### The Baryon Cycle driving Galaxy Evolution

Michele Ginolfi (Sapienza Università di Roma)

Galaxies can be considered as complex ecosystems, whose fate is governed by an intricate network of physical mechanisms involving them and their habitat. Gas replenishment from the intergalactic/circumgalactic medium, star formation and chemical enrichment, gas recycling in the interstellar medium and ejection of processed material through starburst/AGN in the interstellar medium and ejection of processed material through starburst/AGN-driven outflows, are the main processes of the so-called baryon cycle regulating the evolution of galaxies. I will review past and current research on these subjects, from both observational and theoretical points of view, with particular emphasis on what we can learn from the largest existing and upcoming telescopes (e.g., VLT, ALMA, JWST).

### Atmosfere esoplanetarie nell'epoca di ARIEL

Enzo Pascale (Dipartimento di Fisica, Sapienza Università di Roma)

Ogni stella della nostra galassia ha in media un pianeta che le orbita intorno. Più di 3700 esopianeti sono già stati scoperti e molti altri verranno individuati nei prossimi anni. Quello che sappiamo è che il nostro sistema solare non è tipico ed altri sistemi mostrano una varietà di parametri non osservati nel sistema solare. La spektrosopia è il prossimo passo. La missione spaziale ARIEL, selezionata dall’Agenzia Spaziale Europea a marzo, condurrà osservazioni spettroscopiche delle atmosfere di circa 1000 esopianeti consentendo di avere una comprensione di insieme dei meccanismi di formazione ed evoluzione planetaria nella nostra Galassia.

### Tuning the mechanical properties and crumpling temperature of elastic sheets through geometry

David Yllanes

Thermalised membranes without distant self-avoidance are believed to undergo a crumpling transition when the microscopic bending rigidity is comparable to kT. However, most potential physical realisations of such sheets have a bending stiffness well in excess of experimentally achievable temperatures and are therefore unlikely ever to access the crumpling regime. In this talk I propose a mechanism to tune the onset of the crumpling transition by altering the geometry and topology of the sheet, using scalable kirigami principles. These results open a path for an experimental study of thermal crumpling and for the design of mechanical metamaterials with graphene.

### The quest for low frequency gravitational waves

Enrico Barausse (Institute d’Astrophysique de Paris)

I will review the status of the space-based Laser Interferometer Space Antenna (LISA) and its science goals. LISA will detect gravitational waves in the frequency range $10^{-4}$ Hz < f < 1 Hz, a region of the spectrum populated by a large variety of astrophysical sources. Among these, a major role will be played by the mergers of massive black holes, which LISA will detect up to very large redshift $z \sim 10 - 20$. I will focus on the physics of these sources, as well as on how their detection by LISA will shape our understanding of astrophysics, cosmology and fundamental physics.