

POSTERS LIST

as of October 8, 2019

1 Abdurrouf (*Academia Sinica Institute of Astronomy and Astrophysics*)
Study spatially resolved stellar population properties of galaxies with spatially resolved SED fitting

Despite the current improvement in spatial resolution of the imaging surveys, most of the photometric studies of galaxies have only been done by treating a galaxy as a single point object. On the other hand, the advent of IFU surveys has revolutionized the way we study galaxies. Despite its powerful capabilities, wide area IFU surveys have only limited to the local galaxies. In this presentation, I will introduce a spatially resolved SED fitting method that uses broad bands imaging data to derive spatially resolved stellar population properties of galaxies. This method uses a Bayesian MCMC inference technique. Currently, we have applied our spatially resolved SED fitting method to imaging data from HST and GALEX SDSS. Future photometric surveys (using JWST, WFIRST, LSST, Euclid, etc.) will provide a large dataset from which we can apply the spatially resolved SED fitting method to a large number of galaxies across wide redshift range to study the evolution of their internal structure

2 Aishwarya Ashok (*University of Utah, USA*)
A Novel High-Resolution, Infrared Library of Simple Stellar Population Models

Integrated light from a galaxy contains information about stellar populations that cannot be resolved into individual stars. Using the Stellar Population Synthesis (SPS) technique, we can study the chemo-dynamics and structure of galaxies. We present a new empirical spectral synthesis library of high-resolution, near-infrared spectra generated across a wide range of ages, metallicities and alpha abundances. Our library is the first high resolution ($R=22500$) spectral synthesis library available in the NIR. Our models are generated using data from the APOGEE-2 survey, which consists of $\sim 300,000$ Milky Way stars in a wide range of metallicity and abundance. These models produce consistent results for previously studied globular clusters as well as in comparison with lower resolution MILES spectral synthesis models. As a first application of these models, we present fits to the central regions of M31 to study its chemodynamic structure.

3 Ivano Baronchelli (*Università degli studi di Padova*)
Revealing the nature of single emission lines through a machine learning strategy

The most accurate determination of the redshift of a source is obtained through a spectroscopic measurement. However, the correct identification of the nature of the spectral lines is crucial. This problem is not concerning when more than one single line is identified in a spectrum, since the measured relative distance among the lines is consistent with only one reasonable redshift solution. Instead, the problem becomes relevant when only one single line is detected. In this second case, additional observative quantities can be exploited to add information and to help in the identification process. For example, photometric redshifts can be computed if photometric measurements are available. Here we present an algorithm based on a machine learning approach that can be used to correctly identify single spectral lines in grism spectra. The software is tested on a large HST spectroscopic survey, called WISP, representing an important proxy for the future Euclid and WFIRST missions

4 Andrew Battisti (*Australian National University*)
MAGPHYS photo-z: Constraining the Physical Properties of Galaxies with Unknown Redshifts

We present an enhanced version of the spectral modeling code MAGPHYS that allows the estimation of galaxy photometric redshift and physical properties simultaneously, together with robust characterization of their uncertainties. The self-consistent modeling over ultraviolet to radio wavelengths in MAGPHYS photo-z is unique compared to existing standard photometric redshift codes. The broader wavelength consideration is particularly useful for breaking certain degeneracies in color vs. redshift and for estimating photo-z values for dusty galaxies with limited observer-frame ultraviolet and optical data (or upper limits). We demonstrate the success of the

code in estimating redshifts and physical properties for over 4,000 infrared-detected galaxies at $0.4 < z < 6.0$ in the COSMOS field with robust spectroscopic redshifts. We achieve high photo-z precision, high accuracy, and low catastrophic failure rates over all redshifts.

5 Caroline Bertemes (*University of Bath*) **Origin of scatter in the star-forming main sequence: Short-term stochasticity vs Hubble timescale differentiation**

About 90% of the stellar build-up in galaxies occurs gradually on the Main Sequence, with the tightness of this relation being commonly interpreted as a consequence of the self-regulating nature of galaxies. However, within this framework, it remains unclear whether there are multiple pathways of stellar mass growth. In other words, does the observed scatter stem from systematic long-term differences in the star formation histories of galaxies above/below the Main Sequence today? Or can the spread be attributed to short-term stochastic fluctuations in growth rate, induced by minor mergers or “breathing” due to stellar feedback? I will present new insights into the star formation histories of star-forming SDSS-IV MaNGA galaxies, as reconstructed via full spectral fitting with the novel stellar population synthesis code Prospector (Leja et al. 2017). Making use of the IFU data, the spectral fitting is performed both at the galaxy-integrated level and within spatially resolved annuli.

6 Bahar Bidaran (*Zentrum für Astronomie der Universität Heidelberg (ZAH)/ARI*) **A kinematic study of a newly accreted group of dwarf galaxies to the Virgo cluster**

In 2018 Lisker et al. discovered a new infalling group of galaxies, consisting of 9 dEs, in the Virgo cluster. To investigate the physical properties of dEs in their early stages of residency in Virgo as well as the role of different environments (cluster vs. group) in evolution of dwarf galaxies, we have obtained MUSE IFU data for this sample. We find that all the dwarf galaxies in our sample have, on average, higher degrees of rotation in comparison to cluster members. In addition to that, comparison of their specific angular momentum profile with other cluster members as well as low-mass late-type galaxies of field shows higher values in members of our sample than that of “typical” cluster members, yet lower than that of low-mass late-type galaxies in field. We use this result to discuss how differences in specific angular momentum can constrain group vs. cluster processing.

