Extremely Big Eyes on the Early Universe

Report of Contributions

https://indico.ict.inaf.it/e/EEEUniverse

Contribution ID: **3** Type: **Talk**

Observing high-redshft stars through gravitational lensing (Jose M. Diego)

Studying single stars at cosmological distances is possible if the distant star is located near the caustic of a gravitational lens. This was proven possible recently with the observation of a star at redshift 1.49, Icarus, in Kelly et al. (2018) that was being lensed by the combination of a powerful lens (the galaxy clustr MACS1149) and a microlens inside the cluster. This type of alignments are more common than previously thought and observations that reach sufficient depth should reveal more events of even more distant stars. 30-m class telescopes will be able to reach the required depth (m_AB~30) needed to see numerous lensed stars beyond redshift 1. These events can be used not only to study the background stars but also the substructure near the critical curves in the foreground lenses. In particular, we show how this type of observations will constrain the fraction of dark matter in the form of primordial black holes at LIGO masses below the 1% level.

Primary author: Mr DIEGO, Jose M. (IFCA)

Track Classification: Galaxy Stellar Populations and star-formation histories

Contribution ID: **4** Type: **Talk**

FLASH POSTER PRESENTATIONS

Tuesday, September 10, 2019 3:30 PM (18 minutes)

Primary authors: Mr MOHAPATRA, Abhisek (Department of Physics, NIT Rourkela, India); Prof. SRIANAND, R. (IUCAA, India); Ms KHAIRE, Vikram (UCSB, USA); Prof. PRADHAN, A. C (NIT Rourkela)

Track Classification: CGM/ICM/IGM/Chemical Enrichment

Contribution ID: **5** Type: **Talk**

Imaging the high redshift universe with MICADO on the ELT (Richard Davies) (I)

Monday, September 9, 2019 12:08 PM (25 minutes)

MICADO will enable the ELT to perform diffraction limited near infrared observations at first light. The instrument's capabilities focus on imaging, but include also single object spectroscopy. I will describe the project and the instrument, and illustrate its science drivers. I will emphasize what we can expect from MICADO both in terms of directly resolving the structure of galaxies in the early universe, and in inferring the cosmic star formation histories of local galaxies via their relic stellar populations.

Primary author: Dr DAVIES, Richard (MPE)

Track Classification: ELTs overview

Contribution ID: **6** Type: **Talk**

Detecting Population III Stars with HARMONI on the ELT (Kearn Grisdale) (I)

Monday, September 9, 2019 11:40 AM (25 minutes)

Instruments like HARMONI on the ELT will likely be able to observe the first spatially resolved spectra of the very earliest (z~10) galaxies. Contained within these spectra will be details of the very first and as of yet unobserved stars, i.e. Population III stars. Detecting the emission from Pop. III stars would provide significant insight into star formation, galaxy formation and evolution in the early Universe. Using NewHorizon, an AMR-hydrodynamical cosmological simulation, in combination with published SEDs for Pop. III stars and full radiative transfer (i.e. the Yggdrasil Models and CLOUDY) I am able to compute and simulate the flux of the He II 1640 line, a tracer of the presence of Pop. III stars, produced by the simulation.
In this talk I will demonstrate:

- How mock observations of Pop. III stars can be produced.
- That Pop.III stars should be observable in galaxies for redshifts between 10 and 3.
- How such observations can be used to rule out different PopIII models when combined with real observations from the HARMONI on the E-ELT.

Primary author: GRISDALE, Kearn (University of Oxford)

Track Classification: Galaxy Stellar Populations and star-formation histories

Contribution ID: **7** Type: **Talk**

Self-consistent population spectral synthesis with FADO: an exploration of galaxy evolution in the ELTs era (Jean Michel Gomes)

Thursday, September 12, 2019 10:09 AM (18 minutes)

Astronomical observatories with large aperture telescopes, greater or equal to 20 meters in diameter, the so-called extremely large telescopes (ELTs), will provide high-quality data for applying spectral synthesis codes in order to accurately derive the star formation history (SFH) and Chemical Enrichment History (CEH) of galaxies. Therefore, extragalactic astronomy is on the verge of experiencing a leap in our understanding of galaxy formation and evolution.

Despite significant progress over the past decades, all state-of-the-art population synthesis (PS) codes suffer from deficiencies limiting their potential of gaining sharp insights into the SFH and CEH of galaxies, i.e. the neglect of nebular continuum and, the lack of a mechanism to ensure consistency between the best-fitting SFH and the observed nebular characteristics (ONC; Balmer-lines, Balmer/Paschen jumps). These introduce biases in their recovered physical properties (stellar mass M* and sSFR).

FADO (Gomes & Papaderos 2017) is a novel self-consistent PS code employing genetic optimization, publicly available (http://www.spectralsynthesis.org), capable to identify the SFH & CEH that best reproduce the ONC of a galaxy, alleviating degeneracies in the spectral fits.

The current version of FADO (V1.B) uses standard BPT emission-line ratios for the classification of low redshift (z) galaxies. Whereas this permits a reliable distinction between star-forming, Composite, Seyfert and LINERs, it is inapplicable to many high-z galaxies. We present an adaptation of FADO (version V1.C) to classify high-z galaxies employing the "Blue Diagram" (e.g., Lamareille 2010) for which the most prominent blue emission-lines (<~[OIII]5007) are observable while the Halpha and [NII] are inaccessible.

FADO V1.C was applied to synthetic spectra simulating the evolution of galaxies formed at higher-z with different SFHs. FADO can recover the physical and evolutionary properties of galaxies, such as M* and mean age/metallicity, with an accuracy significantly better (~0.2 dex) than purely-stellar codes.

An outline of FADO V1.C and applications to local and higher-z galaxies will be presented with an emphasis on ELTs.

Primary author: GOMES, Jean Michel (Instituto de Astrofísica e Ciências do Espaço)

Track Classification: Galaxy Stellar Populations and star-formation histories

Contribution ID: **8** Type: **Talk**

Galaxy Formation and Reionization (Stuart Wyithe)

Tuesday, September 10, 2019 5:25 PM (20 minutes)

Our knowledge of the high redshift galaxies responsible for reionising the Universe is constantly improving and will take yet another important step forward with future facilities. At the same time, constraints on the 21cm power spectrum from reionization are continually tightening, with a firm measurement from SKA-low likely in the coming years. In order to maximise what we can learn from these two complimentary observations, galaxy formation and reionization must be jointly modeled. In this talk, I will discuss results from the DRAGONS suite of semi-analytic models designed to self-consistently model the connection between galaxy formation reionization. Through monte-carlo analysis we find that the steep faint end slope of the high-redshift galaxy UV luminosity function extends well beyond current observational limits with an escape fraction that increases towards high redshift, indicating that galaxies contributing <50% of the ionising photons available for reionisation have been observed at z<7. I will also demonstrate that the size evolution of high redshift galaxies imposes additional constraints on galaxy formation and how cross-correlating the topology of reionisation using SKA-low with galaxies will allow us to discriminate between different galaxy formation scenarios.

Primary author: WYITHE, Stuart (University of Melbourne)

Track Classification: Synergies

Contribution ID: **9** Type: **Talk**

First Identification of 10-kpc Scale [CII] 158um Halos around Star-Forming Galaxies at z=5-7 (Seiji Fujimoto)

Wednesday, September 11, 2019 10:22 AM (18 minutes)

We report the discovery of 10-kpc scale [CII] 158um halos surrounding star-forming galaxies in the early Universe. We choose deep ALMA data of 18 galaxies each with a star-formation rate of ~ 10-70 Msun with no signature of AGN whose [CII] lines are individually detected at z=5.153-7.142, and conduct stacking of the [CII] lines and dust-continuum in the uv-visibility plane. The radial profiles of the surface brightnesses show a 10-kpc scale [CII] halo at the 9.2sigma level significantly extended more than the HST stellar continuum data by a factor of ~5 on the exponential-profile scale length basis, as well as the dust continuum. We also compare the radial profiles of [CII] and Lya halos universally found in star-forming galaxies at this epoch, and find that the scale lengths agree within the 1sigma level. The existence of the extended [CII] halo is the evidence of outflow remnants in the early galaxies and suggest that the outflows may be dominated by cold-mode outflows, which challenges current galaxy evolution models.

Primary authors: Dr FUJIMOTO, Seiji (The Cosmic Dawn Center); Dr OUCHI, Masami (University of Tokyo); Prof. FERRARA, Andrea (Scuola Normale Superiore); Dr PALLOTTINI, Andrea (Scuola Normale Superiore); Dr IVISON, Rob (European Southern Observatory); Dr BEHRENS, Christoph (Scuola Normale Superiore); Dr GALLERANI, Simona (Scuola Normale Superiore)

Track Classification: Reionization and First Light

Contribution ID: **10** Type: **Talk**

The scientific promise of HIRES, a high resolution spectrograph for the ELT (Alessandro Marconi) (I)

Monday, September 9, 2019 12:34 PM (25 minutes)

I will present the results from the phase A study of ELT-HIRES, an optical-infrared High Resolution Spectrograph for ELT, which has been completed in 2018 by a consortium of 30 institutes from 12 countries forming a team of about 200 scientists and engineers. The top science cases of ELT-HIRES will be the detection of life signatures from exoplanet atmospheres, tests on the stability of Nature' s fundamental couplings, the direct detection of the cosmic acceleration. However, the science requirements of these science cases enable many other groundbreaking science cases. The baseline design, which allows to fulfil the top science cases, consists in a modular fiber-fed cross-dispersed echelle spectrograph with two ultra-stable spectral arms providing a simultaneous spectral range of 0.4-1.8 μm at spectral resolutions of 100,000 or 150,000. The fiber-feeding allows ELT-HIRES to have several, interchangeable observing modes including a SCAO module and a small diffraction-limited IFU.

Primary authors: MARCONI, Alessandro (Dipartimento di Fisica e Astronomia, Università di Firenze); HIRES CONSORTIUM

Track Classification: ELTs overview

Contribution ID: **11** Type: **Talk**

Origin of the first stars, galaxies and massive black holes (Umberto Maio)

Tuesday, September 10, 2019 4:45 PM (18 minutes)

Results from numerical simulations including non-equilibrium chemistry, stellar evolution, metal spreading and raditive transfer will be discussed in order to shed light on the primordial cosmological epochs. Simulation results will be compared against observational data and employed to study the formation of the first galaxies, investigate their impact on high-z dumped Lyalpha gas and GRB hosts, constrain the role of molecules and metals, address the effects of different assumptions for the initial mass function and explore the formation path of early massive black holes.

