

REPORT ON THE RADIONET3 NETWORKING ACTIVITY

TITLE: GALAXIES OF MANY COLOURS – STAR FORMATION ACROSS COSMIC TIME

DATE:	<i>1-5 JUNE 2015</i>	TIME: (WHOLE DAY)
LOCATION:	<i>CARLSTENS CONFERENCE CENTRE MARSTRAND, SE</i>	
MEETING WEBPAGE	http://www.chalmers.se/en/conference/Galaxies-of-Many-Colours/Pages/default.aspx	
HOST INSTITUTE:	<i>CHALMERS UNIVERSITY OF TECHNOLOGY</i>	
PARTICIPANTS NO:	<i>56</i>	
MAIN LEADER:	<i>CHALMERS</i>	

REPORT:

1. Programme of the meeting

Monday 1 June

Session 1: AGN feeding and feedback

09h20: Introduction talk

09h40: Matt Lehnert -- Regulating star formation and gas content with AGN and star formation

10h20: T. Izumi -- Dense molecular gas observations in AGNs with ALMA: Feeding and Feedback

10h40: Coffee break

11h00: K. Sakamoto -- Feeding and Feedback in U/LIRGs: ALMA case studies

11h40: E. Freeland -- An AGN-blown Nuclear Bubble Triggers Star Formation in a Nearby Face-on Analogue to Our Own Milky Way

12h00: Lunch Break

Session 2: AGN--star formation connection

14h00: S. Aalto -- AGN feedback and molecules (last minute change)

14h40: F. Costagliola -- Compact obscured nuclei in the ALMA era

15h00: B. Villarreal -- Unification of AGN through the eyes of Supernova

15h20: Coffee break

15h40: A.M. Mickaelian -- Star-formation rates for IR selected Byurakan--IRAS Galaxies

16h00: N. Falstad -- Herschel spectroscopic observations of Zw 049.057 and Arp 299

16h20: J. Fogasy -- Where is the star formation of SMM J04135?

16h40: Discussion (40min)

17h30: Fortress visit

Tuesday 2 June

Session 3: ISM properties in resolved star forming systems

09h00: J. Turner -- Everyone Knows it's Windy: Or not? Enrichment & Feedback in Massive Clusters

09h40: G. Fuller -- The Hot, Dense Gas in W49: A possible analogue of extragalactic starbursts

10h20: R. Tunnar -- Multiphase Modelling -- a Bayesian Approach

10h40: Coffee break

11h00: J. Gallagher -- Intense Modes of Star Formation: Origins and Impact on Galaxy Evolution

11h40: T. Yoast-Hull -- Cosmic Rays Interactions in Extreme Molecular Media

12h00: Lunch break

Session 4: ISM properties at galaxy scale

13h20: J. Fisher -- Over the Peak: Probing the Radiation, Particle, and Column Densities in IR--Bright Galaxies with Far--IR Spectroscopy

14h00: T. Greve -- Star formation relations across the CO ladder and redshift

14h20: E. Bellocchi -- Molecular emission line analysis in local star-forming galaxies using far--IR Herschel/HIFI and sub--mm APEX data

14h40: Coffee break

15h00: N. Scoville -- ISM Masses and SF at $z = 1$ to 6

15h40: P. van der Werf -- CO ladders and neutral gas cooling in (U)LIRGs

16h00: L. Lindroos -- Measuring sizes of distant faint galaxies

16h20: Discussion (40min)

Wednesday 3 June

Session 5: Star formation in low--metallicity environment

09h00: L. Hunt -- The interstellar medium in metal-poor blue dwarf galaxies

09h40: D.J. Williamson -- Dwarf outflows in groups and the mass--metallicity relation

10h00: R.H. Golshan -- Star Formation History and Stellar Wind Feedback in Two Low Metallicity Dwarf Galaxies: NGC 147 and NGC 185

10h20: S. Konig -- Gas and star formation in minor mergers -- Molecular gas feeding the central starbursts in NGC 1614 and the Medusa merger

10h40: Coffee break

11h00: Y.S. Dai -- What does the infrared grism spectroscopy survey tell us about star formation at $0.5 < z <$

2.5?

11h20: C. Ly -- "Direct" Gas--Phase Metallicities and its Dependence on Star Formation for Metal--poor, Strongly Star--forming Galaxies

11h40: H. Martel -- The Connection between Star Formation and Metallicity Evolution in Barred Spiral Galaxies

12h00: Discussion (40min)

12h40: Lunch break

13h30: Trip to Onsala

Thursday 4 June

Session 6: Star formation in interacting galaxies

09h00: D. Sanders -- A New View of the Galaxy "Main Sequence"

09h40: J. Moreno -- Mapping Star Formation in Interacting Galaxies (J. Scudder)

10h00: E. Nelson -- Spatially resolved maps of star formation for 2000 galaxies at $z \sim 1$: Evidence for the inside--out formation of disk galaxies

10h20: Coffee break

10h40: K. Larson -- Morphology and Molecular Gas Fractions of Luminous Infrared Galaxies as a Function of Infrared Luminosity and Merger Stage

11h00: J. Scudder -- Does gas content control the strength of interaction--triggered star formation?

