



**Appunti di Fisica '16  
&  
Dottorato di Ricerca in Fisica**

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**The co-evolution of galaxies and Black Holes:  
An introduction to the Standard Cosmological Model**

**1. Galaxy formation and Active Galactic Nuclei**

17 Febbraio ore 15:00 - Sala Conferenze CNR-IPCF

**2. The co-evolution of galaxies and supermassive Black Holes**

2 Marzo ore 15:00

**3. General Relativity: Gravitational waves and their extragalactic sources**

9 Marzo ore 15:00

<http://sites.google.com/site/AppuntiDiFisicaMessina/>

Since the deep optical observations from Hubble Space Telescope we know that most galaxies in our Universe host a supermassive Black Hole (Hereafter BH) at their centers. This evidence naturally raises many questions about the role which these BHs have had in the (co)-evolution of galaxies and of their stellar populations. We know that the rapid release of electromagnetic and mechanical energy from these BHs is the main mechanism producing Quasi Stellar Objects (QSOs) and Active Galactic Nuclei (AGNs), with their powerful jets of matter and particles propagating at relativistic velocities. These are two forms of "feedback" by which BHs can heavily affect the evolution of galaxies.

In these talks I will review the phenomenological evidence and theoretical modelling of this co-evolution between galaxies and BHs, and how they can explain the sudden dearth of stellar formation which occurred earlier few billion years after the initial singularity and originated the large populations of Elliptical galaxies. I will also show the importance of gravitational waves as an astrophysical tool to study directly supermassive BHs merging and accretion.