Primary author: MAIO, Umberto (Leibniz Institute for Astrophysics)

Track Classification: Early Black Hole Formation

Contribution ID: **12** Type: **Talk**

Exploiting galaxy-21cm synergies to shed light on the Epoch of Reionization (Pratika Dayal)

Monday, September 9, 2019 5:05 PM (18 minutes)

Over the next decade a number of facilities, that aim to detect neutral hydrogen in the Epoch of Reionization (EoR) through its 21cm spin-flip transition, will be crucial in shedding light on the propagation of ionized regions. However, establishing the veracity of the 21cm signal and understanding the global sources and topology of reionization will require combining 21cm data with that from the underlying galaxy population observed by next-generation telescopes such as Euclid and the E-ELT. I will start by introducing the reionization process and detail the reasons for which its history and topology remain debated. I will then highlights the crucial and urgent synergies required between 21cm and galaxy experiments to understand the physics of the EoR that remains a crucial frontier in the field of astrophysics and physical cosmology. Finally, I will show how the 21cm signal from cosmic dawn can be used to constrain the (warm) nature of dark matter itself.

Primary author: Dr PRATIKA, Dayal (Kapteyn Institute)

Track Classification: Synergies

Contribution ID: **13** Type: **Talk**

The hosts of early ionised bubbles: unveiling the most luminous Lyman-alpha emitters in the epoch of reionisation (Jorryt Matthee)

Wednesday, September 11, 2019 12:40 PM (18 minutes)

Distant luminous Lyman-alpha emitters are excellent targets for detailed observations of galaxies in the epoch of reionisation . Spatially resolved observations of these galaxies allow us to simultaneously probe the emission from young stars, partially ionised clouds in the interstellar medium and to constrain the properties of surrounding hydrogen gas in the circumgalactic medium. Hence, these observations can provide a glimpse of what the ELTs will be able to do for much fainter objects. In this talk specifically, I will focus on recent results from spectroscopic follow-up studies of luminous galaxies observed only ~500 Myr after the Big Bang with ALMA, HST/WFC3, and MUSE and X-SHOOTER on the VLT. We find that these galaxies likely reside in early ionised bubbles and are complex systems, consisting of multiple well separated and resolved components where traces of metals and outflows are already present.

Primary author: MATTHEE, Jorryt (ETH Zurich)

Track Classification: Reionization and First Light

Contribution ID: **14** Type: **Talk**

Environment from cross-correlations: linking cause to effect in galaxy quenching (Egidius Kukstas)

Thursday, September 12, 2019 12:21 PM (18 minutes)

There is significant evidence suggesting that galaxies evolve differently depending on the environment they live in: dense regions of the universe host primarily red ellipticals, while blue spirals occupy the more under-dense regions. These properties are found to be governed by the star formation activity which is, thus, influenced by environment.
Despite decades of research, little progress has been made in determining which processes are driving this evolution. We hypothesise that the reason for this is that, until recently, it has not been possible to directly measure the local physical conditions around galaxies. Instead, existing studies have focussed on optical proxies for local environment, from galaxy observations alone, and compared these with observed galaxy properties.
However, there has been a revolution in recent years; with large area, precise, and accurate galaxy surveys in addition to CMB and X-ray instruments, it is now possible to directly constrain the local hot gas and dark matter properties. The process can be carried out by employing map-based techniques, previously used exclusively in cosmology on CMB and lensing data. Cross-correlating these direct measures of ICM and halo properties with galaxy properties can effectively constrain the processes of environmental quenching.
In this talk I will outline the methods and present the first detection of a correlation between ICM gas properties and galaxy quenching, together with a preliminary comparison to state-of-the-art hydrodynamical simulations.

Primary author: Mr KUKSTAS, Egidijus (Liverpool John Moores University)

Co-author: Dr MCCARTHY, Ian (Liverpool John Moores University)

Track Classification: Galaxy Assembly

Contribution ID: **15** Type: **Talk**

A deep multi-wavelength imaging and spectroscopic investigation of a reionized bubble at z = 7 (Marco Castellano)

Wednesday, September 11, 2019 9:44 AM (18 minutes)

The detection and characterization of early reionized regions will be a key topic for future Extremely Large Telescopes. In this talk I will present the first confirmation of a reionized overdensity at z~7 in the BDF field, based on a combination of deep HST and VLT multi-band imaging and VLT-FORS2 spectroscopy. The BDF field hosts a factor of ~3-4 overdensity of faint LBGs and three confirmed Ly-alpha emitters within 4 physical Mpc. The two brightest Ly-alpha emitters are at the very same redshift (z=7.008) and at only 90 kpc physical distance from each other. A quantitative assessment of the Ly-alpha fraction shows that the number of detected emitters is much higher than the average found at z~7 and more consistent with the Ly-alpha visibility at z~6. I will discuss current constraints on the physical properties of the bright and faint members and their contribution to the creation of the reionized bubble. I will present plans for a thorough assessment of the nature of this region using future facilities, and prospects for a detailed characterization of other early reionized regions. In particular, I will highlight the need for a careful synergy between JWST, EUCLID and AO-assisted imaging and IR multi-object spectroscopy from ELTs.

Primary author: Dr MARCO, Castellano (INAF - OAR)

Track Classification: Reionization and First Light

Contribution ID: **16** Type: **Talk**

Constraining First Star Formation with 21cm-Cosmology (Anna Schauer)

Monday, September 9, 2019 4:47 PM (18 minutes)

Within standard ΛCDM cosmology, Population III (Pop III) star formation in minihalos of mass $M_{\rm halo} > 5 \times 10^5$ M$_\odot$ provides the first stellar sources of Lymanα (Lyα) photons. The Experiment to Detect the Global Epoch of Reionization Signature (EDGES) has measured a strong absorption signal of the redshifted 21 cm radiation from neutral hydrogen at $z \approx 17$, requiring efficient formation of massive stars before then.

In this talk, I will first review the important role that baryon-dark matter streaming velocities play in the context of Pop III star formation. I will then show our model which investigates whether star formation in minihalos plays a significant role in establishing the early Lyα background required to produce the EDGES absorption feature. We indeed find that Pop III stars are important in providing the necessary Lyα-flux at high redshifts, and derive a best-fitting average Pop III stellar mass of ~ 750M$_\odot$ per minihalo, corresponding to a star formation efficiency of 0.1%. Streaming velocities do play an important role in the calculation, to limit the efficiency of Pop~III star formation in minihalos. Without this effect, the cosmic dawn coupling between 21 cm spin temperature and that of the gas would occur at redshifts higher than what is implied by EDGES.

Primary author: Dr SCHAUER, Anna

Co-authors: Mr BOYUAN, Liu; Prof. BROMM, Volker

Track Classification: Galaxy Stellar Populations and star-formation histories

Contribution ID: **18** Type: **Talk**

Physical properties of dwarf star-forming galaxies at intermediate redshifts (Jesus Gallego)

Thursday, September 12, 2019 9:50 AM (18 minutes)

Dwarfs are the most common galaxies and play a significant role in galaxy evolution. However, they are objects still poorly understood. Although most of these systems present an old stellar population, disagreements remain about the period of their dominant star-formation activity.
Our objective is to investigate the dwarf galaxy population in building and acquiring samples of star-forming systems selected by mass. This selection implies to select from a catalog including a lot of information, including multiband photometry, photometric redshifts and stellar masses.
We use a new approach in the near-infrared. It will shed some light on the early stellar mass assembly of dwarfs up to z=2 (where stellar populations are several Gyr less evolved). GTC/EMIR deep spectroscopy provides Halpha and [NII]6584 emission line fluxes and equivalent widths that will help us to characterise the strength of the current star formation process and gas-phase metallicity. We then combine the emission-line fluxes and equivalent widths with ancillary data to infer the star-formation histories from emission lines and spectral energy distribution fittings. This study will provide information about the stellar mass assembly of the sample and the corresponding redshift of formation for the targets, which are observational constraints to current galaxy evolution models.

Primary authors: Prof. GALLEGO, Jesus (Universidad Complutense de Madrid); GOYA, Collaboration

Track Classification: Galaxy Stellar Populations and star-formation histories

Contribution ID: **19** Type: **Talk**

Stellar metallicities at z > 2.5 from rest-frame UV spectra (Fergus Cullen)

Thursday, September 12, 2019 3:25 PM (18 minutes)

I will present initial results from the VANDELS survey (DR2) quantifying the relationship between stellar mass and stellar metallicity for a sample of ~ 700 star-forming galaxies at 2.5 < z < 5.0. Stellar metallicities were determined for a set of high signal-to-noise ratio composite rest-UV spectra in bins of redshift and stellar mass (spanning the range 8.5 < log(M/Mo) < 10.2). We find evidence for a monotonic increase in metallicity with stellar mass, with values ranging from 7% solar at the lowest stellar masses to ~ 25% solar at the highest stellar masses. We do not find evidence for evolution in metallicity with redshift within our sample, which is consistent with predictions from simulations given the relatively narrow redshift range. However, a comparison to the local stellar mass-metallicity relationship indicates an increase of a factor of ~ 4 in the stellar metallicity between z ~ 3.5 to z=0 across all stellar masses. I will discuss how our results provide further evidence in support of the idea that galaxies at these redshifts are uniformly alpha-enhanced, and how this motivates the development of new stellar population models for future high-redshift studies. Finally, I will discuss how these techniques can be pushed to higher redshift in the ELT-era.

Primary author: Dr CULLEN, Fergus (IfA, University of Edinburgh)

Track Classification: CGM/ICM/IGM/Chemical Enrichment

Contribution ID: **20** Type: **Talk**

Gas flows in distant galaxies: from current facilities to ELT (Roberto Maiolino) (I)

Thursday, September 12, 2019 3:00 PM (25 minutes)

Galaxy formation and evolution is critically regulated by
the flow of gas into and out of galaxies. While theoretical
models and cosmological simulations have extensively investigated
these phenomena and provided detailed predictions,
observations still lag behind due to observational difficulties
in detecting signatures of these processes, especially at
early cosmological epochs, when these mechanisms are thought
to be most relevant.
I will illustrate some progress in this area by reporting
some results obtained by combining an ESO-KMOS Large Programme (KLEVER),
MUSE data and ALMA observations, which provide important direct or
indirect information on gas flows in galaxies and quasar hosts at z>1 out
to z~7.
I will then discuss the limitations of the currently available observations
and the main outstanding open issues. I will therefore illustrate how
the cutting edge instrumentation at the forthcoming ELTs
will enable major progress in this field.

