

REPORT ON THE RADIONET3 NETWORKING ACTIVITY

TITLE: The formation and growth of galaxies in the young universe

DATE: *APRIL 26-30, 2014* **TIME:** (WHOLE DAY)

LOCATION: *OBERGURGL, AUSTRIA*

MEETING WEBPAGE *<http://transidee-conference.uibk.ac.at/galaxy-evolution-2014/>*

HOST INSTITUTE: *INNSBRUCK UNIVERSITY*

PARTICIPANTS NO: *108*

MAIN LEADER: *INAF*

REPORT:

1. Agenda and/or programme of the meeting

Attached

2. Scientific Summary

In the previous meeting, during December 2009, highlights included the first results from Herschel, and very early data from WFC3 on the refurbished Hubble Space Telescope. In the intervening years, several major surveys have been completed by Hubble and Herschel, wide-field near-infrared imaging has begun to be delivered by VISTA, SCUBA2 has commenced sub-mm surveys on the JCMT, near-infrared multi-object spectrographs have commenced operation on 8-m class telescopes, and the first results have emerged from ALMA and Planck. At the time of this meeting, ALMA Cycle 1 is nearing completion, KMOS has been commissioned on the VLT, Hyper Suprime-Cam is operational on Subaru, and the next generation of radio surveys are underway.

The aim of this meeting was to review and discuss these observational advances, alongside progress in theory/simulation, with a dual focus on galaxy/black-hole evolution at $z > 2$, and reionization/first-galaxies at $z > 6$. All these topics were covered by experts in the field (usually as 30 mins talks), and younger researchers (usually as 15 mins talks). Due to the size of the meeting, discussions were lively and useful, both after the talks and during the breaks.

The meeting provided an excellent overview of the state of play, and what is to come. Talks are being collected, and will be published on the conference website, or at ESO.

3. Attendance list (incl. participant names, affiliation and country) signed by the participants and confirmed by the organizer

Attached.

4. Financial Report / RadioNet3 contribution

Radionet3 provided funding for the printing of 400 conference posters (EUR 390), and registration fee for four participants (EUR 400 each):

Gergo Popping (Dutch/Hungarian, Groningen)

Johannes Zabl (German, Copenhagen)

Martin Sparre (Danish, Copenhagen)

Emanuele Sobacchi (Italian, Pisa)

So that makes a total of $390 + 4 \times 400 = 1990$ euro.

5. Conference Proceedings and Web page

Presentations will be published on a website, either in Innsbruck, or at ESO.

The Formation & Growth of Galaxies in the Young Universe

Obergurgl 2014

Programme

Saturday 26th April

Late afternoon / evening	Registration
19:00	Welcome Drink
20:00	Supper

Sunday 27th April

08:15 – 08:30	Welcome – Sabine Schindler & Eelco van Kampen
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Session 1: Galaxy formation – the theoretical framework

Chair: Eelco van Kampen

08:30 – 09:00	Simon White (MPI for Astrophysics, Germany) Galaxy formation: progress and challenges
09:00 – 09:30	Joop Schaye (Leiden University, Netherlands) Physical drivers of cosmic star-formation history
09:30 – 10:00	Martin Haehnelt (University of Cambridge, UK) The role of black holes in galaxy formation/evolution
10:00 – 10:30	Coffee
10:30 – 11:00	Desika Narayanan (Haverford College, USA) A comprehensive view of molecular gas at high redshift
11:00 – 11:15	Bruno Henriques (MPA, Germany) Galaxy Formation in the Planck Era
11:15 – 11:30	Claudia Lagos (ESO, Garching, Germany) The neutral gas content of galaxies over time
11:30 – 11:45	Martin Sparre (Dark Cosmology Centre, Denmark) The role of starbursts and quiescent star formation in simulated galaxies
11:45 – 12:00	Gergo Popping (Kapteyn Institute, Netherlands) The nature of the ISM during the star-formation activity peak of the Universe
12:00 – 16:00	Lunch/skiing/discussions