7 Alina Boecker (*Max-Planck-Institute for Astronomy*) **The Art of Measuring a Galaxy's Star Formation and Accretion History from its Integrated Spectrum**

Today's full spectral fittings techniques let us leverage the whole information present in a stellar system's spectrum, but it is still a challenge to obtain the full star formation history. I will talk about the power of extracting such age-metallicity distributions from integrated spectra by presenting a new observational way of determining a galaxy's accreted satellite galaxy mass function from this information. It was successfully tested with the EAGLE simulations. I will also show that the integrated analysis of the nucleus of the Sagittarius dSph yields multiple stellar populations in agreement with its resolved analysis by exploiting a large MUSE dataset. I will discuss how these results depend on stellar population models, wavelength range and other instrumental effects. Constantly improving such techniques will let us finally extract the same knowledge from integrated light as from resolved stars, which is crucial to study galaxy formation in a detailed and statistical sense.

8 Martin Briday (*CNRS/IN2P3*) **Host galaxy environment influences on Type Ia Supernovae.**

Type Ia Supernovae (SNeIa) are standard candles that enable us to measure the recent expansion rate of the Universe. However, their true nature remains unknown, and potential astrophysical dependences of SNeIa that may vary between redshift and/or survey may bias cosmological measurements if not properly accounted for. Last decades studies have shown several relations between SNeIa properties and those of their host galaxy. Yet, the correct way to account for the astrophysical effects remains uncertain as various team find various results — sometime even discrepant — when using various tracers. We propose to compare these previous various environmental analyses methods in light of their ability to accurately trace fundamental SN astrophysical parameters, and notably the progenitor age. We show, as expected, that host colors and H α -based specific star formation rate are better age indicator than, say, morphology. More importantly we show that these known accuracy variations actually explain the discrepancy between the SN magnitude step observed when using different environmental tracers.

9 Caterina Caravita (*DIFA - Università di Bologna; OAS-INAF Bologna*)
Dynamical models of Early-Type Galaxies with multiple stellar populations

We present a significantly improved version of our numerical code JASMINE (Posacki et al., 2013), that can now be used to solve the Jeans equations for axisymmetric galaxy models with multiple stellar populations, a Dark Matter halo and a central Supermassive Black Hole. The stellar components can have different structural (density profile, mass, flattening), dynamical (rotational support, velocity dispersion anisotropy), and population (age, metallicity, Initial Mass Function, mass-to-light ratio) properties. These models, when combined with observations of ETGs - in particular the kinematic fields obtained from Integral Field Spectroscopy -, will allow to investigate important issues, and to quantify the systematic effects of IMF variations, of mass-to-light ratio gradients, and of different stellar kinematic components (e.g. counter rotating disks, kinematically decoupled cores) on luminosity-weighted properties measured within finite aperture radii.

10 Marco Castellano (*INAF - OAR*)
Image analysis algorithms for the Euclid photometric pipeline

Euclid is an ESA space mission aimed at understanding the nature of dark energy and dark matter. OU-MER is the Organisation Unit of the Euclid Science Ground Segment responsible for the creation of the official catalogue combining optical (VIS) and NIR imaging from the Euclid satellite and from ground-based surveys (DES, LSST, Pan-STARRS etc). The pipeline performs source detection and deblending, the latter exploiting an innovative approach based on topological clustering (ASTERISM code), and then assembles the multi-wavelength catalogue through state-of-the-art software for template fitting (T-PHOT) and aperture photometry (A-PHOT). The OU-MER pipeline also performs accurate measurements of non-parametric (CAS) galaxy morphology and star/galaxy classification. In this poster we describe the pipeline and the adopted techniques and software, focusing in particular on deblending and photometry.

11 Sarah Casura (*Universität Hamburg*)
Galaxy And Mass Assembly (GAMA): Bulge-disk decomposition of KiDS and VIKING data in the nearby universe

Obtaining reliable structural parameters for the different components of galaxies is important for a wide variety of studies of galaxy properties and evolution. I will present our current work on the bulge-disk decomposition of approximately 13000 GAMA galaxies in the nearby universe (z smaller than 0.08) in all 9 optical and near-infrared bands covered by KiDS and VIKING. The galaxy profiling itself uses the 2-dimensional Bayesian profile fitting code ProFit (Robotham et al. 2016) while the preparatory work (image segmentation/source identification, sky subtraction, initial parameter estimates) is carried out using the sister package ProFound (Robotham et al. 2018). The local PSF is estimated using a combination of ProFound and ProFit to identify stars near the galaxy of interest and fit them with a Moffat function. These decompositions will be used to derive the stellar mass functions of bulges and disks and study the nature and distribution of dust in galaxy disks.

