The Milky Way panorama.
Credit: ESO/S. Brunier

Discs in Galaxies

2016 Munich Joint Conference
11–15 July, ESO Headquarters, Germany

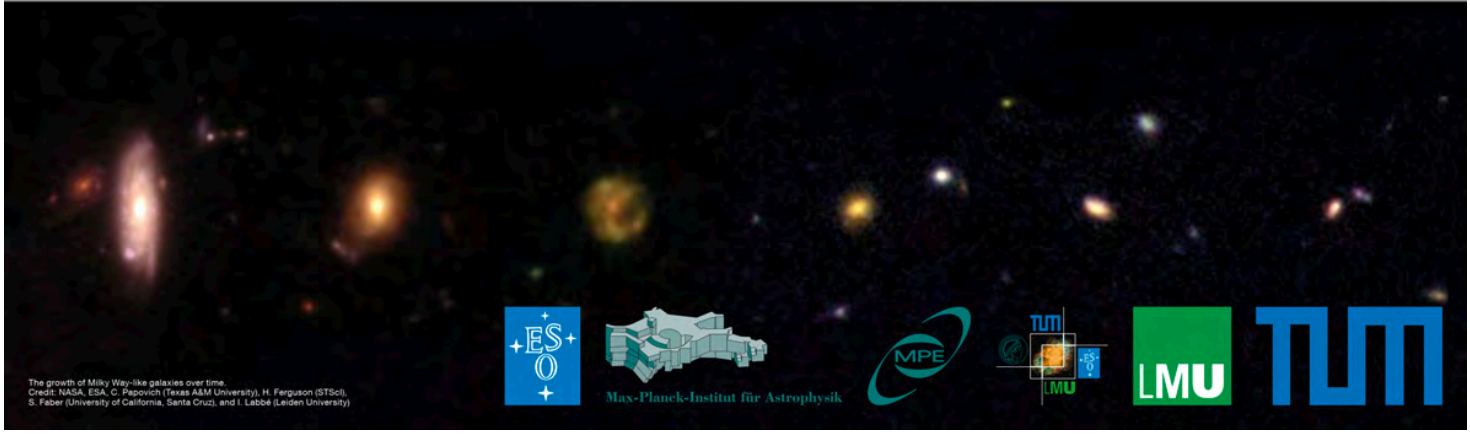
Wide Field Imager view of the spiral galaxy NGC 247.
Credit: ESO

Scientific Organising Committee

Andi Burkert (LMU)
Françoise Combes (IAP, Paris)
Mark Dickinson (NOAO, Tucson)
Richard Ellis (ESO, Chair)
Bruce Elmegreen (IBM, Watson)
Eric Emsellem (ESO)
Amina Helmi (Groningen)
Lars Hernquist (Harvard)
Guinevere Kauffmann (MPA)
Linda Tacconi (MPE)
Hans Walter Rix (MPiA, Heidelberg)

The Sombrero Galaxy. Credit:ESO/P. Barthel,
Acknowledgements: Mark Neeser (Kapteyn Institute, Groningen)
and Richard Hook (ST/ECF, Garching, Germany)

Registration/abstract submission	from 11 January 2016	http://www.eso.org/sci/meetings/2016/Discs2016.html
Abstract submission deadline	18 March 2016	digal2016@eso.org
Early registration closes	29 April 2016	



The growth of Milky Way-like galaxies over time.
Credit: NASA, ESA, C. Papovich (Texas A&M University), H. Ferguson (STScI),
S. Faber (University of California, Santa Cruz), and I. Labbé (Leiden University)

