and in the afternoon he'd be bored, so he'd sit in Wigner's office. I happened to be one of those students of Wigner's who saw him once a week regularly for an hour to tell him what I was doing, and Neumann would just be sitting there; you wouldn't know what he was doing or what he was thinking, and it could have been intimidating.

Patrick: Did he ever ask any questions?

Erich: No, no, he just sat there silently. Yes, it would have been more disturbing really if he had asked a question. Everyone knew how bright he was. But that didn't happen.

Katy: So what brought you to British Columbia?

Erich: First of all, it's something completely romantic. Growing up on the Canadian prairies, I had decided when I was very young, before I started school, that I would eventually end up in British Columbia.

Katy: Why?

Erich: Because of the oceans and the mountains. We lived on a flat prairie, which was interesting enough in its own way; but it was a very Presbyterian world, and one which I didn't particularly resonate with. So I decided that I would eventually end up here and the opportunity arose. But it was more than that. At the time, in 1960, I knew I wanted to be teacher. It's a reasonable vocation, it has nothing to do with being a physicist, but you either like to teach, or you don't. I knew I would like to teach – I did already enjoy lectures and teaching at Chalk River – so I wanted to go to a Canadian university. John Warren here had built up a nuclear physics group; I knew Volkoff and Gordon Shrum very well. They invited me to come down here in 1964 to give a series of lectures, which I did, and I was immediately offered a job.

Patrick: When you came to UBC, was the idea of building a meson facility then being discussed here?

Erich: Yes! That's what brought me here. When I came here, there had been a competition in North America to build a meson factory in the United States. Hans Bethe led the American jury which decided what kind of machine they should build, and they built a Los Alamos Linac, which was a mistake because the runner-up – the one that Reg Richardson, a Canadian, had proposed in California – was better.

Patrick: That's what was built here at TRIUMF?

Erich: Yes.

Katy: What was your role in founding TRIUMF?

Erich: Well, now you're asking me to be some- what immodest. I knew from my work at Chalk River that meson factories and other alternatives could be built, and I knew that we had, under John Warren here, a large group of nuclear physicists who were ready to build something new. When I came here in 1965, I instigated meetings, some of which George Volkoff came to originally, about building a new machine. And from those discussions – it wasn't my idea, but one of the other people here – it emerged that we should kidnap Richardson's negative ion cyclotron which had been turned down in the United States, modify its parameters so that it would be much less costly, and build it here as a meson factory. We decided to do that. I was the chairman of the committee that made the first proposal. We got some design study funds, and then after two years, we had made a proposal for a $23 million facility. My main role at the time – I was a theorist – was not as one who designed equipment, but as a promoter. And so I was the one who went to Ottawa a lot to talk to all the people, and we were lucky in getting funding. George Volkoff used to say, "Erich, I bless you for going to Ottawa, but you don't have a hope in hell of getting that much money to fund a machine. But I'll support you anyway." I thought he was wrong, though we were lucky in a way because no other project a tenth that size had ever materialized in Canada before.

Patrick: They were either very small or very large, nothing in between.

Erich: That's right.

Patrick: Has that changed at all over the years?

Erich: No, I think that that's still true. We were very ambitious, and that's why we got three universities together – a year later, four – to make TRIUMF, for Tri-University Meson Facility. We had an enthusiastic minister and a very supportive deputy in George Laurence, and the funding agency, and we moved ahead rapidly then. Mr. Pepin was the minister in Ottawa who worked the file for us. Then we were given the money to build it. Those were interesting years, too. John Warren, who was an experimentalist, was the first director of TRIUMF, and he was followed by Reg Richardson, another experimentalist, during the construction phase. I came in 1981 when the project was ready to go, and as a theoretical physicist, I directed the project for 14 years. I had been chairman of the board of TRIUMF before that, and was still involved with all of the negotiations with Ottawa, but those were the years in which I also spent time in useless activities such as university administration. (see "George Volkoff and reactor physics in Canada" in the April 2008 edition of CUPJ for a description of Dr. Laurence's 1941 pile experiment)

Patrick: Were you here when the right honorable Prime Minister came and said, "Well, I don't know what this is but I'm glad we have one?"