12 Rachel Cochrane (*University of Edinburgh*)
Star-forming galaxies in ELAIS-N1, an ultra-deep LOFAR field

I will present new analyses of radio-identified star-forming galaxies in ELAIS-N1, one of the three deepest fields surveyed by LOFAR. Radio wavelengths offer a unique view of star-forming galaxies, in which dust obscuration does not play a significant role. In addition to $\sim 20\mu\text{Jy}$ depth 150MHz radio data, we have high quality multi-wavelength ancillary data from UV to FIR. This enables reliable separation of star-forming galaxies from AGN, and characterisation of the physical properties of the star-forming population. I will present work on the evolution of the properties of radio-identified star-forming galaxies with cosmic time.

13 Natacha Dametto (*Universidad de Antofagasta - CITEVA*)
A PANCHROMATIC STUDY OF THE STELLAR POPULATIONS IN NGC 4303

Star formation (SF) tracers in the optical spectral range are considerably well known nowadays and had been used to identify SF in galaxies over the years. The NIR regime, on the other hand, remains poorly explored, even though this is an important wavelength range which is less affected by dust obscuration than the optical and will be the regime probed by future observational facilities such as JWST, ELT/MOSAIC and GMT/NIRS.

Thus, one can use the well studied visible regime to anchor the simple stellar population (SP) models, determine ages and compare the resulting predictions for the NIR. In Dametto et al. (2019, in prep.) the SP synthesis technique was applied from the UV to the NIR using spectra from STIS/HST and SINFONI/VLT of the LLAGN NGC 4303. From these tests, we conclude the inclusion of the NIR adds valuable information to the fits, once it penetrates deeper into the dust layers, unveiling obscured sources that would be missed using only the bluer region of the spectrum.

14 *Guillaume Desprez (University of Geneva)* **Limitations of Euclid photometry for the determination of physical parameters**

When measuring the physical parameters of a source, the information provided by the photometry is limited by the set of observed bands. We propose to assess this limit for the Euclid photometric system. We use a sample of about 60.000 synthetic sources with perfectly known redshifts, parameters and photometry. Since the knowledge base is perfect, a machine-learning algorithm should provide optimal results. A Random Forest regressor is trained on the photometry of half the sources, and is then tested over the rest of the sample. This setup allows us to make predictions on the limits of the Euclid mission capability to derive the different physical parameters in three situations: perfect Euclid photometry, Euclid Deep and Euclid wide. We show how precisely parameters like masses, SFR and intrinsic extinction could be determined with an optimal algorithm.

15 *Andrea Enia (Università degli Studi di Padova)* **Retrieving the Main Sequence with SED fitting of resolved local face on spiral galaxies in Dustpedia.**

We analysed a set of galaxies coming from the DustPedia archive. Our selection criteria favored late-type face-on spirals and uniform coverage in the wavelength domain, with a final sample of 8 galaxies. We perform SED fitting with MAGPHYS on different apertures (from pixel-by-pixel to 1 arcmin apertures) in order to obtain resolved physical properties for the galaxies. The wavelength coverage of the Dustpedia archive, from stellar to dust emission-dominated bands, is of particular interest when comparing with similar studies performed mainly in the optical domain. We retrieve the MS for the sample, extending to values of SFR and stellar mass lower than previous findings (e.g. MaNGA, CALIFA) thanks to reliable SED fitting in the outermost regions of the disk, hinting at the presence of a second sequence related to them.

16 *Lulu Fan (Shandong University, China)* **Deriving physical properties of X-ray AGN by combining their multiwavelength SEDs and image decomposition**

In the literature, the host galaxy properties of X-ray AGN have been derived mostly by linearly combining some galaxy templates (or simple stellar populations) and AGN templates. We propose that photometric images can provide additional information and limitation on SED fitting procedure. In this talk, I will introduce our recent progress on SED fitting of X-ray AGN by taking their image decomposition as a prior. Our results show that we can effectively limit the probable range of fitting parameters.

17 *Aritra Ghosh (Yale University)* **Using Convolutional Neural Networks to Study Galaxy Morphology**

We introduce Galaxy Morphology Network (GaMorNet), a convolutional neural network to classify galaxies according to their bulge-to-total ratio. GaMorNet can be trained with a small amount of real data and works with data of varying quality. Using GaMorNet, we examined morphology-separated colour-mass diagrams for 82547 SDSS ($z \sim 0$) and 21746 CANDELS ($z \sim 1$) galaxies. To achieve this, we first trained GaMorNet on simulations of galaxies and then transfer learned using $\sim 25\%$ of each dataset to achieve net misclassification rates of $< 5\%$. For both SDSS and CANDELS galaxies, disk-dominated galaxies peak in the blue cloud, consistent with slow exhaustion of star-forming gas with no rapid quenching. In contrast, bulge-dominated galaxies are mostly red, with much smaller numbers down toward the blue cloud, suggesting rapid quenching across the green valley. We are now applying GaMorNet to additional data sets and developing a new regression network to characterize additional galaxy properties.