Primary author: Prof. MAIOLINO, Roberto

Track Classification: CGM/ICM/IGM/Chemical Enrichment

Contribution ID: **23** Type: **Talk**

Properties of high redshift passive galaxies: number density and contribution to the cosmic star formation history (Emiliano Merlin)

Tuesday, September 10, 2019 11:44 AM (18 minutes)

We search the five CANDELS fields for passively evolving a.k.a. "red and dead" massive galaxies in the first 2 Gyr after the Big Bang. By means of top-hat star-formation histories, to model an early and abrupt quenching of the activity, we fit the observed photometric data using a demanding probabilistic approach to single out only very reliable passive candidates. Using libraries of models without (with) spectral lines emission, we end up with 102 (42) candidates, including one at $z_{CANDELS} = 6.7$, starting from a total of more than 20,000 $z > 3$ sources in the five fields. This implies a minimal number density of $1.73 \pm 0.17 \times 10^{-5}$ ($7.03 \pm 1.10 \times 10^{-6}$) Mpc^{-3} for $3 < z < 5$. We compare these numbers with those from the outputs of five last generation hydrodynamical cosmological simulations, finding a reasonable agreement at $z < 4$ (provided we pay attention to wisely estimate mass and SFRs in the models), while tension remains at earlier epochs. Finally, we compute the contribution to the global universal Star Formation Rate Density of the high-redshift passive galaxies during their previous phase of activity, finding that they potentially account for $\sim 5 - 10\%$ of the total star formation at $3 < z < 8$, despite being only $\sim 0.5\%$ of the total in number.
The overall picture is that the assembly of the stellar content of galaxies, and consequently the thermal and chemical evolution of the cosmos, are heavily influenced by the extreme but short activity of these kind of sources. The next generations of observational facilities (JWST, ELT, WFIRST, Euclid) will propel a quantum leap forward both in data quality, reducing the photometric uncertainties while increasing the depth of the observation over a wide range of wavelengths, and in statistical reliability of the results, going from the current few tens of thousands to billions of galaxies to analyze; I will present an example of how JWST will be a game changer in the determination of their properties and ubiquity.

Primary author: MERLIN, Emiliano (Istituto Nazionale di Astrofisica (INAF))

Co-authors: FONTANA, Adriano (Istituto Nazionale di Astrofisica (INAF)); Dr SANTINI, Paola; Dr CASTELLANO, Marco; Dr FORTUNI, Flaminia; Dr TORELLI, Marianna; Dr PENTERICCI, Laura; Dr GRAZIAN, Andrea; Dr SCHMIDT, Kasper B.; Dr PILO, Stefano

Track Classification: Galaxy Stellar Populations and star-formation histories

Contribution ID: **24** Type: **Talk**

Illuminating the dark side of cosmic star formation and stellar mass assembly at z > 3 (Margherita Talia)

Tuesday, September 10, 2019 12:02 PM (18 minutes)

One of the key open questions in galaxy evolution is how efficiently galaxies form stars as a function of cosmic time. In order to solve this problem, it is crucial to reconstruct the star formation rate density (SFRD) and its integral (the stellar mass assembly history) to the highest possible redshifts. However, the available information at z>3 is limited and biased towards UV-luminous galaxies. One approach is to search for star-forming galaxies (SFGs) at z>3 missed by optical/NIR surveys because of dust obscuration, and detect them in the FIR/mm. However, this is not trivial because of the limited sensitivity at z>3 and/or the source blending issues of current data. Another possibility is offered by radio surveys with excellent sensitivity and angular resolution. In this project we have used radio data from the VLA-COSMOS survey (Smolcic et al., 2017a) to search for dusty SFGs at z>3. We selected a subsample of 286 galaxies without optical/NIR counterpart in COSMOS2015 photometric catalogue (Laigle et al., 2016). We reconstructed the median Spectral Energy Distribution (SED) of this sample (Talia, Giulietti et al. in prep) performing a stack in each band from the optical to 24um and combining the results with FIR data (Herschel+SCUBA from Jin et al., 2018). The median SED shows no detection in optical bands, while significant emission emerges from NIR to sub-mm. Moreover the SED fitting allow us to provide an estimate of a photometric redshift of ~2.6 and to derive an infrared luminosity (LIR; 8-1000um) of 10^12.2 L/Lsun, consistent with ULIRG's range luminosity. For a subsample of 169 (out of 286) galaxies it was possible to recover a few detections from NIR-to-FIR and to construct the individual SEDs. From the individual SED-fitting we derived a distribution of photometric redshifts that peaks at z ~ 3 with a tail at z > 4 and a mean extinction value A_V = 5 mag. These results suggest the existence of a significant population of obscured high redshift galaxies completely missed in the available NIR surveys, and that our approach based on radio selection is very efficient to find them.

Primary author: Prof. CIMATTI, Andrea (University of Bologna - Department of Physics and Astronomy)

Track Classification: Galaxy Assembly

Contribution ID: **26** Type: **Talk**

Finding the First Quasars with E-ELT and Euclid (Daniel Whalen)

Friday, September 13, 2019 10:27 AM (18 minutes)

Although more than 160 quasars have now been discovered at z > 6, little is known of their origins or early evolution for certain because observations to date have been limited to z = 7.5. This picture will soon change with the advent of the E-ELT and TMT, whose high sensitivities could allow them to detect these rare black holes at much earlier times. I will present synthetic NIR AB magnitudes at z = 6 - 20 for every stage of primordial quasar evolution: the birth of a supermassive Pop III star (SMS), its collapse to a direct-collapse black hole (DCBH), and its subsequent growth in cold accretion flows to ~ 10^9 solar masses by z ~ 7. We find that THE E-ELT could detect a SMS and DCBH out to z ~ 15 and capture these quasars at later stages of evolution down to z ~ 7. In particular, there is an excellent opportunity for synergies in which quasar candidates could be identified by wide-field surveys by Euclid or WFIRST and followed up in spectroscopic detail by E-ELT.

Primary author: WHALEN, Daniel

Track Classification: Synergies

Contribution ID: **27** Type: **Talk**

Optically dark ALMA sources shed light on the formation of a large-scale structure at z~3.5 (Luwenjia Zhou)

Thursday, September 12, 2019 12:03 PM (18 minutes)

We study the clustering properties of a sub-sample of the ALMA sources detected in GOODS-South using the GOODS-ALMA 1.1mm continuum survey (10'x6.7' area in GOODS-South). Out of a sample of five ALMA detections that are optically dark down to H=29AB, we find that four are consistent with being associated with an over-density of galaxies at z~3.5. After tracing the 10th neighbor surface density of galaxies in a redshift slice centered on z~3.5, we find that the most massive one, AGS24, happens to fall in the very center of the peak of the galaxy surface density suggesting that this peak is possibly in the process of virializing and that this galaxy may be the candidate progenitor of the future BcG of this candidate proto-cluster.

Primary authors: Ms ZHOU, Luwenjia (CEA-Sacaly, France); Dr ELBAZ, David (CEA-Saclay)

Track Classification: Galaxy Assembly

Contribution ID: **29** Type: **Talk**

Mapping uncharted territories: AGN feedback at low luminosities and high-z with the ELTs, JWST and SKA. (Vincenzo Mainieri)

Theoretical models of AGN feedback predict that AGN-driven, galaxy wide ouflows are a fundamental process affecting the bulk of the baryons in the universe. Hundreds of hours of observations from the ground are being used to characterize such outflows and their impact on the host galaxies using e.g. NIR IFU on 8-10m telescopes to trace the ionized gas or the molecular phase with ALMA. Nevertheless, ground-based IFU observations are limited to wavelenghts below ~2.4 micron, which implies being able to trace at the same time ionized gas outflows with [OIII] and star-formation with Halpha only up to z~2.3. At the same time the current collecting area of ground based telescopes limit the ability to reach the S/N needed to study such outflows in low luminosity AGN and to trace the outskirt of the galaxies. Both limitations will be supersided in the future. The IFU mode on NIRSpec will be able to move these studies to significantly earlier cosmic epochs, up to z~6. While IFU on the new ELTs, tanks to the large collecting area of the primary and the assistence of AO to reach the diffraction limit, will allow to trace these winds down to very low luminosities and trace the impact that they may have in the turbolent ISM of high-z galaxies.

I will review our current understanding of this possible important phenomena for galaxy evolution and outline the instruments and surveys needed with JWST, the ELTs and SKA to move forward.

Primary author: MAINIERI, Vincenzo (ESO)

Track Classification: Feedback Processes in Galaxies

Contribution ID: **31** Type: **Talk**

Euclid Survey(s): a goldmine for large telescopes (Roberto Scaramella) (I)

Monday, September 9, 2019 4:22 PM (25 minutes)

We will review Euclid satellite, in particular details of the planned wide and deep surveys. The wealth of expected data is enormous and it will constitute a fantastic database for observations on large telescopes.

Primary authors: Prof. SCARAMELLA , Roberto (INAF-Rome Obs.); ON BEHALF OF EUCLID CONSORTIUM

Track Classification: Synergies

Contribution ID: **32** Type: **Talk**

Properties of dust-obscured Spitzer-selected sources at z > 6 (Smaran Deshmukh)

Tuesday, September 10, 2019 10:30 AM (18 minutes)

We investigate the properties of >130 Spitzer-selected galaxies at z > 6. We use the deepest Spitzer imaging in the COSMOS field from the SMUVS survey to constrain the stellar mass and dust-obscuration of these objects. We particularly study the number density of dusty sources at different high redshifts, in order to track their evolution after reionisation. We find that the number density of these objects drops sharply with increasing redshift. We compare our results with existing theoretical models and discuss their implications.