Erich: Yes, I introduced him at the opening ceremony in 1976. I said to Prime Minister Pierre Trudeau that he should feel a little like Queen Isabella of Spain when she sent Columbus out to discover the new world. And he said, with some humour, "People have called me many things, but no one has ever compared me to a Queen before."

Katy: What would you say is the most important thing you've learned throughout your career?

Erich: Well, I think I always came equipped with a good sense of wonder and curiosity, and I've learned how to try to keep that intact. I've learned to appreciate that nature uses a surprising variety of vehicles, I mean human personalities, to further its great work. And I've learned that working in science, just what a pleasurable career it is. Three of my five children are lawyers, and they all earn five times what I ever could have earned, but I don't think they're happier than I have been because I have friends all over the world and have been involved in intellectual activity, which is what I always wanted to do. So I've learned how to cherish that and still do. That's why I come in every day and why I continue teaching.

Patrick: You've taught over 40 years at UBC, and for 25 of those years you taught for nothing? That's when you were director at TRIUMF?

Erich: Yes, and also in UBC administration, and then I went into retirement. Amusingly, only two or three years ago they started giving me a small amount of money – I retired 14 years ago at 65 – because some other professors had retired and demanded money when they wanted them to teach. And so they felt that it was no longer reasonable not to pay me the same amount, though I would have continued to teach for free.

Katy: Is teaching the most interesting job of all the things that you've done?

Erich: Yes, when I get up in the morning, and consider who I am, I think of myself as a teacher, first and foremost. Well, after being a father and grandfather.

Patrick: At your symposium on 4th May, I sat next to some students who you taught some years ago, and they said that they a vividly remember the first time that they walked into your class and you taught them physics. It was no longer a tedious subject but something that was enjoyable and something they really could relate to.

Erich: Yes. I meet students almost every week who I taught a long time ago, and for some of them, it was a life-changing experience. I'm not exaggerating. They decided, as a result of the course, to go in a completely different direction. That's an awesome responsibility because when it happens – for the good, you know – you think "that's perhaps the best feedback I know of." In fact, I think the best feedback about teaching is the considered opinion of people years later about which teachers really mattered, rather than the instantaneous response, when they say, "Hey, he wears nice sweaters," and that sort of thing. Well, the instant response has its own value, because everything is fresh in their mind, but I think it's the later, considered response [that is more valuable]. I have been very fortunate to have many people who have written me letters later on, on what it meant to them.

Katy: Do you consider that influence to be one of your best achievements during your career?

Erich: I think my effect on young students has been, for me, more important than creating TRIUMF or the things that I was able to achieve as a research physicist.

Katy: You've received large variety of awards, honorary degrees, had buildings named after you, and all that sort of thing. What does that recognition mean to you?

Erich: Well, I can honestly say I've never sought an honour. Because I was very open about everything and always very conspicuous, I got, I think, at least my share of awards, OK? I never had to go and seek them. I think that it's always, of course, the esteem of one's colleagues and one's family that one wants more than anything else. And I've had my share of that too, and so those things are the most meaningful. When you get an honorary degree, sometimes it's because the university wants to put on a good show; they want to get somebody conspicuous who will give a good convocation address, and you try to give them their money's worth, but it's not such a big deal.

Katy: Do you have any advice for young physicists who are just finishing their educations and starting their careers?

Erich: Yes, my advice is always – as I say to my students – to try to discover who they are and what they're best at. I think people need to discover what they are good at and to do it, to try to come terms with themselves and then follow that line. I had lots of outstanding students, with enormous gifts, who somehow could not understand themselves well. And nature is very wasteful; it often dissipates those gifts completely unless a person can develop the self-discipline to not only understand themselves, but to pursue those things where they do have some talent.

Katy: Do you ever plan to stop teaching?