18 Giacomo Girelli (*INAF - OAS*) **The stellar-to-halo mass relation over the last 12 Gyr (and beyond)**

Understanding how galaxy properties are linked to the dark matter halos they reside in, and how they co-evolve is a powerful tool to constrain the processes related to galaxy formation. The stellar-to-halo mass relation (SHMR) and its evolution over the history of the Universe provides insights on galaxy formation models and allows to assign galaxy masses to halos in N-body dark matter simulations. We use a statistical approach to link the observed galaxy stellar mass functions on the COSMOS field to dark matter halo mass functions from the DUSTGRAIN simulation and from a theoretical parametrization from $z=0$ to $z=4$. We also propose an empirical model to describe the evolution of the stellar-to-halo mass relation as a function of redshift. We calculate the star-formation efficiency (SFE) of galaxies and compare results with previous works and semi-analytical models. In addition, we test the robustness of the model from $z=0$ up to $z>4$ by applying it to N-body dark matter simulations and comparing with observations.

19 Shoubaneh Hemmati (*NASA JPL*) **BRINGING MANIFOLD LEARNING AND DIMENSIONALITY REDUCTION TO SEDFITTERS**

We show unsupervised machine learning techniques are a valuable tool for both visualizing and computationally accelerating the estimation of galaxy physical properties from photometric data. As a proof of concept, we use self organizing maps to visualize a model library in the observed photometry space. The resulting visual maps allow for a better understanding of how the observed data maps to physical properties and to better optimize the model libraries for a given set of observational data. Next, the SOMs are used to estimate the physical parameters of 14,000 $z \sim 1$ galaxies in the COSMOS field and found to be in agreement with those measured with SED fitting. However, the SOM method is able to estimate the full probability distribution functions for each galaxy up to ~ 106 times faster than direct model fitting.

20 Tim Hewlett (*Pontificia Universidad Catolica de Chile*) **Galaxy Mergers and AGN: A Machine Learning Approach**

The relationship between galaxy mergers and nuclear activity remains highly contested, with significant variance in the literature. One reason for this is the biasing effect of AGN selection method, another that galaxy mergers are hard to robustly identify. Current techniques (e.g. visual classification) can be extremely time consuming and prone to errors, while even small classification errors can very effectively obscure underlying observational signatures. Convolutional neural networks (CNNs) represent an extremely promising technique for image classification, but is intrinsically limited by the training sample: for example, if training examples have been classified by humans the algorithm will be imbued with the same biases. To overcome this limitation, we train a CNN with galaxy images from the Eagle and Illustris simulations, where merger histories and properties are known in detail a priori. Application to the real Universe will allow for swift identification of thousands of mergers and non-mergers, within which we will conduct multi-wavelength searches for AGN. This will reveal with statistical significance the role of galaxy mergers in triggering AGN as a function of selection method and AGN luminosity, amongst other factors.

21 Jacob Isbell (*Max Planck Institute for Astronomy*) **The Evolution of Molecular Gas Fraction Traced by the CO Tully-Fisher Relation**

CO observations show a luminosity-line-width correlation that evolves with redshift. We present a method to use CO measurements alone to infer the molecular gas fraction and constrain the CO-H₂ conversion factor (α_{CO}). The redshift evolution of the luminosity–line-width correlation indicates an evolution of $f_{\text{mol}}/\alpha_{\text{CO}}$. We compile low-J CO observations of 449 galaxies between $0.01 < z < 3.26$. We use an MCMC sampler to derive the posterior probability distribution functions of $f_{\text{mol}}/\alpha_{\text{CO}}$ for these galaxies, accounting for random inclinations and measurement errors in the likelihood function. We find that the molecular gas fraction evolves with redshift, $f_{\text{mol}} \propto (1+z)^2$, for both normal star-forming (SFGs) and starburst galaxies (SBs). The trend agrees well with that inferred from the Kennicutt-Schmidt relation. At $z < 0.1$ SFGs require $\sim 5\times$ larger α_{CO} than SBs to match their molecular gas fractions, but at $z > 1$ both galaxy types exhibit sub-Galactic α_{CO} values and SFGs appear more gas-rich than SBs.

22 Thomas Jackson (*Astronomisches Rechen Institut, Universitaet Heidelberg, Germany*)
Investigating the Evolution of Central Galaxies in SDSS, HSC and IllustrisTNG

Early studies of high redshift, quiescent galaxies have found the rather surprising result that galaxies of a similar stellar mass have much smaller effective radii when compared to low redshift counterparts. In this research we attempt to constrain these size growth mechanisms by firstly presenting an analysis of the stellar mass assembly of $\sim 90,000$ local, massive, central galaxies selected from SDSS group catalogues. We compare estimations, obtained from SED fitting, of the times in which 10%, 50% and 90% of the stellar mass were assembled to the IllustrisTNG simulations. We build on this by secondly presenting current work investigating activity in the outskirts of a sub-sample of these galaxies. We use deep (26 - 28 mag), multi-band imaging from the Subaru HSC survey, applying voronoi binning to maximise signal to noise, and fit SEDs to each bin in order to construct detailed stellar mass, colour and star formation rate maps and reveal radial trends. We find significant amounts of tidal activity or disruption within the sub-sample, with significant stellar material in the outskirts, implying widespread accretion of satellite galaxies via minor mergers.

