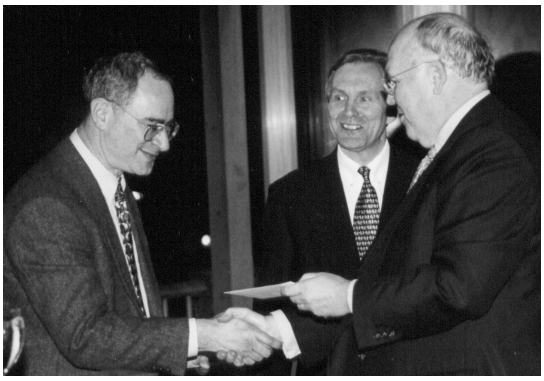
VII. PIMS PRIZES:

2000



George Bluman receives PIMS Education Prize from Martin Taylor (VP Research, Univ. of Victoria) and Ken Foxcroft (TD Securities).

From left, Brian Wetton, Huaxiong Huang, and Keith Promislow receive the PIMS Industrial Outreach Prize from Murray Margolis (Powerex Corp.) and Ken Foxcroft (TD Securities). Missing is the 4th recipient, John Stockie (UNB, Fredericton).

Indira Samarasekera (VP Research, UBC) congratulates PIMS Research Prize winner Terry Gannon (left).

The first annual PIMS Prizes in Education, Research and Industrial Outreach were awarded on December 10 at a Banquet held at the UBC University Centre. The prizes, valued at $3000 each, were donated by the Toronto Dominion Bank Financial Group and TD Securities.

The **PIMS Education Prize** rewards individuals who have played a major role in encouraging activities which have enhanced public awareness and appreciation of mathematics, as well as fostering communication among various groups and organizations concerned with mathematical training at all levels. The review committee for the PIMS Education Prize was Michael Lamoureux (chair of the committee and PIMS Deputy Director), Florin Diacu (PIMS-UVic Site Director), Arvind Gupta (MITACS Programme Leader), Bryant Moodie (PIMS-UA Site Director) and Dale Rolfsen (PIMS-UBC Site Director).

The **PIMS Education Prize** was awarded to **George Bluman**, who is the chair of the UBC Math Department. George Bluman's lifetime commitment to mathematics education in British Columbia, both in the public school system and at the University of British Columbia, make him an outstanding recipient for the PIMS Education Prize. Many aspects of his activities were highlighted by his nominees, including: providing stimulating mathematics experiences for students, through the Euclid contest and various school workshops; supporting math teachers in the schools; working to raise and maintain high standards in the school system; developing a healthy dialogue with the BC Ministry of Education; encouraging math students at UBC to pursue careers in teaching; and encouraging a strong commitment to teaching at UBC.

Typical of his activities and impact is his over-twenty-year involvement with the Euclid contest as the BC and Territories organizer for this high school enrichment contest in mathematics. George supports the idea that the Euclid contest is an event every Math 12 student should be able to enter and, in doing so, feel a sense of accomplishment. Beyond organizing the contest, he has developed three levels of School Workshop programs which give students (elementary, junior high, and senior high) the opportunity to participate in problem solving workshops with university faculty and students. BC enjoys the highest level of participation, per capita, in the Euclid contest and its universities benefit from the excellent preparation these students receive through the program. In the words of the nominators, much of the BC success in Euclid can be directly attributed to George's efforts.

George personally knows most of the mathematics teachers from around the province and uses this network to provide a dialogue between the BC secondary school system and the universities. He has been tracking high school students' performance at university for over twenty year, and often makes personal phone calls or writes to high schools to give suggestions on how to improve their students' performance. Again, his nominators attest to the positive impact his work has had on the designs, and successes, of their mathematics program. The scope and magnitude of his service to mathematical education over the past twenty years is phenomenal.

In his comments after receiving the award, George Bluman states that, "It is not easy for mathematicians to be involved in educational activities. Education issues are often very sensitive with many different (often unfairly stereotyped) 'conflicting' groups and interests— pontificating university professors, strict union mentalities of teachers, anxious students and parents, scandal-seeking media, politicking Ministries of Education paying little attention to common sense and giving lip-service to the opinions of informed teachers and professors. It is essential that all such special interest groups trust each other and stop bickering for the common good. After all we should want our students to have the best education possible within our means."

"PIMS is to be congratulated for taking a sincere interest in Education with its various Education activities including the recognition of those involved through this Award."

He drew particular attention to the semi-annual publication of **Pi in the Sky**, prizes for Math projects in Science Fairs, the support of elementary school Math activities such as the **PIMS Elementary Grades Math Contest**,

the **Mathematics is Everywhere** poster campaign, the **Senior Undergraduate Industrial Math Workshop**, and the **Graduate Industrial Math Modeling Camp**.

"All of the above are new initiatives and continuing activities which certainly would not have happened without the existence of PIMS. Moreover PIMS is very fortunate to have the services of Klaus Hoechsmann for developing and promoting its educational activities. We all now know that Klaus is also a budding playwright from his very well-written and PIMS-sponsored play Hypatia which should be performed for students in schools around the world."

NSERC Director, Danielle Menard speaking at the PIMS Awards Ceremony.

The **PIMS Research Prize** is given for a particular outstanding contribution to the mathematical sciences, disseminated during the past five years. Nominations for the Research Prize were adjudicated by the PIMS Scientific Review Panel, the members of which are chair Nassif Ghoussoub (PIMS Director), David Boyd (UBC), David Brillinger (Berkeley), Ron Graham (UCSD), Alistair Lachlan (SFU), Richard Karp (Berkeley), Bernard Matkowsky (Northwestern), Robert Moody (Univ. of Alberta), Nicholas Pippenger (UBC), Ian Putnam (Univ. of Victoria), Gordon Slade (UBC), and Gian Tian (MIT).