Erich: I had a deal with my department, which I plan to stick to, namely that I would teach – when I made this deal I was not being paid – but I would teach as long as I achieved some of the highest student ratings in the department, and if that was no longer true, then I would stop. You know, there are some very able young teachers coming along, and one of these years, Jamie Matthews is going to be much better than me. And so I'm going to, by my own rules, have to step down before long. In time, it will happen, it's a natural thing and I have just an enormous number of things which give me pleasure that I plan to do.

Katy: For example?

Erich: Well, I still enjoy music enormously and chamber music particularly. I have 16 grandchildren. I can spend a lot of time seeing what they're doing. Some of them are very interesting; well, they're all interesting. And I still believe in books. One of the best things I can do for [my grandchildren] is to give them a fondness for books. We're very lucky to live in a time when it's possible to develop such a hobby and to watch them reading.

Katy and Patrick: Thank you for letting us interview you this afternoon.

Erich: You are very welcome. My door is always open.

This interview forms an abridged excerpt of the complete Vogt interview which is posted at the CUPJ website

Katy Hally is a third year combined honours student in physics and mathematics at Acadia University in Nova Scotia. This past summer Katy was a TRIUMF summer scholarship student working with Dr. A. Schwenck on neutrino physics and supernovae events. Katy can be contacted at production@cupj.ca.

Patrick Bruskiewich is a doctoral candidate in physics at UBC and at TRIUMF. He is also the editor-in-chief of the Canadian Undergraduate Physics Journal. Patrick first met Dr. Vogt as a TRIUMF summer student in 1982. Patrick can be contacted at patrickb@phas.ubc.ca.

Innovating Undergraduate Education

The founding of the Carl Wieman Science Education in 2007 has driven innovation throughout the science departments at UBC. The goal of the CWSEI is to achieve highly effective, evidence-based science education for all post-secondary students by applying the latest advances in pedagogical and organizational excellence.

Physics and Astronomy is no exception. The department has 3 Science Teaching & Learning Fellows (STLFs), all of whom started in Spring 2008: Peter Newbury, Louis Deslauriers, and James Day (part time). Jim Carolan, a retired professor, has been working part time to assist in the continuing development of the department archiving system and acting to coordinate the CWSEI related activities in the department.

The Department SEI effort is currently in three areas. The first is redesigning courses - starting with Physics 100 (attentive readers will refer to the article in the January 2008 edition of this newsletter), Physics 107 (introductory laboratory) and ASTR 310 (a large astronomy course for non-science majors, see the back page of the January 2008 issue). The second area is the development of a program to better prepare graduate student teaching assistants, and finally the creation of a course database system to archive course materials so that they can be easily re-used and improved.

Our students (and faculty) are already reaping the rewards of these efforts. In ASTR 310, for example, hands-on experiments have replaced the standard worksheet-based tutorials and outdated computer simulations. The new program is much more engaging for both the students and the teaching assistants who work with them in groups of six to ten for an intensive learning experience. By the end of the course, the students feel a greater connection between astronomy (and science in general) and their everyday lives --- a key learning goal of the science distribution requirements at UBC.

Graduate student Mya Warren spearheaded the teaching assistance training program and developed a very successful two-day workshop. The workshop has been required for incoming graduate students since the 2007 Fall Term. A system of mentor TAs was initiated to provide a structure in which senior graduate students can oversee other graduate students in the first year undergraduate courses and help to develop their teaching skills. Further improvements to the TA training program are underway and will be enhanced by a new graduate course in pedagogy in Physics & Astronomy. The TA feedback currently being obtained on courses also includes feedback on the effectiveness of the training program.

Texas in Vancouver

The XXIV Texas Symposium on Relativistic Astrophysics, organized by the Department of Physics and Astronomy of the University of British Columbia, was held the second week of December. The Texas Symposium is the premier meeting on relativistic astrophysics worldwide. This is the first time that the meeting was held in Canada and the department of physics and astronomy was a proud sponsor along with UBC, SFU, CIFAR, CITA, IUPAP PITP and the Perimeter Institute as well as the conference venue, the Sheraton Wall Centre.

Following the tradition of past Texas Symposia the talks emphasized recent developments in cosmology, high-energy astrophysics and the frontiers between these and gravitation and particle physics. Nearly three hundred people came to Vancouver for a very successful conference.