Session 2: Galaxy evolution from multi-frequency imaging surveys

Chair: Jeff Wagg

16:00 – 16:30	Harry Ferguson (STScI, USA) Lessons from HST
16:30 – 17:00	David Elbaz (CEA Saclay, France) Lessons from Herschel
17:00 – 17:15	Matthieu Bethermin (ESO Garching, Germany) Understanding the evolution of main-sequence and starburst galaxies across cosmic time
17:15 – 17:30	Tao Wang (CEA Saclay, France) A substantial population of normal dusty galaxies at $z \sim 4$
17:30 – 17:45	Valentino Gonzalez (University of California, USA) The slow evolution of specific star-formation rate at $z > 2$
17:45 – 18:00	Alice Mortlock (University of Edinburgh, UK) The evolution of the stellar mass function in UltraVISTA & UDS
18:00 – 19:30	Dinner

Session 3: Emission lines: kinematics & physical conditions

Chair: Jeff Wagg

19:30 – 20:00	Alice Shapley (University of California, LA, USA) Outflows from high-redshift galaxies
20:00 – 20:15	Greg Walth (University of Arizona, USA) Probing the ISM of high-redshift gravitationally-lensed galaxies detected by Herschel
20:15 – 20:30	Benjamin Wiener (University of Arizona, USA) Probing physical properties of low and high redshift star-forming galaxies with far-infrared emission lines
20:30 – 20:45	Andy Biggs (ESO, Garching, Germany) A search for HI in emission at $z = 1.3$ by stacking DEEP2 galaxies in 3D

Monday 28th April

Session 4: Early structure formation

Chair: Desika Narayanan

08:30 – 09:00	Brant Robertson (University of Arizona, USA) Theoretical Framework
09:00 – 09:30	Volker Bromm (University of Texas, USA) The first stars
09:30 – 10:00	Sadegh Khochfar (University of Edinburgh, UK) The birth of galaxies
10:00 – 10:30	Coffee
10:30 – 10:45	Daniel Ceverino (Universidad Autonoma de Madrid, Spain) Cosmological simulations with radiative feedback and the low efficiency of galaxy formation at high redshift
10:45 – 11:00	Pratika Dayal (University of Edinburgh, UK) The earliest galaxies: chaotic and dusty
11:00 – 11:15	Joseph Munoz (UCSB, USA) The ISM and molecular clouds in the epoch of reionization
11:15 – 11:30	Emanuele Sobacchi (Scuola Normale Superiore, Pisa, Italy) UV background feedback and recombinations during cosmic reionization
11:30 – 11:45	Stephen Wilkins (University of Sussex, UK) Measuring the physical properties of galaxies in the early Universe
11:45 – 12:00	Chris Hayward (Heidelberg, Germany) The heterogeneity of the submillimetre galaxy population
12:00 – 16:00	Lunch/skiing/discussions

Session 5: Observations of galaxies in the first billion years

Chair: Jim Dunlop

16:00 – 16:30	Ross McLure (University of Edinburgh, UK) Galaxies at $z = 6 - 10$ from HST blank-field survey
16:30 – 17:00	Rychard Bouwens (Leiden University, Netherlands) Observing the first galaxies
17:00 – 17:30	Renske Smit (Leiden University, Netherlands) Nebular emission in $z \sim 6-8$ galaxies as seen with Spitzer/IRAC: implications for early galaxy formation
17:30 – 18:00	Dan Stark (University of Arizona, USA) Emission lines at high redshift
18:00 – 18:15	Rebecca Bowler (University of Edinburgh, UK) Luminous $z \sim 7$ galaxies from UltraVISTA and the UDS
18:15 – 18:30	Steve Finkelstein (University of Texas at Austin, USA) Tracing galaxies across cosmic time at high redshift
18:30 – 18:45	Emma Curtis-Lake (University of Edinburgh, UK) Stellar populations and morphological evolution of LBGs
18:45 – 19:00	Kenneth Duncan (University of Nottingham, UK) The mass evolution of the first galaxies
19:00	Conference Dinner