11h20: J. Kotilainen -- Dissecting the Bird: a spectacular off--nuclear LIRG starburst with gas outflows

11h40: G. Drouart -- Star formation at low and high IR luminosity in high--redshift interacting galaxies

12h00: Lunch break

Session 7: Star formation in secularly evolving galaxies

13h40: T. Davis -- Star formation relations in secularly evolving galaxies, and when they break down

14h20: B. Lofaro -- Physical modelling of molecular gas and dust properties of $z \sim 1.5$ star forming BzK galaxies with the GRASIL radiative transfer based spectral synthesis code

14h40: A. Adamo -- The lifecycle of young star clusters;; the role of the galactic environment on cluster formation and evolution

15h00: Coffee break

15h20: T. Kodama -- Super multicolour wide--field NIR imaging survey with Subaru and TAO

15h40: T. Nakajima -- Line Survey with NRO 45--m Telescope and High--Resolution Imaging Observations with ALMA toward Galactic Nuclei (to be confirmed)

16h00: B. Rocca--Volmerange -- Elliptical Galaxy Evolution and supermassive black holes with Pegase.3

16h20: Discussion (40min)

19h00: Conference Dinner

Friday 5 June

09h00: K. Knudsen -- Lensed high-- z starburst galaxies, probing gas at sub--kpc scale

09h40: A. Romeo -- A simple and accurate approximation for the Q stability parameter and characteristic instability wavelength in multi--component and realistically thick discs

10h00: J. Conway -- Prospects for Galaxy Molecular and Continuum Observations with SKA

10h20: Coffee break

10h40: D. Watson -- A Dusty Normal Galaxy at $z=7.5$

11h00: Discussion (40min)

11h40: J. Gallagher: Summary -- end of the conference

12h00: Lunch break

2. Scientific Summary

The conference aimed at bringing together researchers in both observational and theoretical star formation, working at both high and low redshifts, in order to build a coherent picture of star formation in the Universe, design future strategies to tackle the still unanswered questions, and optimize the resources available to the community. A particular emphasis was put on recent ALMA cycle 2 results and the molecular gas component of galaxies.



The conference's main scientific topics included the detailed study of gas flows and feeding/quenching of star formation in the local Universe, and the initial conditions of star formation and the different star formation modes (starburst/secular) in the distant Universe ($z=1-3$).

The 56 participants had a very diverse geographical distribution, representing scientific institutions from Sweden, the U.K., the Netherlands, Germany, France, Italy, Finland, Spain, the U.S., Chile, Taiwan, Armenia, Iran, Canada, and Japan. Young researchers such as post-docs and PhD students represented about 50% of the total. Around 40% of the participants were women.

The scientific contributions included 11 invited talks, 43 contributed talks, and 2 posters. The talks were organized into 7 sessions: (1) AGN feeding and feedback, (2) AGN--star formation connection, (3) ISM properties in resolved star forming systems, (4) ISM properties at galaxy scale, (5) Star formation in low-metallicity environments, (6) Star formation in interacting galaxies, and (7) Star formation in secularly evolving galaxies.

Sections 1 and 2 discussed the impact of AGN activity on galaxy evolution and its interplay with star formation. Observational evidence, mainly from ALMA and Herschel, for large gas flows in starbursts and AGN was presented and its effects on the star formation efficiency of galaxies discussed (e.g., Sakamoto). The main questions here were what regulates the star formation efficiency in galaxies and if AGN feedback could cause quenching or an enhancement of star formation. Also, the possibility that hidden AGN in the compact cores of luminous infrared galaxies (LIRGs) may escape detection was discussed by several talks. Alternative probes of AGN activity were proposed, including chemical effects on the ISM (e.g., Izumi, Costagliola) and vibrationally excited molecular emission lines (e.g., Aalto, Costagliola, Falstad).

The properties of the interstellar medium (ISM) in the Milky Way and in other galaxies were discussed in sections 3 and 4. Observations of Galactic regions with extreme star formation efficiencies were presented as possible analogues to extragalactic starbursts (e.g., Turner, Fuller). The possibility of star formation efficiency to be enhanced in super star clusters was also discussed (e.g., Gallagher). Wide-band far-IR spectroscopy of Ultra-luminous infrared galaxies (ULIRGs) with the Herschel telescope was discussed by several authors (e.g., Fisher, van der Werf, Gonzalez-Alfonso). J. Fischer proposed a Far-IR spectral sequence produced by different ionization factors, X-ray and cosmic ray fluxes, and molecular hydrogen column density.