Texas Symposium delegates enjoying a coffee break at the Sheraton Wall Centre.

Jaymie Matthews: A Stellar Human Being *Alice Cassidy*

Jaymie receiving his Order of Canada from Governor-General Michaelle Jean at Rideau Hall. Not your 'ordinary' recipient, to be sure.

Jaymie Matthews, Associate Professor, Department of Physics and Astronomy and Mission Scientist, MOST Space Telescope Project <www.astro.ubc.ca/ MOST, was recently inducted as an officer of the Order of Canada by Governor-General Michaelle Jean. The official news release notes that Jaymie's innovative contributions to space research and discovery have raised Canada's standing in the field of astrophysics. He is recognized internationally for his studies in stellar seismology and the use of star pulsations to probe their composition and history.

But if you ask Jaymie's students, they would say that he makes learning a ton of fun, and has an extraordinary ability to make complex ideas accessible. In the past he has been awarded the UBC Killam Teaching Prize and the Canadian Association of Physicists Medal for Excellence in Teaching.

And if you ask Jaymie's colleagues who have co-taught with him, they would say that his energy, creativity and care and attention to students and learning is infectious. I had the pleasure of team-teaching with Jaymie in 1999, on a field course to Baja California, along with Kurt Grimm of Earth and Ocean Sciences. It was not all hard work though, as we had a few moments here and there of socializing, swimming, dancing, chatting to the locals, testing the local food and beverages. I could go on, but.... Needless to say, Jaymie is as convivial as he is smart and talented.

And if you ask pretty much anyone who has met or even just crossed paths with Jaymie Matthews, they would tell you that he would do anything to help you, and that just being around him gives you an overall feeling of well-being. What a most appropriate recipient, then, of the Order of Canada.

This article is reprinted with permission from Issue 53 of *Tapestry* published by the Centre for Teaching and Academic Growth (TAG) at UBC. Dr. Alice Cassidy is the associate director of TAG.

Wrong-way Kuiper Belt Object

University of British Columbia astronomer Brett Gladman and the Canada France Ecliptic Survey discovered the first ever trans-neptunian object known to orbit backwards around the Sun (2008 KV42).

The trans-Neptune region of the Solar System (often referred to as the Kuiper Belt) contains objects whose physical compositions are mixes of ice and rock. Until now, all of the known trans-neptunians (TNOs below) circle the Sun in the same sense as the planets, mostly on orbits that look like circles and which are only slightly tilted when compared to the plane in which Neptune orbits. The great majority have tilts less than 20 degrees (Pluto is 17 degrees), and all but one have tilts less than 50 degrees. The previous record-holder is named 2002 XU93 (discovered by the Deep Ecliptic Survey) with a orbital tilt of 77 degrees.

The amazing result was that KV42 goes around the Sun backwards compared to the planets and all other trans-neptunian objects. The orbital tilt, or inclination, is 104 degrees (all orbits more inclined than 90 degrees are called retrograde, meaning in the opposite sense).

This is a peculiar state of affairs, as finding an object like this was not expected. However, in hindsight this object may offer a link between certain types of comets and the outer regions of our Solar System.

There are some comets that orbit the Sun on retrograde orbits, with comet Halley certainly being the most well-known example.

2008 KV42 is a potential missing link between the known population of Halley-type comets and the unknown source of these comets. Production of KV42 via orbital evolutions from currently known source regions seems extremely improbable. Instead, KV42 may be a `transition object' between a source exterior to the Kuiper belt and the Halley-type comets closer to the Sun. Recent models of the formation of the inner edges of the Sun's Oort cloud (the long period comets are thought to originate in the Oort cloud) have indicated where the source of objects like 2008 KV42, and thus the Halley type comets, may be located: beyond Neptune's orbit. Direct observations of the source region will be extremely challenging.

Source: CFEPS Press Release

Here there's no word for male or female?

Elana Brief

In some ways I have been growing tired of the question "Why are there so few women in physics?" When I thought back to my own decision to study physics, I could think of a few good teachers who inspired me, but mainly I told myself that I just liked physics. I believed that everyone's career decisions boiled down to personal choice, and women, for the most part, just weren't that into physics.