Tuesday 29th April

Session 6: Observational probes of reionization

Chair: Andy Biggs

08:30 – 09:00	Benedetta Ciardi (MPIA, Garching, Germany) 21 cm observations
09:00 – 09:30	Masami Ouchi (The University of Tokyo, Japan) Reionization physics from the census of high-z galaxies
09:30 – 10:00	Nial Tanvir (University of Leicester, UK) Gamma Ray Bursts
10:00 – 10:30	Coffee
10:30 – 10:45	Akira Konno (The University of Tokyo, Japan) First Subaru ultra-deep survey for Ly alpha emitters at $z = 7.3$: implications for reionization
10:45 – 11:00	Ryota Kawamata (The University of Tokyo, Japan) Size-luminosity relation for $z \sim 7-8$ lensed galaxies from the Hubble Frontier Fields Data
11:00 – 11:15	Andrei Messinger (Scuola Normale Superiore, Pisa, Italy) Reionization and beyond: detecting the peaks of the cosmological 21-cm signal
11:15 – 11:30	Elizabeth Stanway (University of Warwick, UK) Developing the effective use of local analogues for the high-z population
11:30 – 11:45	Jeff Cooke (Swinburne University, Australia) What is Lyman alpha trying to tell us?
11:45 – 12:00	Julie Wardlow (Dark Cosmology Centre, Denmark) Constraining the Ly-alpha escape fraction with FIR observations of Ly-alpha selected star-forming galaxies
12:00 – 16:00	Lunch/skiing/discussions

Session 7: Far-infrared/mm/radio studies

Chair: Elisabete da Cunha

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| 16:00 – 16:30 | Seb Oliver (University of Sussex, UK)
Herschel HERMES |
| 16:30 – 17:00 | Jim Geach (University of Hertfordshire, UK)
New results from sub-mm/mm imaging surveys |
| 17:00 – 17:30 | Jacqueline Hodge (NRAO, USA)
New results from sub-mm/mm/radio spectroscopy |
| 17:30 – 17:45 | Michal Michalowski (University of Edinburgh, UK)
Towards the complete mass function of dusty galaxies |
| 17:45 – 18:00 | Itziar Aretxaga (INAOE, Mexico)
Large area surveys with the LMT/TolTEC |

18:00 – 19:30 Dinner

Session 7: continued....

Chair: TBD

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| 19:30 – 19:45 | Scott Chapman (Dalhousie University, Canada)
A blind survey for molecular gas in $z \sim 2.5$ protoclusters |
| 19:45 – 20:00 | Justin Spilker (University of Arizona, USA)
Recent highlights from the South Pole Telescope sample of high-redshift dusty star-forming galaxies |
| 20:00 – 20:15 | Alex Karim (Bonn University, Germany)
Dusty starbursts at the dawn of galaxy assembly |
| 20:15 – 20:30 | Rebecca Williams (University of Cambridge, UK)
The nature and assembly of primeval galaxies revealed by ALMA |
| 20:30 – 20:45 | Jorge Zavala (INAOE, Mexico)
The redshift distribution of sub-mm galaxies at different wavelengths |
| 20:45 – 21:00 | Darach Watson (Dark Cosmology Centre, Denmark)
Dust build-up in an archetypal early universe galaxy at $z = 7.4$ |

