

## AC2 Report

The Commission is also the Committee of the International Society on General Relativity and Gravitation. Since the last IUPAP GA in 2008, there have been a number of important developments in the Commission's and the Society's work.

The information service sponsored by the Commission, "hyperspace", was run from 1989-2009 by me. In 2009, following expressions of interest from a number of individuals and institutions, the service was transferred to a team led by Luciano Rezzolla at the Albert Einstein Institute. It has become a fully online and much more automated service, with redesigned interfaces, which is continuing to prove valuable to people in the field. It can be found at [hyperspace.aei.mpg.de](http://hyperspace.aei.mpg.de). The Society's own website was redesigned and modernized, and, with the change of officers in 2010, it moved host and URL: the new URL is [www.isgrg.org](http://www.isgrg.org).

The Society's journal, "General Relativity and Gravitation", published by Springer, has produced a number of special issues and has seen a steady rise in the quality of papers. Its current Editors in Chief will be handing over at the end of 2011, having guided the journal into Springer's top five journals in physics, with an impact factor of 2.538. (One should not, of course, take impact factors as too meaningful, but this does represent a genuine rise in quality.)

The Commission sponsored the biennial Amaldi conferences of 2009 and 2011, and the Marcel Grossman meeting of 2009. It also held the latest of its own triennial conferences, GR19. This took place in Mexico City in July 2010. During the conference, three meetings of the Commission took place, one to review the previous three years, one to select the site for GR20, and one to plan for the next three years. At a General Assembly of the Society, new officers were elected. I became President, having been Secretary, and Dr. Beverly Berger became Secretary. It was agreed that GR20 would be held in Warsaw in 2013; subsequently GWIC agreed to collocate Amaldi 10 there.

GR19 was very successful, with a good attendance (over 700), some excellent plenary talks, and well-attended parallel sessions. The local organizers had managed very well to cope with the drop in sponsorship following the credit crunch, by renegotiating some deals and careful husbandry. Over 180 participants were given free registration, supported by the funds from IUPAP, the Society and other sponsors, and from the general income of the meeting.

During the meeting a number of prizes were awarded. The Xanthopoulos Prize (similar to but predating IUPAP Young Scientists Prizes) was presented to Stefan Hollands (Cardiff). The inaugural triennial Ehlers and Bergmann-Wheeler Prizes (for the best PhD theses in classical and quantum gravity respectively) were presented to Nicholas Yunes (Princeton) and Victor Taveras (Louisiana State). The Hartle Prizes, for student presentations at the meeting, were awarded to Amitai Bin-Nun (U Penn), Samuel Gralla (Chicago), Ian Morrison (UC Santa Barbara), Vivien Raymond (Northwestern), David Sloan (Penn State), Jan Steinoff (Jena), Charalampos Markakis (Wisconsin, Milwaukee), Bethan Cropp (Wellington, New Zealand) and Francesca Vidotto (Marseille). The inaugural Chandrasekhar Prizes, for postdoctoral presentations at the meeting, were awarded to Parampreet Singh (Perimeter Institute), Mark Hannam (Vienna), Thomas Corbitt (LIGO Lab, MIT) and Woei Chet Lim (AEI). AC2 gratefully acknowledge support from FORTH (Greece), Springer-Verlag, the UK Institute of Physics Publishing, and World Scientific for the Xanthopoulos, Ehlers, Bergmann-Wheeler and Chandrasekhar Prizes respectively.

The Society also awarded its first Fellowships, to Alessandra Buonanno (Maryland), Alejandro Corichi (UNAM, Mexico), Gabriela Gonzalez (Louisiana State), James Hough

(Glasgow), Don Marolf (UC Santa Barbara), Roger Penrose (Oxford), Frans Pretorius (Princeton), Carlo Rovelli (Marseille), Madhavan Varadarajan (RRI, Bangalore) and David Wands (Portsmouth).

Scientifically, it has also been an interesting period. There have been significant advances on several fronts and some of the long standing theory problems were resolved. Among the talks at GR19 were two outlining the surprising recently discovered links between gravity theories and fluid dynamics, and gravity and condensed matter physics: for example, it has been shown that certain strong coupling correlation functions which have been difficult to calculate can be transformed into Green's functions on black hole backgrounds where they are much more easy to evaluate. Other talks covered the discovery of fast-spinning black holes, by the properties of the X-ray emission from surrounding accretion disks, and the latest on the remarkable "kicks" found in numerical simulations of interacting systems which can unexpectedly propel interacting compact objects at surprising speeds and directions, and also have implications for star formation.

In 5-dimensional classical general relativity it was definitively established that, as a result of the well known Gregory Laflamme instability associated with black branes, the celebrated cosmic censorship conjecture is violated. In addition, several developments extended the role of classical and quantum gravity to other domains. In cosmology, it was shown that an inflationary phase compatible with the seven year WMAP data occurs for almost all initial conditions in loop quantum cosmology. Another finding, important for future cosmological missions, is that stimulated emission need not be diluted by inflation and can have potentially observable effects on the cosmic microwave background.

Experimentally, there were also striking advances. The Atacama Radio telescope gave the first direct measurements of lensing in the cosmic microwave background, the lunar laser ranging experiment enabled the location of the lost Lunokhod 1 spacecraft, and the gravitational wave experiments made substantial progress too. A collaboration of the LIGO and VIRGO teams and astronomers presented direct upper limits on continuous gravitational wave emission from the Vela pulsar which beat the spin-down limit on gravitational wave emission and reported a search for gravitational wave bursts from six magnetars.

Optical control methods were used to create a resonant state of the mirrors of one of the LIGO instruments with an effective temperature of microkelvins. The effective mass of the oscillators was 2.5 kg. They were only about 250 quanta away from the ground state. Prof. Nergis Mavalvala at MIT, who led this effort, received a 2010 MacArthur genius award for it. A subsequent paper "A gravitational wave observatory operating beyond the quantum shot-noise limit", by the LIGO Scientific Collaboration about the use of "squeezed light" to improve the sensitivity of the GEO gravitational wave detector, has just appeared.

The Advanced LIGO detectors started hardware installation in both LIGO Hanford and Livingston Observatories in October 2010. Science runs are expected to start in 2014/2015. The GEO and the Virgo detectors took data during the European summer in June 3-September 5 2015, and the Virgo Collaboration will start installing its advanced detector in Cascina, Italy, later this year.

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