Max-Planck-Institut für Astrophysik

List of Participants / Discs in Galaxies on 11.-15.07.2016

Last name	First name	Affiliations
Al-Sadooni	Ameerah	Keele University
Aumer	Michael	Rudolf Peierls Centre for Theoretical Physics, University of Oxford
Bahe	Yannick	MPA Garching
Barrera-Ballesteros	Jorge K.	Johns Hopkins University
Behrendt	Manuel	MPE
Bergemann	Maria	Max Planck Institute for Astronomy
Bernard	Edouard	Lagrange - Observatoire de la Côte d'Azur, France
Bian	Fuyan	Australian National University, Australia
Bigiel	Frank	ZAH/ITA, Univ. of Heidelberg
Binney	James	University of Oxford
Bizyaev	Dmitry	Apache Point Observatory/NMSU
BLANA	MATIAS	Max Planck Institute for extraterrestrial Physics (MPE)
Bouche	Nicolas	IRAP
Bournaud	Frederic	CEA Saclay
Bovy	Jo	University of Toronto
Bower	Richard	Institute for Computational Cosmology
Buck	Tobias	Max-Planck Institut für Astronomie
Burkert	Andreas	University of Munich
Choudhury	Omar	Leibniz-Institute für Astrophysik Potsdam (AIP)
Cirasuolo	Michele	ESO
Cole	David	University of Oxford
Cordero	Maria	University of Heidelberg
Curti	Mirko	Università degli Studi di Firenze - INAF Osservatorio Astrofisico di Arcetri
Dalcanton	Julianne	University of Washington, USA
Das	Payel	University of Oxford
Dekel	Avishai	Hebrew University
Desmond	Harry	Stanford University
Dessauges	Miroslava	Geneva Observatory, University of Geneva
Dettmar	Ralf-Juergen	Ruhr-Universitaet Bochum
Drory	Niv	McDonald Observatory, The University of Texas at Austin
Egusa	Fumi	NAOJ
Ellis	Richard	ESO
Elmegreen	Bruce	IBM T.J. Watson Research Center
Emsellem	Eric	ESO
Erwin	Peter	MPE
Feldmann	Robert	University of California, Berkeley
Gadotti	Dimitri	ESO
Galaz	Gaspar	Institute of Astrophysics, P. Universidad Catolica de Chile
Genel	Shy	Columbia University
Genzel	Reinhard	Max Planck Institute for Extraterrestrial Physics
Gilmore	Gerry	IoA Cambridge
Gimeno	German	Gemini Observatory
Girard	Marianne	Geneva Observatory
Glazebrook	Karl	Swinburne University of Technology
Gomez	Facundo	Max Planck Institute for Astrophysics
Gouliermis	Dimitrios	Heidelberg University
Grand	Rob	Heidelberg Institute for Theoretical Studies
Grisdale	Kearn	University of Surrey
Grosboel	Preben	ESO
Guérou	Adrien	ESO, Garching / IRAP-OMP-UPS
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Halle	Anaelle	Institut d'Astrophysique de Paris
Hart	Ross	University of Nottingham
Hernitschek	Nina	Max-Planck-Institut für Astronomie
Herrera-Camus	Rodrigo	MPE
Hessman	Frederic V.	Georg-August-Universitaet Goettingen
Iodice	Enrichetta	INAF - Astronomical Observatory of Capodimonte
Iorio	Giuliano	Università di Bologna
Jog	Chanda	Indian Institute of Science, Bangalore, India
Johnson	Helen	Durham University
Jones	Tucker	Institute for Astronomy, University of Hawaii
Jozsa	Gyula I. G.	SKA South Africa/Rhodes University
Just	Andreas	ZAH/ARI
Kasparova	Anastasia	Sternberg Astronomical Institute, Moscow State University

