第15回
RESCEU コロキウム

東京大学大学院理学系研究科 附属ビッグバン宇宙国際研究センター

日　時:　2017年3月2日(木) 16:00～17:00

場　所:　理学部4号館1階ピロティ RESCEUセミナー室

講　師:　Bernard Carr 氏 (Queen Mary University of London)

Primordial black holes as dark matter and seeds for cosmic structure

The possibility that the dark matter comprises primordial black holes (PBHs) is considered, with particular emphasis on the currently allowed mass windows at 10^{16} - 10^{17}g, 10^{20} - 10^{24}g and 10 - 10^3 M⊙. The last possibility is of special interest in view of the recent detection of black-hole mergers by LIGO. All relevant constraints (lensing, dynamical, large-scale structure and accretion) are considered and various effects necessary for a precise calculation of the PBH abundance (non-Gaussianity, non-sphericity, critical collapse) are accounted for. It is difficult to put all the dark matter in PBHs if their mass function is monochromatic but this is still possible if the mass function is extended, as expected in many scenarios. A novel procedure for confronting observational constraints with an extended PBH mass spectrum is therefore introduced and this is applied for two inflationary models. Even if PBHs provide only a small fraction of the dark matter, they could generate cosmological structure through either the 'seed' effect on small scales or the 'Poisson' effect on large scales. For example, if supermassive PBHs with much less than the critical density seed galaxies, this naturally explains the proportionality between the mass of the central black hole and the galactic mass. On the other hand, if intermediate mass PBHs provide the dark matter, the first bound clouds of 10^6 M⊙ would form through Poisson fluctuations much earlier than usual. In principle, an extended PBH mass spectrum could permit them to fulfill all of these roles - providing the dark matter, the first bound clouds and galaxies. The gravitational wave background from the PBHs would then extend from the LIGO frequency (due to dark matter black holes) to the LISA frequency (due to galactic nuclei black holes).

興味をお持ちの方の聴講を歓迎致します。15:30からお茶とお菓子を用意しております。