23 Olivier Kauffmann (*LAM*)
Simulating JWST imaging in the EGS and HUDF fields and physical parameters recovery

The James Webb Space telescope (JWST) will offer a new perspective on galaxy evolution with the discovery of distant faint galaxies, that will need to be correctly characterized. In preparation for the JWST deep field imaging, we conduct extensive simulation to predict the recovery of galaxy physical properties. We insert the JWST Extragalactic Mock Catalog (JAGUAR) and realistic mock stars into mock images generated with Skymaker, following the observing strategies of the ERS and GTO programs in the EGS and HUDF fields. Photometry is performed with SExtractor and SED-fitting with the LePhare code. Following color-color and photometric redshift based selection criteria, we investigate galaxy completeness and purity. Our analysis shows that the addition of the deep JWST infrared coverage to the optical HST data will give excellent stellar mass measurements and photometric redshifts for sources at redshifts up to and beyond $z=8$.

24 Young-Lo Kim (*CNRS/IN2P3/IP2I Lyon*)
Identifying Host Galaxies and Measuring Their Properties for ZTF SNe Ia

It is well-established that Type Ia supernova (SN Ia) luminosities are correlated with their host properties. Understanding and correcting this relation, therefore, would provide a more accurate result for the SN cosmology. However, the origin of the relation is still under debate. In order to investigate the origin of the relation, here we present an on-going effort studying with the recent ZTF SNe Ia data. First, we introduce a host identification method-the directional light radius method-, which considers a (elliptical) size of a galaxy. Then, we measure host properties, such as stellar mass and global star formation rate (SFR), by using LePHARE with BC03 templates and GALEX SDSS photometry. We show that a distribution of host galaxies in the mass-SFR plane is similar to that of other galaxies. In the near future, we will compare light-curve parameters of ZTF SNe Ia with host galaxy properties to discuss the origin of the relation between SNe Ia and their host galaxies.

25 Janusz Krywult (*Jan Kochanowski University*)
Decomposing galaxy color bimodality at $z \sim 1$ in VIPERS

We study the bimodality of the UBV and NUVrK rest-frame colour distributions of $\sim 50,000$ VIPERS galaxies in the redshift range $0.5 < z < 1.0$. We demonstrate that in sufficiently narrow redshift and galaxy stellar mass ranges both the UBV and NUVrK colour distributions can be very well modelled by a bimodal Gaussian distribution, with virtually no residual. We found that the existence of the galaxy number excess over the sum of two Gaussians in the intermediate "green valley" region in the case of the colour distributions becomes statistically significant only when a sufficiently wide range of redshift and/or stellar masses is considered. We conclude that galaxies present in this intermediate region can well belong to elongated tails of blue and red galaxy populations while timescales for galaxies to cross the green valley are very short, not exceeding $1-1.5$ Gyr.

26 Alina Leščinskaitė (*Center for Physical Sciences and Technology*)
AGB and RGB Stars in the Dwarf Irregular Galaxy Leo A

We studied populations of RGB and bright AGB stars in the dwarf irregular galaxy Leo A using multicolour photometry data obtained with the Subaru telescope and the HST ACS. We developed a photometric method to significantly reduce a number of contaminating foreground Milky Way stars, which allowed us to study the spatial distribution of AGB and RGB stars within the Leo A galaxy. We found that bright AGB stars, as well as stars on the blue side of the RGB sequence, are more centrally concentrated, while the red RGB stars have a significantly more extended distribution. In addition, using optical photometry data, we were able to identify a group of AGB stars which are likely to have dusty envelopes and a sequence of peculiar RGB stars, possibly, indicating anomalous chemical composition.

27 Nicholas Martis (*Tufts University*) **The Prevalence and Properties of Dusty Galaxies Through Cosmic Time**

From a combination of UltraVISTA and 3D-HST data we measure the fractions of quiescent, unobscured star-forming, and dusty star-forming galaxies as a function of stellar mass since $z = 3$. Motivated by this study, we investigate the stellar and dust properties of a mass complete sample of massive and dusty galaxies at $1 \leq z \leq 4$ by modeling their UV-IR spectral energy distributions (SEDs) obtained from UltraVISTA DR3 photometry and Herschel PACS-SPIRE data using MAGPHYS. We evaluate the ability of the rest-frame UVJ color-color diagram to determine the star formation and dust obscuration properties for our sample. We construct median SEDs as functions of redshift and star-formation level. Simultaneous modeling of the panchromatic SED allows us to quantify the contribution to the IR emission from dust heated by star formation rather than evolved stellar populations, which we find to be crucial to characterize these galaxies correctly. We finally compare the $z > 1$ sample to local galaxies.

28 Thibaud Moutard (*Saint Mary's University*) **Local vs. Global: Environment Frames the NUVrK Big Picture of the Star Formation Quenching**

The processes that are involved in the so-called "quenching" of the star formation in low-mass galaxies, by nature not expected to quench, are likely to be quite different from what is at play in the quenching of evolved and massive galaxies. In that respect, I will present the results we obtained regarding the two main quenching channels that can be identified by taking advantage of the rest-frame NUV-r vs. r-K colour (NUVrK) diagram to reliably trace galaxy star formation histories. In particular, I will discuss how the fast quenching channel followed by low-mass ($< 10^{9.7} M_{\odot}$) galaxies, which is responsible for the low-mass upturn observed in the stellar mass function of quiescent galaxies, appears to be driven by their local environment, while the slow quenching channel followed by evolved and massive galaxies, typically when reaching the characteristic stellar mass M^* ($\approx 10^{10.6} M_{\odot}$), may preferentially happen along cosmic filaments.