A few years ago, I started reading a book called "Necessary Dreams: Ambition in Women's Changing Lives" by Dr. Ana Fels, a psychiatrist who tried to make sense of the ambivalent relationship that successful women had to their own achievements. It seems that the taboo of women attaining mastery has been overcome, but behind it, there is a stronger taboo against women receiving recognition for their mastery. The stories she shared in the book sounded eerily familiar and I recognized that some of my education and career choices had been influenced by sociocultural factors I had never noticed. I found that thought so disturbing that I put down the book.

In addition to the research that I continue to do with Prof. Alex MacKay in physics and radiology, I also work as the Research Director for the Women's Health Research Network (WHRN). For the past 18 months, since taking the position with the WHRN, I have been on a steep learning curve, identifying the ways in which gender (a sociocultural phenomenon) and sex (a biological category) influence health. My role with the WHRN is to support BC-based health researchers in considering how gender and sex affect the health conditions they study.

Last summer I received the invitation to "Crossing Perspectives on Gender and Physics" a joint meeting of the Nordic Network of Women in Physics (NorWiP) and the Centre for Gender Research at Uppsala University in September 2008 (see photo). I was surprised by the topic of the conference because I myself had been living two separate lives – Gender (with the WHRN) and Physics (at UBC) – which I didn't think would ever connect. After having been to the conference, I can't believe it took me so long to connect them.

In the invitation to the conference, the organizers posed four themes of questions:

1. What role does gender play in the experimental and theoretical practice of physics?
2. How and why are men's and women's identities as insiders and outsiders created in and by scientific networks?
3. Where does gender influence the teaching and learning of physics?
4. Are there physics theories that are gendered in their applications?

The conference brought together physicists and gender researchers from the Scandinavian countries and Eastern Europe. As well, a few keynote speakers came from Germany and the US.

The meeting began with welcomes from Uppsala University and the sponsoring organizations. I was most touched, though, by the welcome from Ulf Danielsson, the Dean of Physics at Uppsala. The conference was taking place in his building, Ångström Laboratory. He spoke of the importance of the meeting in terms of bringing to light gender biases in physics that we are not consciously aware of. I felt that he was committed to addressing the gender disparity by investigating underlying, unseen phenomena along with gender researchers, and not just relying on how physicists view the problem. Later during the conference I saw that all the single-stall washrooms in Ångström Laboratory had baby-changing tables. It suggested to me that women and men can feel welcomed into a space in many spoken and unspoken ways.

What I learned through the three-day conference was that when we create work environments that are more hospitable to women, we end up having environments that are more inclusive for everyone. The quality of the scientific work improves because there are more perspectives to challenge assumptions and conclusions. Replacing homogeneity

Elvira Scheich (Institute for Social Sciences, Technische Universität Berlin), Helene Götschel (Uppsala University, Centre for Gender Research), Eva Hayward (Department of Cinematic Arts, University of New Mexico), Elana Brief at a coffee break. (Thank you to Helene Götschel for this photograph.)

with diversity allows for the expression of difference (of opinions, lifestyle, and abilities) rather than the suppression of it. But there were cautionary tales, too. I attended a workshop on the second day called "Techniques of Disempowerment". ("Oh good", I told my spouse, "I can finally learn how to marginalize people who work under me!") The facilitator spoke about the power that stems from *homogeneity* in work environments. If everyone in an environment looks the same, there is a sense of belonging and understanding: a feeling of being at ease with each other. When a few "outsiders" join, they can be welcomed, tolerated and maybe even celebrated for their differences. When the number of outsiders reaches a critical mass, though, they may undermine the apparent ease of the individual group. As the number of women in physics rises, women have to go through an unstable transition of being an easily incorporated few to a stronger minority that wrecks an implicit homogeneity. During the workshop, women told stories of being mocked by colleagues (personally very supportive) when they tried to organize "women's lunches". Men and women understand unconsciously that upsetting the status quo will lead to discomfort and a necessity to reorganize.