List of Participants / Discs in Galaxies on 11.-15.07.2016

Last name	First name	Affiliations
Kassin	Susan	STScI
Kauffmann	Guinevere	Max Planck Institute for Astrophysics
Kautsch	Stefan J.	Nova Southeastern University
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Klitsch	Anne	Max Planck Institute for Astrophysics
Kodama	Tadayuki	National Astronomical Observatory of Japan
Kreckel	Kathryn	MPIA
Kruk	Sandor	University of Oxford
Krumholz	Mark	Australian National University
Lang	Philipp	MPE Garching
Lee	Minju	The University of Tokyo
Leethochawalit	Nicha	California Institute of Technology
Leslie	Sarah	MPIA
Lippa	Magdalena	Max Planck Institute for extraterrestrial physics
Lutz	Dieter	MPE
Lutz	Katharina	Swinburne University / ATNF, CSIRO
M	Honey	Indian Institute of Astrophysics
Margalef Bentabol	Berta	University of Nottingham
Martinsson	Thomas	IAC
Menacho	Veronica	Stockholm University
Merrifield	Michael	University of Nottingham
Narbutis	Donatas	Center for Physical Sciences and Technology, Lithuania
Newman	Andrew	Carnegie Institution for Science
Newman	Jeffrey	University of Pittsburgh
Oosterloo	Tom	Netherland Institute for Radio Astronomy & Groningen Universty
Patsis	Panos	Research Center for Astronomy, Academy of Athens
Peng	Zhixin	Nanjing University
Perez Martinez	Jose Manuel	University of Vienna
Perez-Villegas	Angeles	MPE
Pfenniger	Daniel	Astronomy, Geneva Observatory, Switzerland
Pillepich	Annalisa	Harvard University/MPIA Heidelberg
Pinna	Francesca	Instituto de Astrofísica de Canarias
Popping	Gergö	ESO
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Price	Sedona	UC Berkeley
Puschnig	Johannes	Stockholm University
Quinn	Peter	ICRAR, The University of Western Australia
Renaud	Florent	University of Surrey
Rix (SOC/LOC)	Hans Walter	MPIA, Heidelberg
Saburova	Anna	Sternberg Astronomical Institute of Moscow State University
Sachdeva	Sonali	Inter-University Centre for Astronomy and Astrophysics
Sanchez-Blazquez	Patricia	Pontificia Universidad Catolica
Sarzi	Marc	Univ. of Hertfordshire
Schinnerer	Eva	MPIA
Schoenrich	Ralph	University of Oxford
Schruba	Andreas	MPE
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Shabani	Faiezeh	Astronomisches Rechen-Institut- Heidelberg
Shi	Jingjing	SISSA
Silchenko	Olga	Sternberg Astronomical Institute of the Lomonosov Moscow State University
Simons	Raymond	Johns Hopkins University
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Tadaki	Kenichi	MPE
Taranu	Dan	ICRAR/UWA
Toyouchi	Daisuke	Tohoku university
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TUNÇEL GÜÇTEKİN	Sabiha	Graduate School of Science and Engineering
Übler	Hannah	MPE
van de Sande	Jesse	Sydney Institute for Astronomy, Sydney University
Walch	Stefanie	University of Cologne
Wechsler	Risa	Stanford University, USA
Wegg	Chris	MPE
Wilman	David	USM & MPE

List of Participants / Discs in Galaxies on 11.-15.07.2016

Last name	First name	Affiliations
Wu	Po-Feng	Institute for Astronomy, University of Hawaii
Wu	Yu-Ting	Academia Sinica Institute of Astronomy & Astrophysics
Wuyts	Stijn	University of Bath
Zwaan	Martin	ESO

Discs in Galaxies – Garching bei Muenchen, Germany – 11.07.2016 – 15.07.2016

Day 1, Monday July 11th, 2016 (afternoon)		
12:00-13:30	Registration (open until 14:00)	
13:30-13:45	Welcome and Logistics	Richard Ellis
	R=Review (35+5), I=Invited (25+5), and Contributed (15+5)	
	Session I - Galactic Discs: Fundamentals	
	Chair - Andreas Burkert	
13:45-14:25	The Secular Evolution of Disc Galaxies and the Origin of Exponential and Double Exponential Surface Density Profiles	Bruce Elmegreen (R)
14:25-14:45	Hierarchical star formation across galactic discs	Dimitrios Gouliermis
14:45-15:05	First results from the EMPIRE Nearby Galaxy Dense Gas Survey	Frank Bigiel
15:05-15:25	HI discs in nearby galaxies from the HALOGAS survey	Gyula I. G. Jozsa
15:25-15:45	The HIX galaxy survey: the most HI rich discs in the Southern hemisphere	Katharina Lutz
15:45-16:15	**Coffee/tea break**	
16:15-16:45	The Origin of Turbulence in Galactic Discs	Mark Krumholz (I)
16:45-17:05	Impact of galactic environment on star formation	Kathryn Kreckel
17:05-17:25	Impact of integrated parameters in the MaNGA local mass-metallicity relation	Jorge K. Barrera-Ballesteros
17:25-17:45	Star-forming regions in local galaxies & QSOs: size & scaling relations	Dieter Lutz
17:45-18:05	A fresh look on cosmic rays and magnetic fields in disc galaxies	Ralf-Jürgen Dettmar
18:05	END of Day 1	
18:15	Welcome Reception	