29 Marat Musin (*National Astronomical Observatories, Chinese Academy of Sciences*) **Synergy of the SDSS and the WISE in the Stripe 82: physical properties of 15 million galaxies**

We report the current results from our effort to synergize WISE and SDSS in the ~ 300 square degree Stripe 82 region. Using the SDSS images as the prior, we fit the SDSS-detected objects to the WISE W1/W2 images to obtain consistent optical-to-IR SEDs. The major outcome consists of three catalogs: (1) the "SDSS WISE" photometric catalog of ~ 13 million SDSS-detected point sources, (2) the "SDSS WISE" photometric catalog of ~ 15 million galaxies with photometric redshifts, and (3) the catalog of "WISE Optical Dropouts", or "WoDrops", which are those detected in the W1/W2 images but do not have counterparts in the SDSS. We discuss the application of the extragalactic catalogs in the context of Global Stellar Mass Density and Cosmic Star Formation History.

30 Angelos Nersesian (*National Observatory of Athens*) **Dust heating in nearby galaxies with 3D radiative transfer modeling**

Within the framework of the DustPedia project we study the effect of cosmic dust on a vast sample of nearby galaxies. Dust radiative transfer (RT) simulations provide us with the unique opportunity to study the heating mechanisms of dust by the stellar radiation field. From 2D FITS images we were able to derive the 3D geometry distributions of stars, a technique, first introduced by De Looze et al. (2014) and followed afterwards by Viaene et al. (2016). This powerful method allows a more realistic description of the complex stellar geometries found in galaxies like asymmetric features or clumpy structures. Our aim is to analyze the contribution of the different

stellar populations (old, young & ionizing) to the radiative dust heating processes in the nearby face-on barred galaxies NGC1365, M83, M95, and M100 by using high resolution 3D radiative transfer modeling. To model the complex geometries mentioned above, we used SKIRT, a state-of-the-art, 3D Monte Carlo RT code designed to model the absorption, scattering and thermal re-emission of dust in a variety of environments (Nersesian et al. 2019, Forthcoming in A&A).

31 Evangelos-Dimitrios Paspaliaris (*National Observatory of Athens*) **Physical properties of galaxies through cosmic time**

Using the physical properties of local galaxies (Nersesian 2019), we extend the analysis to galaxies at high redshifts aiming at linking the properties of local and distant galaxies and examine their evolution through cosmic time. We make use of multi-wavelength photometric data (UV to submm) already culled in two databases, DustPedia (Davies 2017) and HELP (Vaccari 2016). Our sample of local galaxies is enriched with local (U)LIRGs that occupy the high end of SFR in the local Universe. The purpose is to investigate the role of the dust and its heating by radiation, due to different stellar populations, on the variances of several parameters for galaxies of different morphological types and merging stages. The physical properties of the galaxies are derived by modelling their SEDs. Thus, we examine the way that parameters such as the SFR, the stellar and dust mass, as well as the corresponding luminosities vary with morphological type and merging stage.

32 Bogdan Adrian Pastrav (*Institute of Space Science, Bucharest (Romania)*) **Dust and inclination effects on galaxy scaling relations**

Accurate galaxy scaling relations are essential for a successful model of galaxy formation and evolution. Most of the measured photometric and structural parameters involved in these relations are affected by dust and inclination effects, which introduce biases and degeneracies. We present a detailed analysis of a sample of nearby spiral galaxies taken from the KINGFISH survey. The photometric parameters of the morphological components are obtained from bulge-disk decompositions, using GALFIT. Dust opacities are determined from a previously discovered relation by Grootes et al. (2013). The method and the library of numerical results from Pastrav et al. (2013a,b) are used to correct the measured parameters to intrinsic values. Measured (observed) and intrinsic (corrected) galaxy scaling relations are presented, in the optical regime. The main characteristics of the relations, the mean dust optical depth and dust/stellar mass ratios are in agreement with values found in other works.

33 Thibaut Perdereau (*Institut Astrophysique Spatiale (IAS)*) **Star-forming Galaxy Protoclusters: a case study of a Planck-selected candidate**

Understanding how and when galactic structures formed is a major unsolved problem in Astrophysics, yet such sources are also very red and faint, making their confirmation a challenge. Nascent galaxy overdense regions or "protoclusters" are relatively brighter at $z=2-4$, during which the in-situ star formation rates and/or AGN activities peaked. While obtaining spectroscopic confirmation of multiple member galaxies can be slow-going, at the same time there is ample useful photometric information. We present a study of the protocluster candidate PLCK G256.8-33.2, which is drawn from the Spitzer Planck Herschel Infrared Cluster (SPHerIC) survey. SPHerIC identified 82 galaxy protocluster candidates at $z=1.3-3.0$ using mid- through far-infrared imaging data. In this preliminary analysis we include also optical and near-infrared imaging to do the matched photometry and fit Spectral Energy Distribution (SEDs) to the galaxies in to measure their photometric redshifts.

