

# Summer School: Strings, Gravity and Cosmology

## Perimeter Institute, Waterloo, June 20-July 8, 2005

*Report by Rob Myers, Perimeter Institute*

This graduate summer school was held as part of the thematic program on the Geometry of String Theory which is being hosted jointly by the Fields Institute and the Perimeter Institute (in Waterloo). The school ran for three weeks from June 20 to July 8, 2005 at Perimeter. The organizing committee consisted of Alex Buchel (Perimeter Institute & University of Western Ontario), Taejin Lee (Kangwon National University & APCTP), Robert Myers (Perimeter Institute and University of Waterloo), Moshe Rozali (University of British Columbia) and Gordon Semenoff (University of British Columbia).

This was the third in an ongoing series of annual summer schools in theoretical physics held in Canada. These schools are intended to educate graduate students and young researchers on current developments in string theory and also its interface with gravity and cosmology. The first and second editions of the school was held at the University of British Columbia in 2003 and 2004. As well as being the first time for this school to be held at Perimeter, this marked the first ever graduate summer school to be organized there.

The school brought 23 first-class lecturers and approximately 110 students from all of the world (including about a dozen students from the local area). The lecture topics ran from introductory material to new (as yet unpublished) research results. The introductory courses included "Supersymmetry Basics" by Erich Poppitz (University of Toronto) and "Perturbative String Theory" by Clifford Johnson (University of Southern California). The advanced topics included lectures by Nathan Seiberg (IAS, Princeton) on "Matrix Models and Noncritical Strings", by Hiroshi Ooguri (Caltech) on "Topological String Theory" and by Ashoke Sen (Harish Chandra Research Institute) on "Black Holes, Attractors and Elementary Strings". In listing only a few of the courses here, we are undoubtedly doing an injustice to the remaining lecturers, all of whom obviously put in a great deal of effort in preparation and delivered a superb set of lectures. We refer the interested reader to the school webpage:

<http://www.perimeterinstitute.ca/activities/scientific/cws/PI-SCHOOL-1/>

As well as finding the complete schedule there, you can in fact watch all of the lectures.

There were a couple of course highlights which we must mention. The first is the course by Samir Mathur (Ohio State University) on "Black holes in String Theory". Perimeter's 200 seat auditorium was filled almost to capacity for these lectures, indicating the great interest Samir's recent research attracted not only from the students but also amongst researchers at Perimeter and in the area. Another lecturer who must be highlighted for his enthusiasm and stamina is Vijay Balasubramanian (Pennsylvania University). Vijay was originally scheduled to deliver a three lectures of 1 and 1/2 hours discussing aspects of the "AdS/CFT Correspondence". At the request of the students, Vijay adapted his initial lectures to be of an introductory nature but he then also gave two additional evening lectures, which allowed him to also cover new ideas which he is working on in his research. Vijay closed his course with a marathon lecture which started at 6:15 in the evening and finished after 9 o'clock.

As alluded to already above, the student's days were quite full. Typically the day started at Perimeter between 9 and 9:30 in the morning and ran until 6pm with four 1.5 hour lectures and several breaks for discussions (and lunch). Lectures also ran on the two Saturday afternoons during the school. Only on the Sundays did the students have a day off. Two well-attended field trips were organized for these days to give the students a flavor for southern Ontario beyond Waterloo. On June 26th, a bus took students into Toronto for a day of sight-seeing. Similarly on July 2nd, a group of students went down to see Niagra Falls. The feedback from the students was that trips were thoroughly enjoyed by all of the participants.

Despite the already busy schedule of formal courses, the students also presented short informal lectures about their own research. Sixteen of the students presented talks spread over five additional evening sessions. These seminars covered a remarkably diverse range of topics, including: non-relativistic string theory, tachyon condensation, cosmic D-strings and primordial magnetic fields from inflation. The student talks were organized by two of the students themselves, Mihai Bondaescu (Caltech) and Carlos Hoyos (Universidad Autonoma de Madrid), and we would like to thank them for their efforts.

At the end, we received many complements from students and lecturers alike. So it seems the participants all headed off with good memories of their visit to Perimeter. Many of the students to the opportunity to buy a Perimeter t-shirt as a memento of the school. Similarly the lecturers were given an official PI coffee mug at the close of each course as a souvenir of their contribution to the school. Our intention in choosing the dates for the 2005 school was that it will also offer the students the opportunity to attend the Strings05 conference, which was held at the University of Toronto in the week immediately following the school. So we were happy that a good number of the participants at the school took advantage of this opportunity.

As well as being sponsored by Perimeter and Fields, the summer school received funding from the Asia Pacific Center for Theoretical Physics (based in Seoul, Korea), the Pacific Institute of Theoretical Physics and the Pacific Institute for the Mathematical Sciences (both based in Vancouver). As well as thanking these institutions for their generous support, the organizing committee would also like to express their hope that these sponsors will continue to provide support for future schools. We feel that this year's school at Perimeter was the most successful one in the series which began in 2003. As well as complements for the school, many of the participants inquired about future schools and voiced the hope that they would participate again. On the organizing committee, we certainly hope that this tradition of holding "Strings, Gravity & Cosmology" summer schools annually will be continued.

In closing, the organizers would like to thank the staff at both Perimeter and Fields for all their help in bringing the meeting together and ensuring that everything ran smoothly. In particular, on behalf of all the participants, we thank Jessica Harrison, PI's conference coordinator, for taking such good care of the logistics for everyone.

Notes:

Conference photos are available from Peter Langfelder at: <http://tachyon.uwaterloo.ca/~plangfelder/Perimeter/Work/SummerSchoolJun05/>