The Research Prize was awarded to **Terry Gannon** of the Dept. of Mathematical Sciences, University of Alberta. Terry's accomplishments cover two separate directions, both of which have won him international recognition. The first accomplishment is his work on the "Moonshine Conjectures", which concern a fantastic connection between the representations of the Monster Group and certain classes of modular forms. Richard Borcherds was awarded the Fields Medal in 1998 for his proof of these conjectures. However, Borcherds' proof contained one part that was non-conceptual and had to be shown by brute force computation. Terry provided a conceptual argument to replace this computation. The second and more extensive of Terry's accomplishments concerns the classification of two-dimensional conformal field theories. The problem involves determining all modular invariants which can be constructed from characters of the representations of the underlying affine Kac-Moody Lie algebras. The first success in classifying two-dimensional conformal field theories was the A-D-E classification of Capelli, Itzykson and Zuber for affine-$SU(2)$. In 1994, Terry discovered a solution to the affine-$SU(3)$ problem and has since made enormous advances towards a solution of the general problem.

In describing his research, Terry states, "My bias as a mathematician is toward breadth. Most mathematicians, it seems, try to strike oil by drilling deep wells. This strategy makes a lot of sense. But actually I'm more drawn towards half-completed bridges and wobbling fences. The theory in those places is relatively undeveloped, so there's a lot of basic results still open. And I get a little restless staying too long in one place."

"Some of my work which attracted a little attention was in an area called Monstrous Moonshine. It was noticed that 196 884 –the first interesting coefficient of a function (the j-function) important to classical number theory– equals $1 + 196\,883$, the sum of the first two dimensions of representations of a very special symmetry (the Monster group). The second, third,... coefficients of that function were likewise related to the higher dimensions. The challenge was to explain what that classical number theory had to do with this newly discovered symmetry. A bridge had to be built! Borcherds did most of the work, and for this was awarded a Fields

Medal in 1998. He showed that there's a new and very complicated algebraic structure (a vertex operator algebra) whose symmetry is that Monster group, and whose 'graded dimension' is the j-function. If we twist the graded dimension by various elements of the Monster, we get other special functions (Hauptmoduls) of classical number theory. The best known way to show this is by a theorem I found with Chris Cummins."

"But much of my work thus far has occurred near a certain wobbling fence separating math from physics. String theory, or more precisely, conformal field theory (CFT), was created by physicists for their own shady purposes, but its impact has been far greater in math. Five of the twelve Fields medals awarded in the 1990s were to men whose work directly concerned CFT (namely, Drinfeld, Jones, Witten, Borcherds, Kontsevich). I've tried to clarify some of the algebra and number theory in CFT, but mostly I've been working towards the classification of all CFTs related to a class of infinite symmetries called Kac-Moody algebras. These CFTs seem to be the fundamental ones, and their classification is uncovering unexpected (and unexplained!) links with other areas of math. I hope to complete this classification within the next couple years."

"Research for me is something like chasing squirrels. As soon as you spot one and leap towards it, it darts away, zigging and zagging, always just out of reach. If you're a little lucky, you might stick with it long enough to see it climb a tree. You'll never catch the damn squirrel, but it'll lead you to a tree. Chasing squirrels is a way to find trees! In math, the trees are called theorems. The squirrels are those nagging little mysteries we write at the top of many sheets of paper. We never know where our question will take us, but if we stick with it, it'll lead us to a theorem, and to our next paper. That I think is what research in math is like."

"Receiving the PIMS Research Prize has been enormously significant for me personally, and surprisingly humbling. Recognition from our peers is notoriously rare for those of us near the beginnings of our careers, and now I have some expectations other than my own to live up to (yikes!). Validating and supporting research is the biggest role PIMS can play, in my view. The PIMS post-doc program is wonderful, and the plan for an Oberwolfach-style institute is really very exciting. But one thing which is still quite disappointing in western Canada is the intellectual isolation of the universities from each other. For instance, Calgary and Edmonton are only 3 car-hours apart and yet it's exceptionally rare when one of us gives a talk at the other university. I wonder if PIMS could actively encourage more of these grassroots interactions, e.g. by supplying each local PIMS office with funds whose sole purpose is to invite other westerners to give colloquium talks. Maybe this could help build more of a western mathematical sciences community."

The **PIMS Industrial Outreach Prize** recognizes individuals who have employed mathematical analysis in the resolution of problems with direct industrial, economic or social impact. The review panel for this prize was chaired by the MITACS Programme Leader Arvind Gupta (SFU). The other members of the panel were Don Denney (Syncrude, Inc.), Shahid Hussain (Telus Corp.), Murray Margolis (Powerex Corp.), Brian Seymour (UBC) and Rex Westbrook (Univ. of Calgary).

The prize was awarded to **Dr. Huaxiong Huang (York), John Stockie (University of New Brunswick), Keith Promislow (SFU) and Brian Wetton (UBC)**. This team of researchers are part of the PIMS-affiliated Mathematical Modeling and Scientific Computation Group in MITACS. They are working with Ballard Systems, the world leader in hydrogen fuel cell design, to develop models to help Ballard improve the efficiency and durability of fuel cells.

Using parabolic poles, they modeled the reactant gas flow through the Gas Diffusion Electrode (GDE), a layer of porous, conducting material on either side of the catalyst and membrane in the fuel cell. Mathematical analysis of the models highlighted the sensitivity of fuel cell performance to certain GDE parameters, giving insight into the performance of various possible GDE materials.