Primary authors: DESHMUKH, Smaran (Kapteyn Astronomical Institute); Prof. CAPUTI, Karina (Kapteyn Astronomical Institute)

Track Classification: Galaxy Assembly

Contribution ID: **33** Type: **Talk**

Bridging Simulations and Observations in the Era of Extremely Big Telescopes (Raymond Simons)

Monday, September 9, 2019 3:31 PM (18 minutes)

The last decade brought significant advances in the physical realism of hydrodynamical galaxy formation simulations. It is now critical to conduct meaningful comparisons of these simulations with observations — to test the physical models underpinning the simulations and to help interpret the observations. I will show how we are using synthetic observations of simulations to interpret current observations of the kinematic and chemical evolution of galaxies at high redshift and to make predictions for future 20-40m class facilities.

Primary author: SIMONS, Raymond (Space Telescope Science Institute)

Track Classification: Galaxy Assembly

Contribution ID: **34** Type: **Talk**

Dust production scenarios in galaxies at z ~ 6–8.3 (Aleksandra Leśniewska)

Thursday, September 12, 2019 5:20 PM (18 minutes)

Dust production is a very important issue in galaxy evolution. Unfortunately, we are still unable to determine its formation mechanism. I will present the investigation of dust production in nine galaxies at redshift z > 6, for which dust emission has been detected. In recent years, more accurate measurements were made using the most powerful instruments, eg ALMA, which contributed to better estimates of luminosities and sizes, and thus to determine the masses of gas, dust and stars in the studied galaxies. We conclude that asymptotic giant branch (AGB) stars did not contribute to the dust formation significantly in these Early Universe galaxies, and that supernovae are unlikely to produce the bulk of the dust mass. I will discuss how the advent of future large telescopes will contribute to this topic.

Primary author: Ms LEŚNIEWSKA, Aleksandra (Adam Mickiewicz University in Poznań)

Co-author: Dr MICHAŁOWSKI, Michał (Adam Mickiewicz University in Poznań)

Track Classification: Gas and dust in galaxies

Contribution ID: **35** Type: **Talk**

Reverberation Mapping and spatial structure of the quasars (Liudmyla Berdina)

Friday, September 13, 2019 9:50 AM (18 minutes)

Quasars are known to be variable objects, which change their brightness in a wide range of time scales –from several hours to several years. In gravitational lens systems, we have an opportunity to observe the quasars intrinsic brightness variations repeated in all macroimages and shifted in time. One of the importance applications in astrophysics of measuring these time shifts is the study of matter distribution at different spatial scales in the Universe. We propose new method for processed the astronomical observations data. This method allows to analyse a light curves of quasars and obtain the new more accurate estimates of the time delays. Our method was tested on an example measuring the time delays in gravitationally lensed quasars Q2237+0305 end obtained results was consistent with the most recent theoretic predictions. Also, our method allows measuring the time delays between the brightness fluctuations in different parts of the spectrum. This approach, called reverberation mapping method, allows to obtain direct estimates of distances between the quasar regions responsible for radiation in different spectral bands and investigate their spatial structure with a very high resolution. The method for analyze of observational data is important because despite multilateral studies of quasars and active galactic nuclei, their spatial structure, spectral features, and the mechanism of variability are still not entirely clear. High expectations are associated with observational projects involving simultaneous observations of changes in the brightness of quasars and AGNs in several spectral ranges.

Primary authors: Dr BERDINA, Liudmyla (Institute of Radio Astronomy NAS of Ukraine); Dr TSVETKOVA , Victoria (Institute of Radio Astronomy NAS of Ukraine)

Track Classification: Black Hole/Galaxy Co-Evolution

Contribution ID: **36** Type: **Talk**

[CII]-properties and Star Formation-driven Outflows in high-z Galaxies (MIchele Ginolfi)

Friday, September 13, 2019 10:08 AM (18 minutes)

ALPINE is an ALMA large program designed to study gas and dust properties of a representative sample of more than one hundred main sequence star-forming galaxies with spectroscopic redshifts between 4 < z < 6, with SFR > ~10 M_Sun/yr and stellar mass ~9 < log(Mstar) < ~11.

I will present some results of the survey, focusing on:
- properties of the observed interstellar-medium (including morphology and kinematics) and the connection of [CII] with other physical quantities, e.g., the well known [CII]-SFR relation;
- major results obtained from the stacking analysis of [CII] spectra / data-cubes, providing new key insights on (i) star formation-driven outflows and (ii) gas recycling in the circumgalactic medium, precious for our understanding of the baryon cycling physics that drive the evolution of high-z galaxies.

Primary author: Dr GINOLFI, Michele (Observatory of Geneva)

Track Classification: Gas and dust in galaxies

Contribution ID: **38** Type: **Talk**

Metallicity gradients in quiescent galaxies at z~2 (Marcella Longhetti)

Thursday, September 12, 2019 5:40 PM (18 minutes)

The advent of the E-ELT telescope in the next decade, combined with the new generation instruments, will provide astronomers with the possibility to reach a spatial resolution higher than ever before (16 times the actual HST resolution), combined with a collecting area larger than 20 times the largest actual telescopes. This new facility will then offer the possibility to study the stellar content OF galaxies and IN galaxies at z~2-3, that is in a range of redshift where a large part of their evolution is expected to take place. Here we present a pilot study of the analysis of the metallicity gradient in an early type galaxy at z ~ 2, based on the slitless low resolution WFC3@HST spectra. The target galaxy is one of the 15 quiescent galaxies confirmed members of the z=1.8 JKCS 041 (Andreon et al. 2009). Preliminary results on its stellar content will be presented. The presented analysis is a clear scientific case that would benefit of large improvement from the next coming E-ELT facilities.

Primary authors: Dr LONGHETTI, Marcella (INAF - Osservatorio Astronomico di Brera); ANDREON, Stefano (Istituto Nazionale di Astrofisica (INAF)); Mr DITRANI, Fabio (Università Bicocca - Milano)

Track Classification: CGM/ICM/IGM/Chemical Enrichment

Contribution ID: **40** Type: **Talk**

Probing Cosmic Dawn : determining the age of the most distant galaxies (Nicolas Laporte)

Wednesday, September 11, 2019 12:58 PM (18 minutes)

Determining the period when the first galaxies emerged from a dark intergalactic medium represents a fundamental milestone in assembling a coherent picture of cosmic history. But the so-called 'Cosmic Dawn'period is not accessible yet directly by current ground-based and space telescopes. But it can be constrained following two different methods : simulations of the first population of galaxies or by measuring the age of the most distant galaxies. For the latter, a multi-wavelength approach combining photometric and spectroscopic data from the NIR to sub-mm is crucial. This technique allows to estimate the age of very high-redshift galaxies from either the shape of the 4000A break or the amount of dust formed. Our group is conducting deep spectroscopic surveys using X-Shooter/VLT and MOSFIRE/Keck combined with deep ALMA observations to probe the nature and properties (including age, nature, stellar mass, and SFR) of z>7 HST selected galaxies. During this talk I will present several results from these campaigns and discuss how future extremely large ground-based telescopes will help to probe Cosmic Dawn.

Primary author: LAPORTE, Nicolas (University College London)

Track Classification: Reionization and First Light

Contribution ID: **41** Type: **Talk**

MAORY for ELT: an overview (Paolo Ciliegi)

Monday, September 9, 2019 3:13 PM (18 minutes)

The MAORY (Multi-conjugate Adaptive Optics RelaY) is a first light instrument for the European Extremely Large Telescope (ELT). It is the adaptive optics module that feeds MICADO and a still to be defined large Field of View instrument. We give an overview of the status, describing the instrument configurations. We also focus on strategy for the performance characterization in the framework of the preliminary design review preparation. As an example, we present the steps we follow for the numerical evaluation of the ability to resolve distant high-z galaxies given our best knowledge of both the adaptive optics (MAORY) and the near-infrared camera (MICADO).

Primary authors: ARCIDIACONO, Carmelo (Istituto Nazionale di Astrofisica (INAF)); PORTALURI, Elisa (Istituto Nazionale di Astrofisica (INAF)); Dr VANZELLA, Eros (INAF); GULLIEUSZIK, Marco (INAF - OAPd); CILIEGI, Paolo (Istituto Nazionale di Astrofisica (INAF)); SARACCO, Paolo (INAF-OABrera)

Track Classification: ELTs overview

Contribution ID: **42** Type: **Talk**

Unveiling the history of the Universe's reionisation (Jose Miguel Rodriguez)

Wednesday, September 11, 2019 10:03 AM (18 minutes)

Reionisation was a process that lasted for most of the early history of the Universe and up to a redshift of 6. We propose to follow that history from redshift 15 to redshift 6. For that we should need a set of narrow band filters, spanning Ly_alpha from z~6 to z~14.
We will perform imaging through those narrow band filters searching for Ly_alpha emitters at different redshifts. We are aware that LAEs will not be visible unless they lay within large ionised bubbles. As such these bubbles will likely consist of groups of LAEs. We will explore the Subaru Deep Field, which we know there are several over-densities and what is more important what looks like a filament of dark matter. These filaments are supposed to be more persistence in redshift than mere over-densities. We will use models for determining the number of ionising photons required at each redshift. We will then compare the required number of ionising photons with the observed number of ionised photons determined from the LAEs Ly_alpha luminosity. The combination of the large collecting area, plus the use of AO will make the ELT very competitive for this task. The outcome will be a determination of whether a double reionisation is required as well as a follow up of the history of the Universe's reionisation.

Primary authors: RODRIGUEZ ESPINOSA, Jose Miguel (Instituto de Astrofisica de Canarias); Prof. MUÑOZ TUÑON, Casiana (Instituto de Astrofísica de Canarias); Dr MAS-HESSE, J. Miguel (Centro de Astrobiología, CSIC-INTA)

Track Classification: Reionization and First Light

Contribution ID: **43** Type: **Talk**

Lyman alpha emitters - Groups at z 6 using NFIRAOS with the TMT (Casiana Munoz)

Lyman alpha emitters can be detected from the ground using narrowband filters images. With the 10 m GTC telescope, we sampled Goods North and detected a good number of sources from z 3 to more than 6. Some of them are in groups covering an area with projected sizes below 0.5”x0.5 “. The typical number of the galaxy group members are below 10. To get spectroscopy of the individual sources with the GTC, more than 30 hour integration time would be needed, as they have magnitudes of about 24.5 - 25 AB. With the TMT using NFIRAOS the properties of the galaxies in these clusters could be obtained using a reasonable exposure time. Besides, only with this big telescope and its high spatial resolution by using AO in the NIR we will be able not only to firmly establish the group members but also to study the mass and metallicty distribution of the galaxies in groups at z up to 6. Notice that the number of LAEs with known metallicity is fairly scarce.

