Invited Speakers

	Bernard John Carr	Queen Mary University of London
PRIMORDIAL BLACK HOLES: LINKING MICROPHYSICS AND MACROPHYSICS		

Black holes could span 60 decades of mass - from the Planck scale (10^{-5}g) to the cosmological scale ($10^{22}M_\odot$) - and therefore provide an important link between microphysics and macrophysics. However, only primordial black holes (i.e. those formed in the early universe) could be lighter than the Sun and only those lighter than the Earth would have a Hawking temperature exceeding that of the cosmic microwave background, so that quantum effects are important. Such quantum (microscopic) black holes span the lower 30 decades of mass and provide a unique probe of the early universe and high energy physics. The micro-macro link is most striking at the Planck scale, raising the question of what happens to relativity theory as one approaches the Planck scale from above and to quantum theory as one approaches it from below. Planckian black holes are likely to play a key role in quantum gravity and there may also be a link between elementary particles and sub-Planckian black holes. In the macroscopic domain, attention has recently turned to the possibility that non-evaporating primordial black holes could provide the dark matter or the black-hole mergers detected by LIGO or even some features of cosmic structure.

	Jonathan Gair	School of Mathematics, University of Edinburgh
Science with the Laser Interferometer Space Antenna		

The Laser Interferometer Space Antenna (LISA) is a space-based millihertz gravitational wave detecter scheduled for launch by ESA on 2034. The millihertz band is expected to be rich in gravitational wave sources, including the mergers of massive black holes in the centres of galaxies, the extreme-mass-ratio inspirals of stellar origin black holes into massive black holes, compact stellar binaries in the Milky Way and possible more exotic sources including bursts from cosmic string cusps and a stochastic background of gravitational waves generated at the TeV scale in the very early Universe. Observations of these sources will have profound implications for our understanding of astrophysics, cosmology and fundamental physics. LISA has just entered Phase A of preparation, during which the mission design will be finalised and the planning of data analysis and science exploitation will begin. In this talk I will give an overview of the sources LISA is expected to detect and the science investigations that these observations will allow, including open challenges in extracting this science from the LISA data. I will also describe how LISA science preparation is being organised by the LISA Consortium and ways in which interested scientists can participate in this activity.

	Mark Hindmarsh	University of Sussex
Gravitational waves from phase transitions in the early Universe		

About 10 picoseconds after the beginning of the Universe, the Higgs field turned on. In extensions of the Standard Model of particle physics, this could have been a first order phase transition, with the spontaneously nucleated bubbles of the Higgs phase expanding and colliding at relativistic speeds. I will discuss the characteristic spectrum of gravitational radiation from phase transitions, prospects for observing the radiation at the future space-based gravitational wave detector LISA, and outline how LISA can complement the LHC as a probe of phase transitions and physics beyond the Standard Model.

	David F. Mota	University of Oslo
Nonlinear astrophysical probes of gravity beyond General Relativity		

Extending General Relativity by adding extra degrees of freedom is a popular approach to explain the accelerated expansion of the universe and to build high energy completions of the theory of gravity. The presence of such new degrees of freedom is, however, tightly constrained from observations and experiments. The viability of a given modified theory of gravity therefore strongly depends on the existence of screening mechanisms that suppresses the extra degrees of freedom in certain scales and regimes. I describe how one can use nonlinear structure formation to probe extensions to General Relativity, and will present a set of astrophysical observables that could give smoking guns of screening mechanism.

	José Martín Senovilla	University of the Basque Country UPV/EHU
Multiple Killing Horizons		

Multiple Killing Horizons are null hypersurfaces acting simultaneously as Killing horizons of several independent Killing vectors. Their main properties and classification will be presented, and some interesting explicit examples will be shown. They turn out to be closely related to Near Horizon geometries, and this connection will be discussed.

	Alexei A. Starobinsky	L.D. Landau Institute for Theoretical Physics
Looking for quantum-gravitational corrections to $R + R^2$ inflation		

Quantum field theory in curved space-time and quantum gravity predict some quantum corrections to the $R + R^2$ (Starobinsky) inflationary model. Observational consequences for a number of such corrections are calculated. However, none of them is observed, and only upper bounds on their free parameters are obtained. This has been expected since the relative smallness of these corrections is caused by the anomalously large value of the dimensionless coefficient in front of the R^2 term that finally follows from the actual amount of present large-scale inhomogeneity of the Universe.

	Hirotaka Takahashi	Nagaoka University of Technology
Status of KAGRA and KAGRA data analysis (tentative)		
We report on the status of KAGRA and KAGRA data analysis.		

	Jean-Philippe Uzan	CNRS / Institut d'Astrophysique de Paris
Properties of the anisotropy of the astrophysical stochastic gravitational wave backgroundy		
The properties of the angular power spectrum of the astrophysical gravitational wave background constituted of the radiation emitted by all resolved and unresolved astrophysical sources is presented. Its shape and amplitude depend on both the astrophysical properties on galactic scales and on cosmological properties. Its correlations with weak lensing and galaxy distribution are discussed. This new results pave the way to the study of a new observable at the crossroad between general relativity, astrophysics, and cosmology.		

	Vincent Vennin	APC Paris
Stochastic Inflation and Primordial Black Holes		
Primordial black holes can be seeded by large cosmological fluctuations produced during inflation. This happens if the potential for inflation is sufficiently flat in some regions. However, in such regions, the dynamics of the inflaton is dominated by quantum diffusion rather than by classical slow roll. This implies that the standard method to calculate the amplitude of the fluctuations, hence the abundance of black holes, breaks down. We show how a proper calculation of inflationary perturbations that incorporates the effect of quantum diffusion can be performed using the formalism of stochastic inflation. We discuss how the predictions for the primordial black holes abundance change, hence how the constraints on the inflationary potential coming from their non detection are modified.		