Wednesday 30th April

Session 8: Phenomenological models, stellar populations, AGN, Future

Chair: TBD

08:30 – 09:00	Simon Lilly (ETH Zürich, Switzerland) A phenomenological approach to galaxy formation
09:00 – 09:30	Elisabeta da Cunha (MPIA, Garching, Germany) Recent progress in evolutionary synthesis models
09:30 – 09:45	Margherita Talia (Università di Bologna, Italy) The star-formation rate cookbook: recipes at $z > 1$
09:45 – 10:00	Simon Driver (University of Western Australia) Are the compact galaxies at high redshift naked bulges?
10:00 – 10:30	Coffee
10:30 – 10:45	Marco Viero (Caltech, USA) Taking a census of the CIB
10:45 – 11:00	Wiphu Rujopakarn (Chulalongkorn/Tokyo University) Resolving the Obscured Cosmic Accretion History and Modes of Galaxy Assembly
11:00 – 11:15	Fabian Walter (MPIA, Garching, Germany) The $z > 6$ quasar population: new quasars and rest-frame FIR studies
11:15 – 11:30	Neven Caplar (ETH Zürich, Switzerland) AGN evolution from a galaxy evolution viewpoint
11:30 – 11:45	Jared Gabor (CEA Saclay, France) Simulating AGN fueling and feedback in high- z disk galaxies
11:45 – 12:00	Jonathan Trump (Penn State, USA) The AGN census at Cosmic Noon: growing black holes in bulgeless adolescent galaxies
12:00 – 12:15	Eelco van Kampen (ESO, Garching, Germany) Galaxy formation and evolution with the full ALMA
12:15 – 12:30	Jeff Wagg (SKA, Manchester, UK) Galaxy formation and evolution with the Square Kilometer Array
12:30 – 13:00	Richard Ellis (Caltech, USA) Conference summary and future prospects
13:00	Close/lunch/skiing