Discs in Galaxies – Garching bei Muenchen, Germany – 11.07.2016 – 15.07.2016

Day 2, Tuesday July 12th 2016		
08:00-09:00	Additional Registration	
	Chair - Eric Emsellem	
09:00-09:30	Regulating Star Formation in Galaxy Discs	Eva Schinnerer (I)
09:30-09:50	The ISM structure and star formation process in nearby disc galaxies	Andreas Schruba
09:50-10:10	Disentangling the evolution of S0 galaxies using spectral data cubes	Michael Merrifield
10:10-10:40	Disc Galaxies in the SDSS-IV/MaNGA IFU Survey	Niv Drory (I)
10:40-11:10	**Coffee/Tea break**	
11:10-12:00	Panel discussion	
	END of Session I	
12:00-13:30	**Lunch**	
	Session II - The Emergence of Early Discs	
	Chair - Richard Ellis	
13:30-14:10	The Formation and Evolution of Massive Star Forming Disk Galaxies	Reinhard Genzel (R)
14:10-14:30	Kinematics of z~2 star-forming galaxies with MOSDEF, CANDELS & MassiveFIRE	Sedona Price
14:30-14:50	High resolution studies of lensed z~2 galaxies: kinematics & metal gradients	Nicha Leethochawalit
14:50-15:10	KMOS-3D: the mass budget in early star-forming galaxies	Stijn Wuyts
15:10-15:30	Revealing the assembly history of discs in galaxies through higher order stellar kinematics with SAMI	Jesse van de Sande
15:30-16:00	**Coffee/Tea break**	
16:00-16:30	A new global stability parameter for disks	Karl Glazebrook (I)
16:30-16:50	Falling outer rotation curves of star-forming galaxies at z~0.7-2.6 probed from KMOS-3D and SINS/zC-SINF	Philipp Lang
16:50-17:10	Formation of bulges, discs and two component galaxies in the CANDELS survey at z<3	Berta Margalef-Bentabol
17:10-17:30	ALMA reveals rapid formation of a dense core for massive discs at z~2	Kenichi Tadaki
17:30-18:00	Early Disc Galaxies Revealed by Gravitational Lensing	Tucker Jones (I)
18:00	END of Day 2	

Day 3, Wednesday July 13th, 2016		
	Chair - Linda Tacconi	
08:30-09:00	Evolution of High-z Disks: Theoretical perspective	Avishay Dekel (I)
09:00-09:20	The fate of giant star-forming clumps	Robert Feldmann
09:20-09:40	Disc assembly as seen by the SIGMA survey	Susan Kassin
09:40-10:00	The build-up of low-mass discs revealed by deep MUSE observations	Nicolas Bouché
10:00-10:30	**Coffee/Tea break**	
10:30-11:00	Discs in Early Quiescent Galaxies	Andrew (Drew) Newman (I)
11:00-11:20	The nature of star-forming disc galaxies in proto-clusters	Tadayuki Kodama
11:20-12:00	Panel discussion	
	END of Session II	
12:00-13:30	**Lunch**	
	Session III - The Milky Way and Local Group	
	Chair - Bruce Elmegreen	
13:30-14:10	Galaxy Evolution at High Resolution: the New View of the Milky Way's Disc	Jo Bovy (R)
14:10-14:40	The Most Detailed View of Astrophysics in a Spiral Disc: Lessons from the Panchromatic Hubble Andromeda Treasury	Julianne Dalcanton (I)
14:40-15:00	Morphology & kinematics of neutral hydrogen in the vicinity of z~0 galaxies with Milky Way masses: a study with Illustris simulations	Guinevere Kauffmann
15:00-15:20	New Insight into the History & Evolution of M31's Disc	Edouard Bernard
15:20-15:50	**Coffee/Tea break**	
15:50-16:20	Chemical abundance distributions in the Milky Way disk and their origin	Maria Bergemann (I)
16:20-16:40	C, N and α-element abundances determine the formation sequence of the Galactic thin and thick discs	Gerry Gilmore
16:40-17:00	The chemodynamical evolution of the Milky Way disc	Andreas Just
17:00	END of Day 3	
19:00	Conference Dinner	