I took the title of this article from the talk: "'Here we don't have a word for male and female.' Gender making processes in Finnish university physicists' everyday working life" by Jenny Vainio. Through interviews with 36 Finnish physicists, she tried to understand overt and subtle ways in which gender influenced the working lives of physicists. For her title she quoted one male participant who gave voice to the shared notion that physics is objective and gender neutral, even genderless. I remember as a physics student musing on how androgynous I and other physics students looked, thinking that it would undermine my own standing if I wore make-up and a dress. "Surely she's not serious about physics if she puts time into styling her hair," I worried others would think. I had thought that the gender-blindness of physics was part of what made it possible to succeed as a woman in physics. But, after the conference, I was very much convinced that even physicists cannot escape the social processes that take place in any organization. Being "gender-blind" has some advantages, except gender doesn't go away and we all end up just blind.

The funny thing about all of my previous efforts to confront the gender disparity in physics is that I never even considered asking a gender researcher to give his or her perspective. I had so deeply believed in personal choice, that I neglected to consider larger sociocultural influences. I think that it would do us well as physicists to invite gender researchers to help us consider how we are keeping "outsiders" from getting in.

My great hope is that our efforts do not end with addressing gender parity – I would love to see a physics department that can embrace differences in physical abilities, sexual orientation, socioeconomic status, and other differences that lead to stigma in our culture. I would love to see that because physics stands to benefit from the diversity of perspectives and talent that the "other" can bring.

Elana Brief, PhD Physics (UBC, 2000)
Research Director, Women's Health Research Network
President, Society for Canadian Women in Science and Technology
Research Associate, Physics, University of British Columbia

Dr. Brief's attendance at the Uppsala conference was support by the office of the UBC Dean of Science.

Beyond the Standard Model

UBC's Joss Ives and Doug Bryman along with an international team of investigators have discovered an extremely rare disintegration of an unstable subatomic particle called a K meson into three other particles. These decay products are a positively charged pion which is observed, and an unseen neutrino antineutrino pair. There are other, more probable, paths by which a K meson can decay.

All the observations of this disintegration infer a decay rate of once in every 5.8 billion decays, more than twice as often as predicted by the Standard Model. This may require new Physics to explain. This process (written $K+\rightarrow\pi+\nu\nu$) is predicted by the Standard Model to occur only once in every 12 billion decays. This is one of the rarest and most interesting decay processes ever observed because it is extremely sensitive to new physical effects not accounted for in the Standard Model.

K+ mesons exist for only 12 billionths of a second before decaying. So to catch the fleeting events and identify the rare decay, the scientists built a state-of-the-art particle detector the size of a small house, capable of examining 1.6 million decays every second. Interesting events are recorded and physicists use sophisticated data-mining techniques to pore over the data to find the most promising events and examine them in exquisite detail.

This is the first time that any experiment has had enough sensitivity to observe candidate events in a region with lower energy pions. The study of these events is challenging due to backgrounds that can mimic the $K+\rightarrow\pi+\nu\nu$ process so new analysis techniques were invented to clearly distinguish the tiny signal.

Source: TRIUMF Press Release

Breaking the Surface of High T_c Superconductors

Dr. Andrea Damascelli is accustomed to facing the unimaginable. An expert in nanoscience, a field of applied science that seeks to control matter on an atomic and molecular scale, he routinely peers into a world where structures are between 100 and 1,000 times smaller than what scientists are traditionally familiar with. As Canada Research Chair in Electronic Structure of Solids and Associate Professor at UBC Vancouver's Department of Physics and Astronomy, Damascelli's research on harnessing the power of high-temperature superconductors and quantum materials is exploring possibilities that few thought were possible – and it is offering the promise of a widespread technological revolution.

Conventional superconductors are materials that offer no resistance to the flow of electricity at temperatures nearing absolute zero (-273.15°C). These materials are commonly used in medical imaging machines, lossless power lines and in the development of next-generation quantum computing and information processing. However, their potential has not yet been fully exploited because their topmost surface layers take on different properties from the rest of the material, which provides a critical barrier to their application in functional devices and makes them a difficult subject to study.

