1. PHD PROJECT DESCRIPTION (4000 characters max., including the aims and work plan)

Project title: Star-formation histories and dust attenuation of galaxies across cosmic time

1.1. Project goals

To reconstruct representative star-formation histories (SFHs) of galaxies and determine how dust attenuation depends on UV slope, stellar mass and redshift. The project will connect the observed star-forming main sequence and galaxy stellar-mass function with empirical SFHs, while calibrating the IRX-beta and IRX-M* relations using JWST-selected galaxies and far-infrared data.

1.2. Outline

About half of stellar emission is absorbed by dust and reradiated in the infrared, so UV/optical data alone cannot provide a complete picture. The student will combine JWST COSMOS-Web catalogues with Herschel, SCUBA-2 and ALMA data. Stacking will recover average IR luminosities below individual detection limits, and SED modelling will constrain physical quantities. The work will build on the group's main-sequence/GSMF analysis.

1.3. Work plan

Task 1 (months 1-14): derive galaxy growth tracks from the evolving SFR-M* relation and GSMF; reconstruct average SFHs, compare parametric and non-parametric forms, quantify dependence on initial mass and quenching, and test recovery with SED-fitting codes. Task 2 (months 15-28): measure LIR and LUV in bins of beta and redshift; calibrate the evolving IRX-beta relation and assess the role of mass, selection and dust-law assumptions. Task 3 (months 29-42): calibrate IRX-M* as a function of redshift, compare it with IRX-beta and simulations, and deliver public tables, reproducible code, papers and dissertation chapters.

1.4. Literature (max. 10 listed, as a suggestion for a PhD candidate)

- Speagle et al. (2014), ApJS, 214, 15
- Carnall et al. (2019), ApJ, 873, 44
- Leja et al. (2019), ApJ, 876, 3
- Meurer et al. (1999), ApJ, 521, 64
- Koprowski et al. (2018), MNRAS, 479, 4355
- McLure et al. (2018), MNRAS, 476, 3991
- Koprowski et al. (2024), A&A, 691, A164

1.5. Required initial knowledge and skills of the PhD candidate

Master's degree in astronomy, physics or a related discipline; basic knowledge of extragalactic astronomy and galaxy evolution; practical Python and Linux skills; familiarity with statistics and numerical data analysis; ability to read and write scientific English. Experience with SED fitting, astronomical catalogues or FITS data is advantageous but not required.

1.6. Expected development of the PhD candidate's knowledge and skills

Advanced knowledge of galaxy evolution, stellar populations and dust physics; independent analysis of large JWST and FIR data sets; stacking, de-blending, SED fitting, Bayesian inference and uncertainty propagation; reproducible scientific software development; preparation of journal papers, conference presentations and an international doctoral dissertation.