Primary authors: MUÑOZ-TUÑON, Casiana (Instituto de Astrofísica de Canarias); RODRIGUEZ ESPINOSA, Jose Miguel (Instituto de Astrofisica de Canarias); Dr PABLO, Arrabal Haro (Instituto de Astrofisica de Canarias)

Track Classification: Reionization and First Light

Contribution ID: **44** Type: **Talk**

Exploring the sources of the reionization behind lensing clusters with MUSE (Geoffroy de la Vieuville)

Wednesday, September 11, 2019 10:40 AM (18 minutes)

In our current understanding of the reionization era, the sources responsible for the transition of the universe from a neutral Hydrogen state to an ionized state are likely faint, low mass, star-forming galaxies. One way to study this type of population is to determine the Luminosity Function (LF) of galaxies selected from their Ly-a emission. However, the current studies and their conclusions are in general limited by the lower luminosity that can be reached by the surveys.

In an attempt to reach lower luminosity regime, we are working in lensing clusters with deep VLT/MUSE observations. MUSE is a large field of view integral field unit ideal to work on the galaxy luminosity function as it allows a complete and blind selection of Lyman-a Emitters (LAEs) without any photometric preselection. In addition, MUSE provides a continuous redshift range of 2.9 < z < 6.7 for LAEs that overlaps with the end of the reionization era, making MUSE well suited to study and provide constraints on the sources of reionization.

The combined used of large IFU data cubes and lensing fields makes this analysis computationally challenging. To get around this difficulty, we have developed new methods to account for the contribution of each individual LAE, including the effective-volume and completeness determinations. The volume computation is based on the simulation of the detection process of individual LAEs in the source plane reconstruction of MUSE cubes to account for both the lensing effects and the individual spatial and spectral profiles of LAEs.
To the cost of a significant increase in complexity and a lower volume of universe explored, both due to the lensing effect, we build the LAE LF using a Monte-Carlo process to account for all possible sources of uncertainties, for a population of LAEs with $39.5 \leq \log L \leq 43$ selected across multiple deep MUSE observations.
The resulting LFs provide an unprecedented level of constraints on their faint end shape down to $\log L \sim 40.5$.
The analysis of the LFs revealed that the LAE population has roughly a similar level of contribution as the UV selected population (LBG) to the total cosmic ionizing emissivity at z~6. And depending on the relative intersection of the two population, their union may produce enough ionizing flux to keep the universe reionized at z~6.
These results were obtained on a first sample of four lensing clusters as part of a large program conducted in the framework of the MUSE GTO. During the presentation, I will also discuss the results derived with an enlarged sample including up to eight lensing clusters, therefore improving the statistics and significance of the faintest population of highly magnified LAEs

Primary authors: Mr DE LA VIEUVILLE, Geoffroy (IRAP); PELLO, Roser (IRAP); MAHLER, Guillaume (University of Michigan); RICHARD, Johan (CRAL); MUSE GTO CONSORTIUM

Track Classification: Reionization and First Light

Contribution ID: **45** Type: **Talk**

Extended galaxies in deep extragalactic fields are not an annoyance but a potential treasure trove (Fernando Buitrago)

Friday, September 13, 2019 12:20 PM (18 minutes)

Future JWST or any giant telescope imaging, intended to investigate the high-z Universe, are "contaminated" by a number of extended galaxies. They are either massive and/or low-z galaxies. Similarly, synoptic surveys like Euclid or LSST will commonly find such objects. We started their analysis with the study of the six most massive (>5x10^10 M_Sun) galaxies at z < 1 in the Hubble Ultra Deep Field. The outer (10 < R/Kpc < 50) parts of these early-type galaxies host 5-20% of their stellar mass, at variance with what happens for same-mass late types (<5%). This is key to explain the inside-out growth of massive galaxies, being these outer envelopes progressively created by the continuous merging with surrounding satellites, and therefore being in their own right stellar haloes detected in our sample at a median redshift z = 0.65! We are extending our analysis to similar galaxies in all HST CANDELS fields and I will show how to deal with these large galaxies in order to retrieve accurate masses and structural parameters. Additionally, only a good characterization of their light, i.e. an optimized data reduction and an excellent PSF characterization, could unveil the properties of both the very low surface brightness galaxy outskirts and their minor galaxy neighbours. Finally, our experience enables us to explore extreme objects such as IC1101, the largest galaxy ever detected, for which I will provide updated sizes, surface brightness profiles and for the first time a stellar mass based on HST and dedicated MUSE data.

Primary author: BUITRAGO, Fernando (Institute for Astrophysics and Space Sciences / University of Lisbon)

Track Classification: Black Hole/Galaxy Co-Evolution

Contribution ID: **46** Type: **Talk**

Gamma-ray bursts as tools to probe the early Universe (Susanna Vergani) (I)

Friday, September 13, 2019 11:54 AM (25 minutes)

TBD

Primary author: VERGANI, Susanna (CNRS - Paris Observatory)

Track Classification: Reionization and First Light

Contribution ID: **47** Type: **Talk**

Synthetic nebular emission lines of simulated galaxies in the early Universe(Michaela Hirschmann)

Thursday, September 12, 2019 10:59 AM (18 minutes)

We present a detailed analysis of synthetic optical and UV emission lines of simulated galaxies out to the epoch of re-ionisation. The theoretical strong emission lines are derived from self-consistently coupling "new-generation" spectral models accounting for nebular emission from both young stars and AGN to new sets of high-resolved cosmological hydrodynamic zoom-in simulations of young galaxies as well as to the IllustrisTNG simulation. Investigating the evolution of optical line-ratios in the BPT diagrams, we find that the simulations can successfully reproduce the observed trend that for a given [NII]/Ha ratio, the [OIII]/Hb ratio is increasing towards high redshifts as a consequence of increased SFRs in young galaxies. Standard selection criteria in the classical BPT diagrams can appropriately differentiate simulated star-forming galaxies, galaxies dominated by AGN and composite galaxies at low redshifts, but they fail to distinguish the main ionising source(s) in metal-poor galaxies, which dominate in the early Universe. To robustly classify the ionising radiation of such metal-poor galaxies, we propose 11 novel diagnostic diagrams based on equivalent widths and luminosity ratios of UV lines. We additionally highlight the multifaceted imprint of AGN feedback in projected 2D nebular emission line maps of massive high-redshift galaxies, such as (i) central Ha deficiencies, (ii) reduced extent of Ha emission, and (iii) flattened [NII]/Ha gradients of high-redshift galaxies. Our novel interface between simulations and observations is potentially important for the interpretation of high-quality spectra of very distant galaxies to be gathered by next-generation telescopes, such as the James Webb Space Telescope.

Primary author: HIRSCHMANN, Michaela (DARK / University of Copenhagen)

Track Classification: Feedback Processes in Galaxies

Contribution ID: **48** Type: **Talk**

Reaching the earliest star formation epochs in nearby dwarf galaxies with ELTs. (Francesca Annibali)

Tuesday, September 10, 2019 12:21 PM (18 minutes)

In the Lambda CDM scenario, the smallest dark matter haloes are the first to collapse, and therefore we expect dwarf galaxies to be the sites of the earliest star formation activity in the Universe. Resolved stellar population studies of nearby dwarf galaxies are extremely valuable for probing the early Universe, since they allow us to reconstruct the dwarfs' star formation histories with great details back to the most ancient lookback times. However, current instrumentation permit to probe the earliest star formation epochs in a limited number of systems, typically within ~1 Mpc distance. This unfortunately excludes the most relevant to cosmology, i.e. the most metal-poor and the most active ones. I will discuss how the combination of imaging and spectroscopic facilities mounted on ELTs will provide real progress in this field, allowing us to reconstruct the star formation and the chemical enrichment histories in a large number of nearby dwarf galaxies outside the Local Group back to the most ancient epochs.

Primary author: ANNIBALI, Francesca (Istituto Nazionale di Astrofisica (INAF))

Track Classification: Galaxy Stellar Populations and star-formation histories

Contribution ID: **49** Type: **Talk**

Dust, gas, and star formation in galaxies at z~2 (Irene Shivaei)

Thursday, September 12, 2019 3:45 PM (18 minutes)

The interstellar medium (ISM) of galaxies is composed of multiple components (molecular, neutral, ionized gas, and dust grains), which are related to each other through star formation —some are fuel for star formation (molecular gas) and some are the products of it (ionized gas, dust). Studying these different components simultaneously is crucial to fully understand the physics of star formation and its evolution throughout cosmic time. Such studies require multi-wavelength spectroscopic and photometric datasets out to high redshifts, which become accessible by combining the power of current and future facilities such as ALMA, JWST and ELTs. I will talk about the main goals of JWST MIRI and NIRCam extragalactic GTO programs, and discuss the synergies between JWST, ALMA, and ELTs to study the gas, dust, and star formation at the peak epoch of cosmic star formation activity, z~1-3. Using JWST/NIRCAM and MIRI we will be able to trace the bulk of stellar mass and hot dust at z~1-3 for large samples of galaxies down to low luminosities, owing to the significantly higher sensitivity of the JWST instruments while retaining spatial resolution comparable to the most powerful current facilities. On the other hand, ALMA gives us the unique opportunity to trace the dust and cool gas content of individual unlensed and typical L* galaxies at z>1 in an efficient way. The optical and near-IR instruments on 10-40-m class telescopes will add important pieces of information to this picture by revealing the stellar and ionized gas properties of faint galaxies at intermediate and high redshifts. The synergies among all these facilities will give us a nearly complete multi-wavelength picture of the evolution of galaxies over a large dynamical range during the peak epoch of cosmic star formation activity.

Primary author: SHIVAEI, Irene (University of Arizona)

Track Classification: Gas and dust in galaxies

Contribution ID: **50** Type: **Talk**

The effects of the ICM on gas, dust and star formation histories: lessons learned from integral-field spectroscopy at low redshift (Benedetta Vulcani) (I)

Thursday, September 12, 2019 4:50 PM (25 minutes)

GAs Stripping Phenomena in galaxies (GASP) is a program aimed at studying gas removal processes in nearby galaxies in different environments, using observations at different wavelengths (X, UV, optical, sub-mm, radio). The core of the program is an integral-field spectroscopic survey with MUSE at the VLT, that allows to study the spatially resolved properties of galaxies.
I will present some breakthrough results based on the GASP survey on the effects of the ICM on gas dust and star formation histories. I will focus both on specific galaxies undergoing strong gas stripping and on some general trends that help us to understand
galaxy quenching and evolution in general.
I will also focus on galaxies in low density environments, showing the multitude of mechanisms that can affect the gas distribution.