Despite these obstacles, Damascelli and his team have developed a way to understand and control how electrons behave on the surface of high-temperature superconductors, a breakthrough that is expected to take superconductor research to the next level.

"Today, we realize that the thin surface layer of material is really a new playground to work with," says Damascelli. "Actively manipulating the surface is a better way to control the physics than just hoping nature does what you would like it to do."

The seminal discovery came following experiments conducted at UBC and the Advanced Light Source synchrotron at Berkeley Lab. Synchrotrons, such as at the Canadian Light Source in Saskatoon, are large-scale particle accelerators in which electrons traveling at nearly the speed of light generate the most brilliant light available to scientists. Damascelli and his team's groundbreaking experiment involves using samples of yttrium-barium-copper oxide, which are widely considered to be the purest high-temperature superconductors and were produced locally by another team of UBC researchers.

Firstly, in order to avoid contamination, atomically clean sample surfaces are generated in a stainless steel chamber subject to "outer space" vacuum conditions. Then, potassium atoms are evaporated onto the sample's surface, unleashing additional electrons on the surface. Finally, ultraviolet light from the synchrotron source is shone on the sample, where it is absorbed by the electrons. The electrons are then expelled from the surface in a way that can be measured by scientists.

> " We had to find a trick to bring the electrons back to where they are supposed to be."

Damascelli explains: "What we discovered is the number of electrons at the surface is different than inside the sample, which makes the physical properties very, very different. Because of this, we had to find a trick to bring the electrons back to where they are supposed to be and precisely control their number. Using light to emit electrons from a material, we can study those electrons in a vacuum and use energy and momentum conservation laws to infer their properties inside the solid. For instance, we can really study the motion of electrons inside the solid, which defines the electronic properties of the material."

According to Damascelli, the significance of this technique is that scientists are now able to manipulate the number of electrons on the superconductor's surface in an effort to enhance the material's potential for applications. While research at this stage is primarily aimed at understanding electron behaviour, the impact of this discovery is expected to have a ripple effect on the development of new technologies that hinge on utilizing extremely thin layers of materials, particularly in the field of electronics and computing.

"Material surfaces and interfaces can exhibit very exotic properties; if you can control them, then you can really get into new things," says Damascelli. "Quantum materials are now a much bigger class of systems with many more spectacular properties. You can imagine the technology that would come out of this could be groundbreaking in many ways. The simplest examples are lossless power lines and high-efficiency fuel cells. More significantly, we're trying to come up with new electronic materials whose functionality is defined by quantum mechanical interactions and whose application could strongly impact the quality of everyday life."

Dr. Andrea Damascelli's research is funded by the Canada Foundation for Innovation (CFI) and the Natural Sciences and Engineering Research Council of Canada (NSERC). Under Damascelli's leadership, future studies into superconductor and quantum material technology will be conducted at the Quantum Materials Spectroscopy Centre at the Canadian Light Source in Saskatoon.

This article is reprinted with permission from the Fall/Winter 2008 issue of *Frontier* published by the Office of the Vice President Research at UBC: http://www.research.ubc.ca/.

UBC Observatory

The observatory is open on clear Saturday nights for public viewing. Check out: http://scope.phas.ubc.ca for details.

Comings

Administration

Salena Li - Finance Clerk
Salena joined the financial management team in May.

Trevor King
Trevor joined our admin. team at the end of September.

Faculty
Robert Raussendorf joined the department from the Perimeter Institute.

... and Goings

Administration
Khadija Hirji – Financial Assistant
Khadija left the department in January to take up a new position at St. Paul's hospital.

Janie McCallum – Department Office Manager
Janie left the department to manage human resources for the Department of Psychiatry at UBC.

Technical

Ernest Diamant – Student Machine Shop
Tom Felton - Electronics Engineer
Tom retired from the department at the end of June 2008.

Stan Knotek - Electronics Engineer
Stan will be leaving the department at the end of January 2009 to enjoy his retirement.

Faculty
Jim Dunlop
Jim left the department for the University of Edinburgh.

