

COMMISSION 1

GALAXY AT THE EPOCH OF REIONIZATION

*GALAXIES
DE LA REIONISATION*

PRESIDENT
VICE-PRESIDENT
SECRETARY
PAST PRESIDENT
ORGANIZING COMMITTEE

Denis. Burgarella
Laura Pentericci
N/A
N/A
Valentina d’Odorico, Akio Inoue,
Roser Pello, Kanak Saha,

COMMISSION J.3 WORKING GROUPS

ANNUAL REPORT 2022-2023

1. Introduction

The commission Galaxies at the Epoch of Reionization (C.J3) commission is a commission under Division J, Galaxies and Cosmology.

We define the epoch of reionization as a transition epoch from a universe filled with relatively cold neutral hydrogen to a universe fully filled with hot ionized gas. The end of the reionization occurred at a redshift $z \sim 6$, that is about a billion years after the Big Bang. The origin of the reionization of the Universe is not clearly identified. This phase transition marks the beginning of the galaxy-dominated era in the Universe. However, we still have not definitively established how reionization occurred. The origin could be found in low-mass galaxies that are broadly distributed, or in massive galaxies that are rare and clustered in high-density regions. While still debated, it seems active galactic nuclei (AGN) seem less favoured as the source of the reionization. In summary, it is still a crucial question for the formation and evolution of galaxies and the universe to address the question: What sources caused reionization?.

Many facilities are used to constrain the characteristics of galaxies at the epoch of reionization. However, in the coming years, the James Webb Space Telescope (JWST) will very likely be a key observatory to study galaxies at the epoch of reionization, and to constrain the origin of the reionization itself.

2. Scientific Meetings

A number of meetings closely related on galaxies at the epoch of reionization have been held in 2022-2023:

- **SAZERAC 21 cm 2022**, 14-17 March 2022 (online), Observations of the 21 cm signal have the potential to provide precision constraints on astrophysics and cosmology from the Dark Ages to the present day ($150 > z > 0$). Organizers : Abhirup Datta

(IIT Indore), Adalie Gorce (McGill University), Suman Majumdar (IIT Indore), Garrelt Mellema (Stockholm University), Raul Monsalve (Berkeley Space Sciences Laboratory), Steven Murray (Arizona State University), Abinash Kumar Shaw (Open University of Israel), Jonathan Pritchard (Imperial College London), Peter Sims (McGill University), Cathryn Trott (Curtin University), Stephen Wilkins (University of Sussex), http://sazerac-conference.org/21cm_2022/index.html#

- **From galaxies to cosmology with deep spectroscopic surveys**, Monday, 4 July 2022 - Friday, 8 July 2022, Marseille, France (in person), Organizers : K. Caputi (University of Groningen), T. Contini (IRAP), M. Dickinson (NOAO), R. Ellis (Caltech), A. Fontana (INAF), Bianca Garilli (INAF), S. Lilly (ETH Zurich), C. Maraston (University of Portsmouth), Y. Mellier (IAP), Roser Pello (LAM), N. Palanque-DeLabrouille (IRFU/CEA), A. Pollo (Jagiellonian University, Krakow), Jason Rhodes (JPL), D. Schaerer (University of Geneva), N. Scoville (Caltech), G. Zamorani (Bologna Observatory), <https://specsurveys2021.sciencesconf.org/>

- **IAU Symposium 373: Resolving the Rise and Fall of Star Formation in Galaxies**, IAU General Assembly XXXI in Busan, Korea, 9-11 2022 (hybrid), Organizers : Tony Wong (U. Illinois, USA), Eva Schinnerer (MPIA, Germany), Guillermo Blanc (U. Chile, Chile), Sara Ellison (U. Victoria, Canada), Robert C. Kennicutt Jr. (U. Arizona, USA), Woong-Tae Kim (Seoul National U., Korea), Johan Knapen (IAC, Spain), Kotaro Kohno (U. Tokyo, Japan), Claudia Lagos (UWA, Australia), Janice C. Lee (IPAC/Caltech, USA), Karin Menendez-Delmestre (UFRJ, Brazil), Yingjie Peng (Peking U., China), Amelie Saintonge (UCL, UK), <https://iausymp373.web.illinois.edu/soc/>

- A number of JWST-related meetings have also been organized during this period, where galaxies at the epoch of reionization are central.

3. Prospects and Recommendations

With JWST, we have clearly in better position to address the questions that are central to this commission about galaxies in the epoch of reionization, and reionization itself. The first JWST data suggested the presence of a relatively large number of galaxies at $z > 10$. However, even though seven galaxies have been spectroscopically confirmed beyond this redshift, none have been at $z > 13.5$. This is in agreement with the pre-JWST predictions that suggested about 1 galaxy at $z > 14 \text{ deg}^{-2}$. Beside this "normal" density of ultra-high redshift galaxies, JWST provides us very high signal-to-noise ratio spectra of galaxies at the epoch of reionization that allow us to quantitatively measure some of their physical parameters like the metallicity. This is maybe the strongest breakthrough.

We will follow the new results coming from JWST. However, beyond JWST, we would like to foster works that make use of the synergy between JWST and the other powerful capabilities in rest-frame optical and rest-frame far-infrared. Of course, this objective is already in the mind of astronomers studying galaxies at the epoch of reionization. How we could amplify this trend is a reflection that we should seriously consider in our commission.

Denis Burgarella
President of the Commission