Discs in Galaxies – Garching bei Muenchen, Germany – 11.07.2016 – 15.07.2016

Day 4, Thursday July 14th, 2016		
	Chair - Eva Schinnerer	
09:00-09:30	Satellites of the Milky Way's Siblings	Risa Wechsler (I)
09:30-09:50	Dynamic modelling of the inner Galactic barred disc	Matthieu Portail
09:50-10:10	Action-based dynamical modelling for the Milky Way disc	Wilma Trick
10:10-10:30	Gravitational scattering in the Galactic disc and the old high altitude open clusters	Bengt Gustafsson
10:30-11:00	**Coffee/Tea break**	
11:00-11:20	The Milky Way disc in its extragalactic context	Jeffrey Newman
11:20-12:00	Panel discussion	
	END of Session III	
12:00-13:30	**Lunch**	
	Session IV - Interfacing Theory with Observations	
	Chair - Risa Wechsler (TBC)	
13:30-14:10	Disc Galaxies: Building Blocks of the Universe	Richard Bower (R)
14:10-14:30	Formation and evolution of Milky Way sized galaxies in high resolution cosmological zoom simulations	Robert Grand
14:30-14:50	Stellar radial migration in discs: quantification of churning & blurring	Anaelle Hallé
14:50-15:10	Dissecting disc and bulges with SAMI and Romulus	Dan Taranu
15:10-15:40	**Coffee/Tea break**	
15:40-16:10	Disc Dynamics in the Early Universe: instabilities, giant clumps, feedback & outflows	Frédéric Bournaud (I)
16:10-16:30	The quiescent growth of galactic discs	James Binney
16:30-16:50	Role of gas in supporting global spiral structure in galaxies	Chanda Jog
16:50-17:10	The distribution of atomic hydrogen in simulated galaxies: morphologies, profiles & HI holes	Yannick Bahe
17:10-17:40	Star Formation Regulated by Disc Dynamics	Florent Renaud (I)
17:40	END of Day 4	

Discs in Galaxies – Garching bei Muenchen, Germany – 11.07.2016 – 15.07.2016

Day 5, Friday July 15th, 2016		
	Chair - James Binney	
09:00-09:30	Star formation and feedback in simulated galactic discs	Stefanie (Steffi) Walch (I)
09:30-09:50	Using hydro simulations to interpret observed kinematic maps of star-forming galaxies	Raymond Simons
09:50-10:10	Ex-situ discs with Eris and Illustris	Annalisa Pillepich
10:10-10:30	Survival of pure disc galaxies over the last 8 billion years	Sonali Sachdeva
10:30-11:00	**Coffee/Tea break**	
11:00-11:20	Understanding the baryonic cycle: confronting galaxy physics with the mass-metallicity relation and dust content over cosmic time	Gergö Popping
11:20-11:50	Galactic winds and the angular momentum of simulated disc galaxies	Shy Genel (I)
11:50 - 12:30	Concluding Panel Discussion	
12:30	END OF CONFERENCE	

Talks

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

BAHE, Yannick
MPA, Garching bei München, Germany

Title talk:
The distribution of atomic hydrogen in simulated galaxies: morphologies, profiles, and H I holes.

Talk abstract:
I will present an analysis of the content, shape, and distribution of atomic hydrogen (HI) in simulated galaxies from the «Evolution and Assembly of Galaxies and their Environment» (EAGLE) project. Our analysis shows that EAGLE matches the observed relation between HI and stellar mass in unprecedented detail. Furthermore, the simulated galaxies broadly reproduce the observed HI mass-size relation, as well as measured HI density profiles. Interestingly, many simulated galaxies show large HI `holes' that lead to a mass deficit in the galactic centres; accounting for their presence leads to superb agreement of simulated galaxies with observed HI profiles. I will discuss some clues to the origin of these unphysically large holes. Finally, if time permits, I will present first results from a follow-up project aiming to understand the reasons why some galaxies contain so much more HI than others, while still obeying the same scaling relations.

Author/s of this Distribution:
Yannick Bahe, et al.

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

BARRERA-BALLESTEROS, Jorge K.
Johns Hopkins University, Baltimore, USA

Title talk:
The impact of integrated parameters in the MaNGA local mass-metallicity relation.

Talk abstract:
We present the surface mass density - gas metallicity (Σ_*-Z) relation for more than 500,000 spatially-resolved star-forming regions from a sample of 617 disk galaxies included in the MaNGA survey. We find a tight relation between these local properties with higher metallicities as the surface density increases, resembling a scaled-down version of the relation found previously for their integrated counterparts. This relation expands over three orders of magnitude in the surface mass and a factor of 8 in metallicity. Our large sample allows us to study the impact of global properties in this local relation. In particular, we find that for most disk galaxies the Σ_*-Z relation does not depend on the total stellar mass. Even more, for a large fraction of our sample ($\log(\mathrm{M}_*/M_{\odot})$ > 9.2) the observed metallicity gradients are well reproduced by the mass density gradients and the Σ_*-Z relation. We also find that this relation does not change significantly within the range of redshifts span by our sample. Our results suggest as the predominant scenario for metal enrichment as gas been recycled locally at shorter timescales in comparison to other global processes such as gas accretion or outflows.