Primary authors: Dr POGGIANTI, Bianca; Dr THE GASP TEAM

Track Classification: CGM/ICM/IGM/Chemical Enrichment

Contribution ID: **51** Type: **Talk**

Insights into the high redshift Universe from cosmic noon studies of CIII] and CIV (Andra Stroe)

Tuesday, September 10, 2019 3:10 PM (18 minutes)

While traditionally associated with AGN, the properties of the rest-frame UV CIII] and CIV emission lines are still uncertain as large, unbiased samples of sources are scarce. Recently, CIII] and CIV emission lines have been observed in galaxies in the early Universe ($z > 5$) and have been proposed as the prime way of measuring their redshift and studying their stellar populations. I will present results from the first blind, statistical CIII] and CIV survey at the cosmic noon. By using a multiwavelength approach, we find that CIII] emitters at $z \sim 1.05$ trace a general population of star-forming galaxies, with an UV beta slope of ~ -0.8, a variety of optical morphologies, including isolated and interacting galaxies, and low black hole accretion rates, indicating very low AGN activity. Our CIV emitters at $z \sim 1.5$ are consistent with young, blue quasars ($\beta\ -1.9$) with point-like optical morphologies, bright X-ray counterparts and large black hole accertion rates. We also find some surprising CIII] and CIV emitters with extreme rest-frame equivalent widths, as large as $50 - 100$ Angstrom. We predict that the CIII] and CIV lines can only be truly competitive in confirming high redshift candidates in the JWST era when the hosts are intrinsically bright and the effective Lyα escape fraction is below 1 per cent.

Primary authors: STROE, Andra (Center for Astrophysics | Harvard & Smithsonian); SOBRAL, David (Lancaster University); MATTHEE, Jorryt (ETH Zurich); CALHAU, Joao (Lancaster University)

Track Classification: Gas and dust in galaxies

Contribution ID: **52** Type: **Talk**

Determining the Stellar Ages of Galaxies in the Reionisation Era (Guido Roberts-Borsani)

Wednesday, September 11, 2019 12:20 PM (18 minutes)

The enterprise of finding, confirming and characterising z>7 galaxies in the era of Cosmic Reionisation has developed rapidly in recent years, due to the combined power of HST, Spitzer and ground based-telescopes. An important development has been the discovery and study of luminous 7<z<9 galaxies with a red [3.6]-[4.5] micron colour whose prominent Lyman-alpha emission might indicate they lie in accelerated ionised bubbles. A key untested assumption, however, is that the IRAC [4.5] micron band in these sources is boosted by strong [O III] emission indicative of young stellar populations. However, recent observations of a galaxy at z=9.1 reveal a similar red IRAC colour which can, at such a high redshift, only arise from a strong Balmer break, indicative of an evolved stellar population. This discovery raises the question as to whether the IRAC colours at lower redshift may, in part, be due to evolved stars. To address this we use detailed SED modelling with strong spectroscopic priors of the ISM (e.g., [OIII] 88 micron line strengths, dust masses, non-thermal emission) from ALMA observations, with the aim of determining the primary driver of the early ionised bubbles. Ultimately this will enable us to provide new constraints on the timing of Cosmic Dawn prior to the arrival of the ELT and JWST.

Primary author: ROBERTS-BORSANI, Guido (University College London)

Co-authors: Prof. ELLIS, Richard (University College London); LAPORTE, Nicolas (University College London)

Track Classification: Reionization and First Light

Contribution ID: **53** Type: **Talk**

Latest Results from the MOSDEF Survey: Case for Multi-object Infrared Spectrograph on ELT" (Bahram Mobasher)

Tuesday, September 10, 2019 9:50 AM (18 minutes)

We have now completed the MOSFIRE Deep Evolution Field (MOSDEF) Survey of
1500 galaxies in CANDELS fields at cosmic "high noon"(i.e., 1.4< z < 3.8). A total of 46 observing nights on Keck/MOSFIRE were allocated to this program to obtain near-infrared spectroscopy of these galaxies (selected in H-band). Using MOSDEF, we have studied rest-frame optical diagnostic lines and their relation with the physical parameters
in galaxies. In this talk I will review the latest scientific results from the MOSDEF, including Stellar Mass- SFR- Metallicity relation at high redshift, evolution of the BPT
diagram, dynamics of galaxies and their relation with the physical parameters and the evolution of the Equivalent Widths in galaxies with redshift. Using the MOSDEF results
I will build a scientific case for the need for an infrared multi-object spectrograph on the Extremely Large Telescopes.

Primary authors: Mrs JAFARIYAZANI, Marziye (University of California, Riverside); Prof. MOBASHER, Bahram (University of California, Riverside)

Track Classification: Galaxy Assembly

Contribution ID: **54** Type: **Talk**

Using gravitational telescopes to probe the faint and distant Universe (Gabriel Bartosch Caminha)

Wednesday, September 11, 2019 9:25 AM (18 minutes)

Strong gravitational lensing by galaxy clusters can magnify the light of background sources by factors of tens or more, pushing the current observational limits towards the faint and distant Universe.
Thanks to coordinated programs using deep HST imaging (from large programmes such as CLASH, Hubble Frontier Fields and RELICS) and spectroscopy from MUSE in cluster fields, we can now probe intrinsically faint, high redshift (out to z ~ 6.6) sources in detail with potential impact on cosmic reionization.
It is worth noting that some of these clusters have been selected to be observed with JWST under different GTO and ERS programmes (IDs 1176, 1199, 1208, and 1324).
In this talk I will show the current deep MUSE data from our ESO/VLT programmes on a sample of clusters and the characterization in the rest-frame UV of intrinsically faint Lyman-alpha emitters (with Ly-alpha luminosities down to ~10^{41} erg/s) and Lyman-break galaxies at high redshifts, that can be observed only thanks to the gravitational lensing effect.
Special attention will be given to the observations of the HFF cluster MACSJ0416, which has the deepest MUSE observations for a cluster lensing up to date, overcoming the depth of the most expensive observations on blank fields, such as the Hubble Ultra-Deep Field.
This will give us a glimpse and pave the way for the science that we will be able to explore with the extremely large telescopes and JWST in the near future.

Primary author: Dr CAMINHA, Gabriel Bartosch (Groningen)

Track Classification: Reionization and First Light

Contribution ID: **55** Type: **Talk**

First galaxies, Epoch of Reionization and galaxies evolution in the ELT Era: which science with MOSAIC (lLidia Tasca)

Monday, September 9, 2019 2:55 PM (18 minutes)

The MOSAIC instrument, the only multi-objects spectrograph foreseen after first light on the ELT, will allow for an incredible leap forward in our understanding of how present-day galaxies formed and evolved.
While JWST will discover over a thousand sources in the patrol field of MOSAIC, the latter will carry out their spectroscopic follow up thanks to the high spectroscopic sensitivity, the large field of view and the high-multiplex.
MOSAIC will allow to detect and to study the very first galaxies. Their light will bring information on the reionisation epoch.
Despite the great progress made in the last decade to constrain cosmic reionisation and to assemble large samples of high-redshift galaxies, we desperately need to spectroscopically confirm their high-redshift nature and to study their physical properties. I will present the exiting new perspective opened by MOSAIC."

Primary author: Dr TASCA, Lidia (LAM -France)

Track Classification: ELTs overview

Contribution ID: **56** Type: **Talk**

Tracing the mass-metallicity relation of star-forming galaxies at high redshifts using GRB-selected galaxies' (Maryam Arabsalmani)

I present a study of the mass-metalliciy (MZ) relation in a redshift range of z ~ 0.3-3.4 using 33 star-forming
galaxies selected by Gamma Ray bursts (GRBs) with emission metallicity measurements. GRBs are beacons
of star-forming galaxies up to very high redshifts. The detectability of these extremely bright and dust-penetrating
explosions is independent of the brightness and dust content of their host galaxies. Hence faint galaxies are not
missed when selected by GRBs. I show that GRB host galaxies remarkably follow the MZ relation of the general
star-forming population with considering the redshift evolution of the MZ relation. While our results confirm the MZ
relation and its evolution at z>2, they also suggest GRB hosts as obvious candidates for studying the MZ relation
and its evolution at high redshifts. The presence of GRB afterglows provide accurate metallicity measurements for
GRB host galaxies up to very high redshifts (z~6). These measurements are based on absorption profiles and
hence do not suffer from calibration issues. In addition it is confirmed now that though at z<1.5 GRB hosts appear
to follow the low mass end of the luminosity function, at higher redshifts they sample the star-forming galaxy population.
I discuss the possibility of using GRB hosts with absorption metallicity measurements to investigate the MZ relation
at high redshifts. This study lays the ground for observations with the next generation of telescopes such as ELT

Primary author: Ms ARABSALMANI, Maryam (Uni Melbourne)

Track Classification: CGM/ICM/IGM/Chemical Enrichment

Contribution ID: **57** Type: **Talk**

GLaD: Gravitational Lensing and Dynamics combined analysis to unveil properties of high-redshift galaxies. (Giulia Chirivì)

Tuesday, September 10, 2019 10:10 AM (18 minutes)

Recent advances in Integral-Field Units and dynamical modelling of the stellar kinematics provide a powerful way to unveil the structure of galaxies in the local Universe, while gravitational lensing is nature's cosmic telescope to explore the properties of galaxies beyond the local Universe. We present a new approach that is able to unify the great tools of dynamical modelling of galaxies with the magnification power of strong gravitational lensing, to reconstruct the dynamical properties of high-redshift galaxies. We use axisymmetric Jeans modelling to create a dynamical model of the source galaxy assuming a mass model and a surface brightness, and then predict how the source' s surface brightness and kinematics would look like when lensed into arcs. We reconstruct the distorted kinematic data by comparing to the observed arcs of real strong gravitational lensing systems, and we present how well we are able to recover the lens and source mass and surface brightness parameters exploiting the combination of lensing and dynamics.