Faculty and Staff Awards

APS Outstanding Referee
Ian Affleck
Douglas Scott

CAP Brockhouse Medal
Jess Brewer

Fellow of the Royal Society, UK
George Sawatzky

Fellow of the United States Academy of Education
Carl Wieman

Peter Wall Early Career Scholar
Kris Sigurdson

Sloan Fellowship
Scott Oser

UBC Alumni Achievement Award for Outreach
Chris Waltham

Quick News

Ludo van Waerbeke and a team of international scientists have discovered the largest structures of dark matter ever seen. Using the newly developed technique called "weak gravitational lensing", the team was able to map structures that span 270 million light-years across.

The Wilkinson Microwave Anisotropy Probe (WMAP) team including UBC's **Mark Halpern** found evidence for the "cosmic neutrino background", a fossil from the very early universe. These neutrinos originated in the universe's early moments, when enormous numbers of matter and antimatter particles annihilated one another.

In May, three Nobel Laureates and dozens of other scientists converged on the Hebb Theatre to honour **Erich Vogt**. Erich spend a decade as a professor in the then Dept. of Physics, before becoming a UBC Vice President. In 1981, he was named director of TRIUMF where besides particle physics, he was deeply involved in the fight to build a "*KAON Factory*." Through all this, he never neglected his passion for teaching physics as he continues to teach undergrad courses at UBC. It is estimated that Erich has taught over 5000 students over his 43 year career!!

In July, UBC's **Jaymie Matthews** and the MOST team celebrated five years of operation of the MOST satellite. That reminds me (and probably Jaymie as well) of another "five-year mission to explore new worlds … "

UBC's **Ingrid Stairs** and **Rob Ferdman** are among a team that measured the precession of the spin axis of the pulsar. The rate of precession is in good agreement with the theory of general relativity.

The 2008 Nobel Prize in Physics was awarded to Yoichiro Nambu "for the discovery of the mechanism of spontaneous broken symmetry in subatomic physics," and to Makoto Kobayashi and Toshihide Maskawa "for the discovery of the origin of the broken symmetry which predicts the existence of at least three families of quarks in nature." Understanding this symmetry breaking and CP (Charge Parity) violation is one of the primary goals of the BaBar experiment (as mentioned in the Nobel press release). Many UBC physicists have been active contributors to the Babar project. Professors **Janis McKenna, Chris Hearty**, **Tom Mattison**, and PhD students **Dave Asgeirsson** and **Bryan Fulsom** form the current UBC Babar Group.

Back Page: *A Poetic Synergy*

If the Department of Physics and Astronomy had a poet laureate, she would be Mari-Lou Rowley. While a writer for the UBC Faculty of Science newsletter *Synergy*, Rowley covered many of the great stories of the cutting-edge research in the Department of Physics and Astronomy. She has published seven collections of poetry. The *Globe and Mail* writes that Mari-Lou Rowley's science inflected poetry "pulls us into a teaming world of biological and physical processes, where thought and emotion are physics and chemistry, and the subatomic world a model of spiritual grace." Many of her poems draw on the work of the UBC Physics and Astronomy Department in particular.

Rowley read some of her recent work as part of the Play Chthonics reading series at Green College on the UBC campus on December 3, including poems from *CosmoSonnets* and *Suicide Psalms* (her most recent book). She read "D-Wave Pairing" from *Viral Suite* that provides a poetic description of high-temperature superconductivity

entwined in a cloverleaf two-step
they ripple and bend for hours on end
later, superfluid, vibrating in the body's
exchange they mouth the same words,
frictionless endearments trapping light

We end with a poetic version of the pictures of high-temperature superconductivity that UBC physicists are building with the Canadian Light Source in Saskatoon. Sometimes a few words are worth a thousand pictures.

Physicists and non-physicists wait in anticipation of the two poets in the piano lounge at Green College.

Mari-Lou Rowley reads several poems from her book *Viral Suite*.

Department of Physics and Astronomy
University of British Columbia
6224 Agricultural Road
Vancouver BC V6T 1Z1 Canada