Star formation in early-stage, low metallicity galaxies was discussed in section 5. Observations of the ISM of metal-poor galaxies were reported in various talks (e.g., Hunt, Williamson). A method to trace the star formation history of galaxies based on near- and mid-IR observations was discussed by R.H. Golshan. A dependence of metallicity with star formation rate found with the Subaru telescope was reported by C. Ly. Numerical modelling of metallicity in barred galaxies was presented by H. Martel.

Section 6 was devoted to the enhanced star formation and AGN activity in merging galaxies. The main sequence of star formation in galaxies and its extension to ULIRGs and starbursts in the early Universe was reviewed by D. Sanders. Results from simulation of interacting galaxies were reported by J. Moreno and D.

Williamson, showing how the nature of the interaction can have a very different imprint in the interaction results. The use of gravitational lensing to study interacting galaxies in the early universe was discussed in the talk by G. Drouart.

Secular star formation was discussed in Section 7. Here the main questions regarded the differences between secular star formation and starbursts events, the measurement of star formation efficiency in galaxies, and the possibility to observe Milky Way-type galaxies in the early Universe. A review on the measurement of star formation activity in galaxies was given by T. Davis, who focused on the importance of using the right tracers and taking into account galactic timescales. The possibility of observing “normal” galaxies at high redshift with sub-kpc scale resolution through gravitational lensing was discussed by K. Knudsen.

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

See attachment.

4. Financial Report / RadioNet3 contribution

The RadioNet3 contribution was used to waive the conference fee for the 11 invited speakers, for a total of 3370 EUR.

5. Conference Proceedings and Web page

The pdf of the presentations will be uploaded to the conference website:

<http://www.chalmers.se/en/conference/Galaxies-of-Many-Colours/Pages/default.aspx>

Galaxies of many colours - List of participants

S. Aalto	Chalmers University, Sweden
A. Adamo	Stockholm University, Sweden
F. Aghaee	IPM, Iran
E. Bellocchi	CSIC/INTA, Spain
J. Black	Chalmers University, Sweden
W. Chamani	Göttingen University, Germany
J. Conway	OSO - Chalmers University, Sweden
F. Costagliola	Chalmers University, Sweden
T. Davis	Hertfordshire University, UK
Y. S. Dai	Caltech, US
G. Drouart	Chalmers University, Sweden
N. Falstad	Chalmers University, Sweden
J. Fischer	Naval Research Laboratory, US
J. Fogasy	Chalmers University, Sweden
E. Freeland	Stockholm University, Sweden
G. Fuller	Jodrell Bank Centre for Astrophysics, UK
J. Gallagher	Wisconsin University, US
R. H. Golshan	Institute for Research in Fundamental Sciences, Tehran, Iran
E. Gonzalez-Alfonso	Univiversity of Alcalá de Henares, Spain
T. Greve	UCL, UK
L. Hunt	INAF - Arcetri Observatory, Italy
T. Izumi	Tokyo University, Japan
K. Knudsen	Chalmers University, Sweden
T. Kodama	NAOJ, Japan
S. Konig	IRAM, France
J. Kotilainen	FINCA, Turku University, Finland
K. Larson	Institute for Astronomy, Hawaii University, US
M. Lehnert	IAP, France
J. Leja	Yale University, US
L. Lindroos	Chalmers University, Sweden
B. Lofaro	LAM, France
C. Ly	NASA Goddard Space Flight Center, US
H. Martel	Laval University, Canada
A. M. Mickaelian	BAO, Armenia
J. Moreno	Cal Poly Pomona, US
T. Nakajima	Nagoya University, Japan
E. Nelson	Yale University, US
V. Olivares Sepulveda	Concepción University, Chile
F. Pozzi	Physics and Astronomy Department, Bologna, Italy
B. Rocca-Volmerange	IAP, France
A. Romeo	Chalmers University, Sweden
K. Sakamoto	ASIAA, Taiwan
D. Sanders	Hawaii University, US
N. Scoville	Caltech, US
J. Scudder	Sussex University, UK
J. Silk	IAP, France

S. Tavasoli	IPM, Iran
M. Thomasson	Chalmers University, Sweden
R. Tunnar	UCL, UK
J. Turner	UCLA, Chicago, US
S. van den Broek	Leiden Observatory, Netherlands
P. van der Werf	Leiden Observatory, Netherlands
E. Varenius	Chalmers University, Sweden
B. Villarroel Rodriguez	Uppsala University, Sweden
D. J. Williamson	Laval University, Canada
T. Yoast-Hull	Wisconsin University, US

On behalf of the SOC and LOC
Francesco Costagliola