Primary author: Ms CHIRIVÌ, Giulia (MPA)

Track Classification: Galaxy Assembly

Contribution ID: **58** Type: **Talk**

Census of dusty starbursts in the distant universe via strong lensing (Helmut Dannerbauer)

Thursday, September 12, 2019 4:05 PM (18 minutes)

To obtain a reliable census of the star formation rate density of the universe, it is indispensable to measure the fraction of obscured star formation up to the epoch of reionization. One method to find distant starbursts - the so-called sub millimeter galaxies (SMGs) - is via strong lensing. I am presenting results from our on-going efforts via several (sub)mm facilities to reveal and characterize the cold ISM of this source population. One outstanding result of our work is the discovery of cold molecular gas of an ultra-bright lensed SMG at z=2.04, the so-called Cosmic Eyebrow, yielding in the brightest CO(3-2) detection ever of an SMG. Its unseen brightness offers the opportunity to new insights in the star-formation processes of high-z galaxies and thus establish it as a new reference source at z=2 for galaxy evolution. Based on our experience on blind redshift searches, I will discuss optimized strategies to determine spectroscopic redshifts via molecular gas observations of star-forming galaxies beyond z=3. Furthermore, I will present our IRAM NOEMA large program Z-GAL aiming to determine spectroscopic redshifts of more than 100 lensed SMGs, selected from Herschel surveys, and characterize their cold molecular gas and dust properties in detail. This dataset is complemented by deep NIR imaging from the ESO public survey SHARKS. Strikingly, even in the deepest images with the HST a significant fraction of dusty starbursts beyond z=4 is unseen at optical and near-infrared wavelengths. Thus finally, I will discuss the potential of ELT observations of this optical dark sources and its synergy with current and future state-of-the art radio facilities.

Primary author: DANNERBAUER, Helmut (IAC)

Track Classification: Gas and dust in galaxies

Contribution ID: **59** Type: **Talk**

Extremely Big Eyes at the Focus of Cosmic Telescopes (Eros Vanzella) (I)

Wednesday, September 11, 2019 9:00 AM (25 minutes)

The identification of young massive star clusters (YMCs) at cosmological distance is becoming a real fact. The occurrence of such systems is believed to increase at high redshift, eventually enclosing a significant fraction of the star formation activity of the Universe, in an epoch when also globular clusters (GC) formed. The potential role of such stellar systems play during reionization, their demography and the physical mechanisms behind the formation of GCs are among the key questions that will require JWST and E-ELT for a crucial quantum leap. I'll present recent results from Hubble deep imaging coupled with our VLT/MUSE Deep Lensed Field (MDLF, 20 h) and VLT/X-Shooter observations boosted by strong gravitational lensing. The best cosmic lenses allow us to anticipate E-ELT high spatial resolution capabilities (a few mas) and probe new low-luminosity regimes (mag > 32), along with quantifying our current limitations when studying non-lensed sources. The same cosmic lenses observed with E-ELT will allow us to further probe star-formation at the pc scale (or sub-pc in the more extreme cases), and identify gravitationally-bound star clusters in the first Gyrs, possibly GC precursors.

Primary author: Dr VANZELLA, Eros (INAF-OAS)

Track Classification: Reionization and First Light

Contribution ID: **60** Type: **Talk**

Galaxy evolution science with ELTs in (and after) the era of JWST (Mark Dickinson) (I)

Galaxy evolution science with ELTs in (and after) the era of JWST"(Mark Dickinson)

Primary author: Dr DICKINSON, Mark (NOAO)

Track Classification: ELTs overview

Contribution ID: **61** Type: **Talk**

« Normal » and « extreme » stellar populations and galaxies in the early Universe (Daniel Schaerer) (I)

Thursday, September 12, 2019 9:00 AM (25 minutes)

I will present an overview of recent results on analogs of the sources of cosmic reionization and very low (or zero) metallicity galaxies, whose detection and understanding are among the major goals with the next generation of facilities.

For example, I will discuss new insight on the far-UV SED and HeII emission from low metallicity galaxies, which is of importance for modeling and interpreting emission line observations of early/distant galaxies and to study their stellar populations.

I will also discuss observed and theoretical emission line diagnostics of metal-poor galaxies, and their potential to find Lyman continuum (LyC) emitters, determine their LyC escape fraction, and other properties.

Primary author: Prof. SCHAERER, Daniel (Astronomy Dept, University of Geneva)

Track Classification: Galaxy Stellar Populations and star-formation histories

Contribution ID: **62** Type: **Talk**

Big eyes on the early formation of massive structures (Emanuele Daddi) (I)

Thursday, September 12, 2019 11:37 AM (25 minutes)

Big eyes on the early formation of massive structures

Primary author: DADDI, Emanuele (CEA-Saclay)

Track Classification: Galaxy Assembly

Contribution ID: **63** Type: **Talk**

An overview of the ELT (MIchele Cirasuolo) (I)

Monday, September 9, 2019 11:15 AM (25 minutes)

An overview of the ESO ELT

Primary author: Dr CIRASUOLO , Michele

Track Classification: ELTs overview

Contribution ID: **64** Type: **Talk**

An overview of TMT (Christophe Dumas) (I)

Monday, September 9, 2019 9:55 AM (25 minutes)

An overview of TMT

Primary author: Dr DUMAS, Christophe

Track Classification: ELTs overview

Contribution ID: **65** Type: **Talk**

The ELT Multi-Object Spectrograph: latest news from MOSAIC (Francois Hammer) (I)

Monday, September 9, 2019 2:30 PM (25 minutes)

The E-ELT Multi-Object Spectrograph: latest news from MOSAIC

Primary author: Prof. HAMMER, Francois

Track Classification: ELTs overview

Contribution ID: **66** Type: **Talk**

Search and confirmation of passive galaxies in the early Universe (Paola Santini) (I)

Tuesday, September 10, 2019 11:18 AM (25 minutes)

Passive galaxies in the early Universe: results and challenges

Primary author: Mrs SANTINI, Paola

Track Classification: Galaxy Assembly

Contribution ID: **67** Type: **Talk**

Extremely Big Eyes on Stellar Populations (Claudia Maraston) (I)

Thursday, September 12, 2019 9:25 AM (25 minutes)

In this talk I shall use stellar population models to showcase analysis that could be performed with the E-ELT.

Primary author: Prof. MARASTON, Claudia

Track Classification: Galaxy Stellar Populations and star-formation histories

Contribution ID: **68** Type: **Talk**

Unveiling the active early galaxy assembly with emission-lines and ELTs (David Sobral) (I)

Tuesday, September 10, 2019 9:25 AM (25 minutes)

Unveiling the active early galaxy assembly with emission-lines and ELTs

Primary author: Dr SOBRAL, David

Track Classification: Galaxy Stellar Populations and star-formation histories

Contribution ID: **69** Type: **Talk**

Galaxy assembly, outflows and the evolution of disks with the IllustrisTNG simulations (Annalisa Pillepich)(I)

Tuesday, September 10, 2019 9:00 AM (25 minutes)

TNG50 is the last installment of the IllustrisTNG project (www.tng-project.org), a series of three cosmological gravity+magnetohydrodynamics simulations for galaxy physics. It returns an unprecedented combination of statistics and numerical resolution, so that we can quantify the evolution of massive star-forming galaxies at high redshift while simultaneously following, for example, the interactions of dwarf galaxies within a Virgo-like galaxy cluster all the way to the present epoch. In this talk, I will give an overview of the insights that these simulations are allowing us to uncover on the evolution of galaxy demographics and of galaxies' structures and morphological components. I will focus on the quantitative details of gas outflows and their relation to galaxy properties, the emergence of stellar and gaseous disks across cosmic times from both a structural and kinematical perspective, and the theoretically-expected mass fractions of dark matter within the innermost regions of galaxies.

Primary author: Ms PILLEPICH, Annalisa

Track Classification: Galaxy Assembly

Contribution ID: **70** Type: **not specified**

Summary of previous meetings (Alvio Renzini)

Monday, September 9, 2019 9:30 AM (25 minutes)

Contribution ID: **71** Type: **Talk**

Measuring the Evolution of Reionization with Big-Glass Observations of Lyman-Alpha (Steve Finkelstein) (I)

Wednesday, September 11, 2019 11:54 AM (25 minutes)

The epoch of reionization (6 < z < 10) marks the period in our universe when the first large galaxies grew to fruition, and began to affect the universe around them by burning off the haze of neutral gas that had filled the intergalactic medium (IGM) since recombination. The evolution of this process constrains key properties of these earliest luminous sources, thus observationally constraining reionization is a key science goal for the next decade. The measurement of Lyman-alpha emission from photometrically-identified galaxies is a constraining probe of reionization as a neutral IGM will resonantly scatter these photons, reducing detectability. I will describe our groups recent efforts to do this with 10m-class telescopes, showing that ultra-deep observations can routinely detect Lyman-alpha at z > 7. However, these observations require extremely large telescopes (ELTs) –the flux limits available from today's 10m class telescopes are sufficient for only the brightest galaxies (m < 26.5). Ultra-deep surveys with the Giant Magellan Telescope (GMT) and Thirty Meter Telescope (TMT) will be capable of detecting Lyα emission from galaxies 2-3 magnitudes fainter than today's deepest surveys. Wide-field fiber spectroscopy on the GMT combined with narrow-field AO-assisted slit spectroscopy on the TMT will be able to probe the expected size of ionized bubbles throughout the epoch of reionization, following up ~degree scale deep imaging surveys with the Wide Field Infrared Space Telescope. These data will provide the first resolved Lyα-based maps of the ionized intergalactic medium throughout the epoch of reionization, constraining models of both the temporal and spatial evolution of this phase change.

Contribution ID: **72** Type: **not specified**

The Bright Future with Big Eyes: Reionization and Early Galaxy Formation in High Definition (Rychard Bouwens) (I)

Wednesday, September 11, 2019 11:28 AM (25 minutes)

Current astronomers clearly live in a golden area of astronomy, with an almost incessant march towards viewing the early universe in ever greater clarity and sensitivity, new observational facilities coming online ever 18 months that astound and amaze, and new scientific insights becoming available almost every few days. One of these areas where astronomers have been granted a completely new outlook on the early
universe has been through the use of strong gravitational lensing clusters and as a result of vision and investment of the community in the ambitious Hubble Frontier Fields (HFF) program. With that program, we have
been able to study significantly lower luminosity sources than thought possible before and small star-forming systems at very high spatial resolution, even allowing the community to identify proto-globular cluster candidates in the deep data. In my presentation, I present some lessons the community has gained from the use of those data, recent
work from my own team on that front, new WFC3/UVIS data soon to be collected over the HFF clusters to enable future science, and the capabilities future telescopes should have to optimize such science going forward. In closing my presentation, I provide a prospective on what can be
in searches for massive ISM reservoirs in the early universe with current technology, using the newly approved cycle-7 ALMA large program REBELS I am
leading as an example and then remarking about how such science can be made better with future facilities.

