The planned astrometric space mission JASMINE will provide the exact positions, distances, and proper motions of the bulge stars. The data brought by JASMINE will certainly reveal the origin and evolution of the Galactic bulge. In fact, the formation process of the bulge is still veiled. The Galactic bulge has a bar, and kinematics of the bulge stars imply a secular formation process of the bulge. The Galactic bulge has a bar, and kinematics of the bulge stars imply a secular formation process of the bulge.

### I. Enigma of bulge formation in the context of galaxy formation

**“Spheroids”: 50-70% of stellar mass in local Universe**

In the hierarchical galaxy formation scenario based on the cold dark matter Universe, the bulges are inevitably formed in the central region of galaxies at a very early stage. Its fossil record is imprinted in stars.

- **Age:** old
- **kinematics:** e.g., $V/\sigma$ small
- **density profile:** $r^{1/4}$ law

Cold dark matter Universe predicts classical bulge but, classical : pseudo $= 1 : 2$ in real Universe, pseudobulges are dominant. How do we make a pseudobulge through secular evolution without making a merger-built classical bulge?

- **Two types of bulges**
  - Classical bulges
  - Pseudobulges

- Likely, a bar is linked to the formation process. Secular evolution, likely, not so old.

### XI. Goals of JASMINE

1. **Acquire precise CMD:** star formation history
2. **$V/\sigma$ gradient:** distribution: the origin of the Galactic bulge

#### International collaboration

- radial velocity, chemical composition are the critical supplementary information
- JMPM needs to collaborate with ongoing projects.
- PIs:... a few hundred stars will be plotted

### IV. Tie up with ongoing bulge survey projects

1. **ARGOS project**
2. **BRAVA project**

#### ARGOS project

- observations starting from 2005
- Metallicity as a function of age
- Interpreting the age-metallicity correlation in the bulge formation process

#### BRAVA project

- observations starting from 2005
- Hydrogen and electron abundance of the Bulge
- Discovery of cylindrical rotation
- Discovery of high-velocity gas: $v_{rot} \approx 200 \text{ km/s}$