list of participants

city	countrycode	badge_fullname	badge_organisation	badge_organisation2	participant_status
Garching bei M	DE	Eelco van Kampen	ESO		Organization
Edinburgh	UK	James Dunlop	University of Edinburgh	Institute for Astronomy	Organization
Coventry	UK	Elizabeth Stanway	University of Warwick	Physics	Regular
München	DE	Andy Biggs	European Southern Observatory		Organization
Macclesfield	UK	Jeff Wagg	SKA		Organization
Pasadena	US	Marco Viero	California Institute of Technology	California Institute of Technology	Regular
Edinburgh	UK	Michal Michalowski	University of Edinburgh	Institute for Astronomy	Regular
Brighton	UK	Stephen Wilkins	University of Sussex	Physics and Astronomy	Regular
Versoix	CH	Daniel Schaerer	Geneva University	Geneva Observatory	Regular
halifax	CA	Scott Chapman	Dalhousie University	Physics	Regular
Durham	UK	Chian-Chou Chen	Durham University	Department of Physics	Regular
Muenchen	DE	Claudia Lagos	European Southern Observatory	European Southern Observatory	Regular
Edinburgh	UK	Pratika Dayal	University of Edinburgh	Institute for Astronomy	Regular
Innsbruck	AT	Francine Marleau	University of Innsbruck	Institute of Astro and Particle Ph	Regular
Copenhagen	DK	Julie Wardlow	Dark Cosmology Centre		Regular
Edinburgh	UK	Joao Pedro Ferreira	University of Edinburgh	Institute for Astronomy	Student Grant
Edinburgh	UK	Rebecca Bowler	University of Edinburgh	Institute for Astronomy	Student Grant
Heidelberg	DE	Michael Maseda	MPIA Heidelberg		Regular
Haverford	US	Desika Narayanan	Haverford College		Organization
Tucson	US	Dan Stark	University of Arizona	Astronomy	invited Speaker
Tucson	US	Benjamin Weiner	University of Arizona	Steward Observatory	Regular
Garching bei M	DE	Matthieu Bethermin	ESO Garching		Regular
Canberra	AU	Fuyan Bian	Australian National University	Mt Stromlo Observatory/Research	Regular
Nottingham	UK	Kenneth Duncan	University of Nottingham	School of Physics and Astronomy	Student Grant
Heidelberg	DE	Christopher Hayward	Heidelberg Institute for Theoret	Theoretical Astrophysics	Regular
	AT	Sabine Schindler	Universität Innsbruck	Institut für Astro- und Teilchenph	Regular
Groningen	NL	Gergo Popping	Kapteyn Institute, Groningen Uni		Regular
Hyderabad	IN	Rahul Nigam	BITS Pilani		Regular
Crawley	AU	Simon Peter Driver	University of Western Australia		Regular
Edinburgh	UK	Fergus Cullen	University of Edinburgh	IfA	Student Grant
Edinburgh	UK	maciej piotr koprowski	university of edinburgh	institute for astronomy	Student Grant
Livingston	UK	Derek McLeod	University of Edinburgh	Institute for Astronomy	Student Grant
Edinburgh	UK	Alice Mortlock	The University of Edinburgh	IfA	Regular
Zurich	CH	Simon John Lilly	ETH Zurich	Institute of Astronomy, Departm	invited Speaker
Leiden	NL	Joop Schaye	Leiden University	Leiden Observatory	invited Speaker
Heidelberg	DE	Elisabete da Cunha	Max Planck Institute for Astronom		invited Speaker
Edinburgh	UK	Sadegh Khochfar	University of Edinburgh	Institute for Astronomy	invited Speaker
Pasadena	US	Richard Ellis	California Institute of Technology	Astronomy	invited Speaker
Kashiwa	JP	Masami Ouchi	The University of Tokyo		invited Speaker
Baltimore	US	Henry Ferguson	Space Telescope Science Institut		invited Speaker
Bologna	IT	Margherita Talia	Università di Bologna	Dipartimento di Fisica e Astronom	Regular
Tucson	US	Brant Robertson	University of Arizona	Department of Astronomy	invited Speaker
Gif-sur-Yvette	FR	David Elbaz	CEA Saclay	Service d'Astrophysique	invited Speaker
Zurich	CH	Kurt Thomas Soto	ETH Zurich	Institute for Astronomy	Regular
Garching	DE	Benedetta Ciardi	Max Planck Institute for Astroph		invited Speaker
Charlottesville	US	Jacqueline Hodge	NRAO		invited Speaker
Heidelberg	DE	Fabian Walter	MPIA		Regular
Den Haag	NL	Göran Pilbratt	ESA	Scientific Support Office	Regular
Cambridge	UK	Martin G. Haehnelt	University of Cambridge	Institute of Astronomy	invited Speaker
Leiden	NL	Renske Smit	Leiden University	Leiden Observatory	invited Speaker
Atlanta	US	John Wise	Georgia Tech		Regular
Zurich	CH	Will Hartley	ETH Zurich	Institute for Astronomy	Regular
Brighton	UK	Seb Oliver	University of Sussex	Physics and Astronomy	invited Speaker
Munich	DE	Alexander M. Beck	University Observatory Munich		Regular
Chiba	JP	Akira Konno	The University of Tokyo	Astronomy	Student Grant
Tokyo	JP	Ryota Kawamata	The University of Tokyo	Astronomy	Student Grant
Bonn	DE	Alexander Karim	Bonn University	Argelander-Institute for Astronom	Regular
Austin	US	Steven Finkelstein	The University of Texas at Austin	Astronomy	Regular
Garching (Mun	DE	Bruno Henriques	MPA		Regular
Heidelberg	DE	Remco van den Bosch	MPIA		Regular
Tucson	US	Justin Spilker	University of Arizona	Astronomy	Student Grant
Durham	UK	Cheng-Jiun Ma	Durham University	Extragalactic group	Regular
Pisa	IT	Andrei Mesinger	Scuola Normale Superiore		non-residential
Copenhagen	DK	Johannes Zabl	Dark Cosmology Centre	Niels Bohr Institute, University of	Regular
Santa Barbara	US	Joseph A Munoz	UCSB	Physics	Regular
Kashiwa	JP	Wiphu Rujopakarn	University of Tokyo	Kavli IPMU	Regular
Edinburgh	UK	Nathan Bourne	Royal Observatory Edinburgh	Institute for Astronomy	Regular
Hatfield	UK	James Geach	University of Hertfordshire	Centre for Astrophysics Research	invited Speaker
Leicester	UK	Nial R Tanvir	University of Leicester	Physics and Astronomy	invited Speaker