Contribution ID: **73** Type: **not specified**

Probing black hole-galaxy co-evolution from de-biased scaling relations (Francesco Shankar) (I)

Tuesday, September 10, 2019 2:20 PM (25 minutes)

It has been claimed for decades that almost all galaxies in the local Universe host at their centre a super-massive black hole (SMBH) the mass of which appears to be tightly correlated with the stellar mass and the random motion ("velocity dispersion", sigma) of the stars of the host galaxy. In this talk I will first review the state of the art in this field. I will then highlight that significant biases affect local black hole-galaxy correlations. I will specifically show that the majority of quiescent early-type galaxies with central black hole dynamical mass estimates have significantly higher velocity dispersions than local typical galaxies of similar stellar mass. Through aimed Monte Carlo simulations, residual analysis, and the comparison with latest AGN clustering measurements, I will then illustrate that present data sets of active and quiescent galaxies strongly favour on average lower SMBH masses than previously thought, and point to velocity dispersion as more "fundamental" than galaxy stellar mass, galaxy size or Sersic index. I will then move on discussing the main implications of these findings, in particular: 1) The implied black hole radiative efficiencies and obscured fractions; 2) the consequences on feedback from active black holes and SMBH binary gravitational waves; 3) the connection to cosmological models that rely on velocity dispersion, rather than stellar mass, as main driver of black hole growth.

Contribution ID: **74** Type: **not specified**

Extremely Big Eyes on the co-evolution of Galaxies and Supermassive Black Holes (Laura Ferrarese) (I)

Tuesday, September 10, 2019 2:45 PM (25 minutes)

During the talk, I will first review the observational evidence for the existence of a connection between supermassive black holes and their host galaxies, and its evolution as a function of cosmic time. I will then move to describe what I believe to be the most pressing questions that still need answering, and the role the next generation of 30m optical/NIR facilities will play in advancing the field."

Contribution ID: **75** Type: **Talk**

The early growth of the first supermassive black holes (Raffaella Schneider) (I)

Tuesday, September 10, 2019 4:20 PM (25 minutes)

The early growth of the first supermassive black holes

Primary author: Prof. SCHNEIDER, Raffaella

Track Classification: Early Black Hole Formation

Contribution ID: **76** Type: **Talk**

GMTO: Project Overview and Status. (Rebecca Bernstein) (I)

Monday, September 9, 2019 10:20 AM (25 minutes)

Contribution ID: **77** Type: **not specified**

Susanna Vergani (Title TBD)

Contribution ID: **78** Type: **not specified**

The multiphase baryon cycle in galaxies and future prospects with the EELTs (Claudia Cicone) (I)

Friday, September 13, 2019 9:00 AM (25 minutes)

Galaxy formation and evolution are driven by the (re)cycling of baryons in and out of galaxies. Active galactic nuclei and star formation can generate galaxy-scale outflows and fountains, which in part feed the extended interstellar and circum-galactic medium (ISM and CGM) reservoirs, and in part escape the galaxy halo hence enriching the intergalactic medium (IGM). In turn, cosmic inflows from the IGM and CGM constantly replenish the ISM with new fuel. Multi-wavelength, multi-epoch (from z=0 to z>7) observations are needed to constrain the physical properties of the multiphase baryon cycle and its evolution across cosmic times. Moreover, these observations require extremely high sensitivity, as well as high spatial and spectral resolution to capture the low surface brightness components of gas flows, and at the same time resolve their complex morphological and kinematical structures. The ELT will have a pivotal role in the investigation of the multiphase baryon cycle from z=0 to z>7 in the optical/IR regime, best complementing and strengthening the observations that will be carried out in the other wavelength windows by other facilities such as ALMA.

Contribution ID: **79** Type: **not specified**

Extremely Big Eyes on galaxies and gas flow processes (Nicolas Bouche') (I)

Friday, September 13, 2019 9:25 AM (25 minutes)

Gas flow processes such as galactic winds and gas accretion are key to galaxy formation. The interface between galaxies and where most of the baryons are (the inter-galactic medium) is where gas in and ouflows are occurring and also where gas flows are directly connected to the evolution of the host galaxy. For instance, galactic wind may remove part or the totality of the ISM, and accretion may spin up galaxy disks. Thus the circum galactic medium are key to understand galaxy evolution. In this presentation, I'll review our current knowledge of the gas flows on scales of 100-150kpc, discuss the prospects of further advances with ELT-like telescopes and with IFUs such as Harmoni."

Contribution ID: **80** Type: **not specified**

Final discussion lead by M. Talia, I.Shivaei, P. Dayal and G. Roberts-Borsani

Friday, September 13, 2019 12:40 PM (35 minutes)

Contribution ID: **81** Type: **not specified**

Revealing a population of dual supermassive black holes from Subaru to the ELTs (John Silverman)

Tuesday, September 10, 2019 5:05 PM (18 minutes)

Contribution ID: **82** Type: **not specified**

test2

Session Classification: TEST

Contribution ID: **83** Type: **not specified**

Welcome and introduction

Monday, September 9, 2019 9:15 AM (10 minutes)

Contribution ID: **84** Type: **Talk**

PRELIMINARY PROGRAM

Contribution ID: **85** Type: **not specified**

Probing AGN-feedback and host-galaxy properties in the most luminous QSOs up to z~6 with ALMA (Manuela Bischetti)

Friday, September 13, 2019 11:35 AM (18 minutes)

Contribution ID: **86** Type: **not specified**

Active Galactic Nuclei in Dusty Starbursts at z = 2: Feedback Still to Kick in (Giulia Rodighiero)

Friday, September 13, 2019 11:16 AM (18 minutes)

We investigate a sample of 152 dusty sources at 1.5 < z < 2.5 to understand the connection of enhanced star formation rate (SFR) and black hole accretion rate. The sources are Herschel-selected, having stellar masses M * > 1010 M ⊙ and SFR (~100–1000 M ⊙ yr−1) elevated (>4×) above the star-forming "main sequence,"classifying them as starbursts (SBs). Through a multiwavelength fitting approach (including a dusty torus component), we divided the sample into active SBs (dominated by an active galactic nucleus (AGN) emission, SBs-AGN, ~23% of the sample) and purely star-forming SBs (SBs-SFR). We visually inspected their Hubble Space Telescope/ultraviolet (UV) rest frame maps: SBs-SFR are generally irregular and composite systems; ~50% of SBs-AGN are instead dominated by regular compact morphologies. We then found archival Atacama Large Millimeter/submillimeter Array continuum counterparts for 33 galaxies (12 SBs-AGN and 21 SBs-SFR). For these sources we computed dust masses, and, with standard assumptions, we also guessed total molecular gas masses. SBs turn into gas-rich systems (f gas = M gas/(M gas + M *) ≈ 20%–70%), and the gas fractions of the two SB classes are very similar (f gas = 43% ± 4% and f gas = 42% ± 2%). Our results show that SBs are consistent with a mixture of: (1) highly star-forming merging systems (dominating the SBs-SFR) and (2) primordial galaxies, rapidly growing their M * together with their black hole (mainly the more compact SBs-AGN). Feedback effects have not yet reduced their f gas. Indeed, SBs at z = 2, with relatively low bolometric AGN luminosities in the range 1044 < L bol(AGN) < 1046 erg s−1(compared to bright optical and X-ray quasars), are still relatively far from the epoch when the AGN feedback will quench the SFR in the host and will substantially depress the gas fractions.

Contribution ID: **87** Type: **not specified**

Formation and chemical evolution of dusty galaxies at z >= 4 (Luca Graziani)

Thursday, September 12, 2019 11:18 AM (18 minutes)

In this talk I will first review recent models of galaxy formation featuring the creation and evolution of dust in the ISM of galaxies recently observed in the early universe (z >4). Processes of dust formation from stellar sources (see Marassi et al., 2019) will be discussed, with a particular emphasis on the modeling of dust stellar yields and the efficiency of the reverse shock process in destroying the dust created by supernovae (Ginolfi et al., 2018). The evolution of dust grains present in the various phases of the ISM, as well as their impact on the colors of these galaxies, will be then discussed in light of recent results of our semi-analytic models (Mancini et al,. 2015,16). Finally, a new set of hydrodynamical simulations performed with the recently developed SPH code dustyGadget will be introduced and their predictions compared with an extended set of dust estimates in high redshift, normal star forming galaxies. Future radiative transfer simulations including dust (see Glatzle et al., 2019) will allow to investigate how the the hot and cold ISM phases evolve in the first galaxies, under the effects of consistent radiative and chemical feedback.

Contribution ID: **88** Type: **not specified**

Big eyes on big guys: tracking the formation and transformation of massive galaxies. (Mauro Giavalisco)

Tuesday, September 10, 2019 12:42 PM (18 minutes)

Current facilities, especially spectroscopy, do not yet have the power required to study

The assembly of the mass and the transformations of galaxies'structures are the result of the interplay between gravity, baryon physics and the properties of the dark matter on the one hand, and formation of, and feedback by, stars and black holes on the other. How do massive galaxies transition form star-forming disks to passively evolving spheroids? Why do they stay passive for most of the Hubble time? How do the early thick, hot disks and modern thin, cold ones relate to each other? Why would quenching, in addition to stop star formation, also change the dynamics and morphology of galaxies? The observations required to answer these questions require sensitive (>23 mag/arcsec), spatially resolved (~100 pc or better, thus higher than HST/JWST), medium resolution (R~6000) spectroscopy and high-resolution imaging at optical to NIR wavelengths that current facilities cannot deliver for systematic studies, except for rare and uncharacteristic bright sources or gravitationally lensed ones. The upcoming generation of 30-meter telescopes holds the promise to finally allow us to understand these issues that are of fundamental importance in cosmology.