34 Andreea Petric (*CFHT/MSE/IFA*) **(1) High Redshift Obscured Quasars and the Need for Optical to NIR, Massively Multiplexed, Spectroscopic Facilities. (Option 2: What heats the Molecular Gas in Active Galaxies?)**

(1) Most bulge-dominated galaxies host black holes with masses that tightly correlate with the masses of their bulges suggesting that black holes may regulate galaxy growth or vice versa. Galaxies with active black holes in their nuclei, that are fully or partially hidden by dust and gas may be key to understanding this connection. We emphasize the need for future large multiplexed spectroscopic instruments that can perform dedicated surveys in the optical and NIR to pin down the demographics of such objects and study their reddening properties, star-formation histories, and excitation conditions. (2) We use MIR spectroscopy to study the ISM of ~2000 active galaxies and Pan-STARRS images to characterize their optical morphologies. We find statistically

significant differences between the warm molecular gas temperatures, silicate strengths, PAH line-ratios, and star-formation rates between mergers, non-mergers, and early-mergers as well as between the hosts of AGN non-AGN.

35 Benjamin Rose (*Space Telescope Science Institute*)
Estimating the Average Age of Stellar Populations to Understand Type Ia Supernova Systematics

The cosmic distance indicators, Type Ia supernovae, now show signs that their peak luminosity correlate with their progenitor environments. The stellar mass of the host galaxy is the most commonly used galaxy property to correct for these systematics. This property has no physical connection to the explosion mechanism, but is easy to measure. The age or metallicity of the progenitor system are more likely the physical cause of this systematic shift in peak luminosity. I will present my work, started as part of my dissertation, where I estimated the average stellar population age from the broadband photometric SED of SDSS. I will also present options for speeding up these age estimates by using the No-U-Turn Hamiltonian Monte Carlo sampler in Stan and using component analysis of the SEDs.

36 Zahra Sattari (*UC Riverside*)
Resolved properties of galaxies at intermediate redshifts ($0.5 < z < 2$)

We study the role of environment in pixel-by-pixel (resolved) properties of galaxies at intermediate redshift ($0.5 < z < 2$). We perform pixel-by-pixel SED fitting to produce surface density maps of stellar mass (M), star formation rate (SFR), specific star formation rate (sSFR), stellar age, and extinction. We utilize the Canny edge detector method to identify clumps in sSFR maps of galaxies and study the possible correlation between the clumpiness of galaxies and their stellar mass or the environment they are located in.

37 Abtin Shahidi (*University of California, Riverside*)
A complete census of massive evolved galaxies at $z > 3$ in CANDELS

Using the final multi-waveband photometric catalogs for the CANDELS fields, we identified galaxies with Balmer Break features at rest frame 3648. This technique was used to select populations of massive and evolved galaxies at $3 < z < 4.5$. Using their Spectral Energy Distributions (SEDs), we are going to perform these selections separately based on UVJ, observed color, inferred properties from the SED. We are going to assess the effect of the photometric uncertainty on each selection. Then we are going to compare the evolution of the corresponding number densities with numerical simulations and previous observational estimates.

38 Heath Shipley (*McGill University*)
Characterization of an Important Evolutionary Post Starburst Galaxy Class at $1 < z < 5$

One of the most fundamental questions in galaxy formation and evolution is how and when the most massive galaxies in the Universe formed. The massive galaxy, C1-23152, at redshift $z > 3$ was speculated to be a prototype of the progenitors of local most massive elliptical galaxies. Using the HFF-DeepSpace, UltraVISTA and 3D-HST surveys, we have constructed the largest sample of post-starburst galaxies at $1 < z < 5$ with SEDs similar to C1-23152. I will present the full characterization of this galaxy population (e.g., stellar masses, star-formation rates, number density, and AGN fraction) across cosmic time, and its role in the formation and evolution of massive galaxies.

39 Sarah Sweet (*Swinburne University of Technology*)
Stellar angular momentum distribution sets galaxy morphology

A galaxy's angular momentum is a fundamental property in its evolutionary history, as it encodes the impact of cumulative tidal torques. I will present spatially-resolved stellar specific angular momentum for a high-quality subset of 25 CALIFA galaxies, accounting for stellar velocity and velocity dispersion, and one $z=1.62$ disk galaxy. I will demonstrate that the specific angular momentum distribution is a robust tracer of morphology via higher-order moments of the probability density function PDF(j^*). The PDF(j^*) is not well-described by theoretical predictions, indicative of physical processes e.g. outflows and tidal stripping. Galaxies with bigger bulges have

more strongly-tailed (leptokurtic) PDF(j^*)s due to an excess of dispersion-dominated material, while disks of all sizes rotate similarly. All galaxies that are known to host pseudobulges have mesokurtic bulge PDF(j^*). Finally I will present the utility of the PDF(j^*) as a photokinematic decomposition tool.