Los Angeles	US	Alice Shapley	University of California, Los Angeles	Physics and Astronomy	invited Speaker
Gainesville	US	Jingzhe Ma	University of Florida	Astronomy	Student Grant
College Park	US	Kari Helgason	University of Maryland / NASA Goddard		Regular
University Park	US	Jonathan Trump	Penn State	Astronomy & Astrophysics	Regular
Puebla	MX	Emmaly Aguilar Pérez	Instituto Nacional de Astrofísica, Optica y Electrónica	Astrophysics	Regular
Edinburgh	UK	Emma Curtis Lake	University of Edinburgh	Institute for Astronomy	Regular
La Laguna, Tenerife	ES	Rui Marques	Instituto de Astrofísica de Canarias		Student Grant
La Laguna, Tenerife	ES	P. Martinez-Navajas	Instituto de Astrofísica de Canarias		Student Grant
Santa Maria T. Mexico	MX	Jorge Zavala	INAOE	Astrophysics	Regular
Hawthorn	AU	Jeff Cooke	Swinburne University	Centre for Astrophysics and Supercomputing	Regular
Göttingen	DE	Christoph Behrens	University of Goettingen	Institut für Astrophysik	Student Grant
Goettingen	DE	Jan Frederik Engels	University of Goettingen	Institute for Astrophysics	Student Grant
Madrid	ES	Daniel Ceverino	Universidad Autonoma de Madrid		Regular
ORSAY	FR	David GUERY	IAS		Student Grant
Edinburgh	UK	Victoria Bruce	University of Edinburgh	Institute for Astronomy	Regular
Pisa	IT	Emanuele Sobacchi	Scuola Normale Superiore		Regular
Belgrade	RS	Marijana Smailagić	Astronomical Observatory Belgrade		Student Grant
Zürich	CH	Anna K. Weigel	ETH Zürich	Institute for Astronomy	Student Grant
Zurich	CH	Neven Caplar	ETH Zürich	Department of Physics	Student Grant
Riverside	US	Valentino Gonzalez	University of California Riverside		Regular
Edinburgh	UK	Esther Marmol-Queraltó	SUPA, Institute for Astronomy	University of Edinburgh	Regular
Paris	FR	Jared Gabor	CEA Saclay		Regular
København Ø	DK	Darach Watson	University of Copenhagen	Dark Cosmology Centre, Niels Bohr Institute	Regular
SCEAUX	FR	Corentin Schreiber	CEA Saclay	SAP	Regular
Edinburgh	UK	Shegy Parsa	Institute for Astronomy, University of Edinburgh	Physics and Astronomy	Student Grant
Gif-sur-Yvette	FR	Tao WANG	CEA/Saclay		Regular
Cambridge	UK	Rebecca Williams	University of Cambridge	Cavendish Astrophysics	Student Grant
Copenhagen	DK	Bo Milvang-Jensen	Dark Cosmology Centre		Regular
Copenhagen	DK	Martin Sparre	Dark Cosmology Centre, University of Copenhagen	Niels Bohr Institute	Regular
Sta. Maria Toral	MX	Itziar Aretxaga	INAOE	Astrophysics	Regular
Tucson	US	Gregory Walth	University of Arizona	Astronomy	Student Grant
Seoul	KR	Sung-Ho An	Yonsei University		Student Grant
Edinburgh	UK	Iván Oteo	Edinburgh University		Regular
Edinburgh	UK	Ross James McLure	University of Edinburgh	Institute for Astronomy	invited Speaker
Strasbourg	FR	Pierre Ocvirk	Observatoire astronomique de Strasbourg	Galaxies & cosmology	Regular
Baltimore	US	Nor Pirzkal	STScI		Regular
Baltimore	US	Kai Gerhard Noeske	ESA / STScI		Regular
Leiden	NL	Rychard Bouwens	Leiden University	Sterrewacht	invited Speaker
Garching bei München	DE	Simon D. M. White	MPI for Astrophysics		invited Speaker
Austin	US	Volker Bromm	University of Texas	Department of Astronomy	invited Speaker

Signed for the organizing committee:



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