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For the students of the M.Sc. in Astronomy and Ph.D. in Astronomy

BARRED GALAXIES

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Barred galaxies have been described as major drivers of secular evolution in disk galaxies. Understanding them is therefore vital for understanding how disks evolve. Moreover the Milky Way is barred and understanding large swathes of data from the Gaia satellite will not be possible without a clear understanding of its bar and the dynamics of bars. This lecture series will introduce students to barred galaxies, their dynamics, observational properties, and evolution, as well as their effects on the supermassive black holes, bulges, disks, and halos. The classes are designed for the M.Sc. students following the course on Astrophysics of Galaxies by Prof. E.M. Corsini, but they are also offered to the other M.Sc. students and to the Ph.D. students.

Timetable and content of the lectures

- **Monday 15/01:** Room A, 2:30-4:30 pm. **Morphology:** Statistics at low and high z . Variations across Hubble type. Secondary structures (rings, lenses, etc.). Bar strength. Models of the light distribution.
- **Tuesday 16/01:** Room A, 2:30-4:30 pm. **Pattern speeds, resonances and closed orbits:** Measurement of pattern speeds. Concept of closed orbits as backbone of bars. Families of orbits in 2D and 3D. The weak and strong bar cases. Resonances. Bar migration.
- **Wednesday 17/01:** Room A, 2:30-4:30 pm. **Bar formation:** The Toomre resonant-cavity mechanism. Inhibiting bars. Formation in interactions. N-body models. Formation of double-barred galaxies. The Louis-Gerhard theorem. Interaction with spirals.
- **Thursday 18/01:** Room A, 2:30-4:30 pm. **Bars, bulges and secular evolution:** The evolution of density profiles. The buckling instability. Kinematic fractionation. The evidence for bars in edge-on boxy/peanut-shaped bulges. Bars and AGN. Bars and dark matter. Bar destruction.
- **Friday 19/01:** Room A, 2:30-4:30 pm. **The Milky Way as a barred galaxy:** Discovery of a bar in the Milky Way. Pattern speed. Bulge properties. Multiple bars? Bars in M31, M33 and the LMC.