40 Behzad Tahmasebzadeh (*Shangahi Astronomical Observatory*) **Deprojection of external barred galaxies from photometry**

The observations of any astrophysical object are projected into the plane of the sky. It is important to accurately deproject them in order to get the corresponding intrinsic quantities. Here we provide a model for the deprojection of the surface brightness profile specially to cover inner region of a barred galaxy. We consider axisymmetric shape to represent disk component and triaxial shape to describe bulge region. We use GALFIT to decompose our simulated barred galaxy image to bulge and disk parts, then we perform MGE fit to each component separately. Finally we use some constraints to reduce degeneracy due to deprojection then compare intrinsic density distribution of our model with mass density of the mock galaxy. As the test of our model we calculated potential, force components and orbit structure of the mock galaxy and deprojected density which obtained from photometry, Results show this method can work well for the case of barred galaxies with different observational inclination and position angles.

41 Carlos Vargas (*University of Arizona*) **Measuring Star Formation Rates in Edge-on Galaxies and a New Explorer to Directly Measure Molecular Gas**

I present new narrow-band H-alpha imaging for 24 nearby edge-on galaxies in the CHANG-ES Survey, and use the images in conjunction with WISE 22 micron imaging to measure improved SFRs using the updated recipe from Vargas et al. (2018). I explore correlations with updated star formation properties with radio continuum scale heights, scale lengths, and diameters as measured in Krause et al. (2018). I identify a region of star formation at an extreme distance from the star-forming disk of NGC 4157, possibly ionized by a single O5.5 V star. The H-alpha Imaging from this work are released and readily available at <https://www.queensu.ca/changes>. I also present a new proposed NASA Small Explorer (SMEX) mission, called Hyperion, which aims to directly measure ultraviolet molecular hydrogen fluorescence in Milky Way molecular clouds. Direct molecular gas measurements of this type will provide key information on the relationship between clouds, their environments, and newborn stars within.

42 Jorge Andrés Villa Vélez (*Laboratoire d'Astrophysique de Marseille (LAM)*) **On the search for a possible SFR-[OIII] correlation using CIGALE SED fitting of galaxies in the COSMOS and GOODS-S fields**

Understanding how dust attenuates light is paramount to derive accurate physical properties of galaxies. For a long time, SED fitting has been used to achieve these goals. We built a sample of galaxies in the COSMOS and GOODS-S fields including photometric data covering the UV-to the-IR wavelength range and H α , and [OIII] density fluxes from the 3D-HST. SED fitting analysis is performed using CIGALE-code which is flexible enough and allows us to include the emission lines and explore different attenuation laws. Classical recipes fit really well the emission lines although more values in the parameter-space must be explored to reproduce [OIII]-line for example. The amount of attenuation is quantified to correct the emission lines and compute in a later stage SFRs. We discuss if [OIII] emission line can be proposed as a quantitative tracer of SFR because it represents a valuable tool to identify and study high-redshift galaxies in future surveys where the classical H α is not available.

43 John Weaver (*Cosmic Dawn Center, Niels Bohr Institute, University of Copenhagen*) **The Farmer: Improved model-based photometry for the next generation of galaxy surveys**

While the increasing depth and area of galaxy surveys promise definitive high-redshift studies, ever more crowded sources challenge current photometric methodology. Pressed by the declining ratio of galaxies with spectroscopy to those without, we must pioneer methods to characterize these increasingly faint sources. Recent work by Lang and Hogg (2016) has provided another toolkit: The Tractor. By leveraging our understanding of galaxy morphologies, the Tractor is able to force galaxy models derived from high-resolution images onto less resolved ones, with superior deblending and robust photoz's – advantageous for high-redshift studies. We present the Farmer, a comprehensive software interfacing with The Tractor to detect sources,

efficiently determine the best model type for each source, and perform forced photometry in a scalable architecture. Built in part to exploit the future synergy of Subaru/Spitzer/Euclid, The Farmer is here showcased with results from the next COSMOS catalog.

44 *Alessandra Zanichelli (INAF - Istituto di Radioastronomia)* **Measuring the properties of X-shaped radio galaxies: the case of A3670**

X-Shaped Radio Galaxies (XRGs) exhibit both bright primary lobes and weak secondary "wings" that give the source a cross-like shape. Currently there is no general consensus on the theoretical model for the formation of these radio sources. We analysed multi-frequency JVLA data for the candidate XRG in Abell 3670 to characterize its properties and the connection with the host galaxy, a dumbbell BCG. We classified the source as an FRI XRG and estimated a black hole mass $\sim 10^9$ Msun. From radiative age maps we found that the wings are ~ 20 Myr older than the lobes. Radio lobes and wings are aligned with the optical major and minor axes respectively, in agreement with the typical properties of XRGs. Among the theoretical models for the origin of XRGs, the jet-stellar shell interaction one may best reproduce the observed properties of A3670. Further optical data are needed to confirm the presence of stellar shells and unambiguously disentangle among the various formation scenarios.

45 *Ying Zu (Shanghai Jiao Tong University)* **Dissecting the Star Forming Main Sequence in EAGLE and SDSS**

We present a comparison of properties of galaxies on the star forming main sequence between the EAGLE simulation and the SDSS main galaxy sample. In particular, we focus on the histories of metal enrichment, star-formation, and the host dark matter growth measured for those galaxies.