Author/s of Contribution:
J.K. Barrera-Ballesteros, T. Heckman, G. Ben, N. Zakamzka, S.F. Sanchez

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

BIGIEL, Frank
ZAH/ITA, Univ. of Heidelberg, Germany

Title talk:
First Results from the EMPIRE Nearby Galaxy Dense Gas Survey.

Talk abstract:
I will present first results from our EMPIRE survey, a large program (~500 hr) at the IRAM 30m telescope to map high critical density gas and shock tracers (e.g., HCN, HCO+, HNC, N2H+, etc.) as well as the optically thin 1-0 lines of 13CO and C18O for the first time systematically across 9 prominent, nearby Disk Galaxies.

"How is star formation regulated across disk galaxies" is the central question framing our science. Specifically, and building on a large suite of available ancillary data from the radio to the UV, we study, among other things, dense gas fractions and star formation efficiencies and how they vary with environment within and among nearby disk galaxies. Of particular interest is how our measurements compare to studies in the Milky Way, predicting a fairly constant star formation efficiency of the dense gas. Already in our first case study focusing on the prominent nearby spiral galaxy M51, we find signifycant variations of this quantity across the disk.

In my talk, I will present results from a first series of studies about to me submitted addressing these questions with our EMPIRE and complementary, high-resolution ALMA data. In addition, I will present details of the survey and report on ongoing projects and future directions. I will place our work in context with other work, including studies of dense gas tracers in other galaxies and in particular the Milky Way.

Author/s of this Distribution:
F. Bigiel & EMPIRE Team

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

BINNEY, James
Rudolf Peierls Centre for Theoretical Physics, Oxford University, U.K.

Title talk:
The quiescent growth of galactic discs

Talk abstract:
We use N-bodies to simulate the growth since redshift ~2 of an isolated disc in a live halo. Giant molecular clouds (GMCs), The bar and spiral structure all play key roles in the evolution of the disc. Our GMCs are short-lived and have masses drawn from a mass spectrum. Their number density is related to the SFR. For the expected number densities and likely maximum masses of GMCs, they heat the disc very effectively at early times, and either postpone or cancel bar formation. They generate remarkably exponential vertical profiles. Spiral structure drives a level of radial migration that agrees well with that predicted by models of local chemical evolution. The radial patterns of star formation include different levels of inside-out growth. The radial scale length of the final disc is always greater than any of the scale lengths used for star formation and rather independent of the extent of inside-out growth. The only way to obtain a thick disc nearly as massive as those observed is to include in the initial conditions a massive, extended object that will be compressed into the present thick disc by the gravity of the thin disc.

Author/s of Contribution:
James Binney, Michael Aumer, Ralph Schoenrich

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

BOUCHE, Nicolas
IRAP, Toulouse, France

Title talk:
The build up of low-mass disks revealed by deep MUSE observations

Talk abstract:
The kinematics (and its evolution) of L* galaxies is now relatively well established up to redshift z=3, thanks to large IFU surveys such as SINS and KMOS3D. However, little is known about the kinematics of lower mass galaxies (below 1E10Msun). We use MUSE to characterize the kinematics of this population at intermediate redshift. We find that the low mass galaxies follow the Tully-Fisher relation defined from previous IFU surveys but with a higher dispersion; and follow the scaling relations defined in the local universe between the specific angular momentum and the stellar mass with a continuous transition from the disk-dominated to dispersion dominated locus.

Author/s of Contribution:
Bacon, Contini, and MUSE-GTO team

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

DETTMAR, Ralf-Jürgen
Astronomisches Institut, Ruhr-Universitaet Bochum, Germany

Title talk:
Wiggling Disks

Talk abstract:
SDSS images have been used to identify a small sample of edge-on disc galaxies with corrugated substructure in the dust lanes. We have measured both the wavelengths and the amplitudes of the wave pattern for this sample in "un-sharp masked" images. The galaxies studied are supplemented with additional measurements from the literature and the total sample discussed covers rotational velocities from 80 km/s to 230 km/s. For most galaxies the wavelength of the corrugation is comparable to the disk scale-length while the amplitude is between 1/10 and 2/3 of the scale-height for the stellar disk.

The measurements are used to perform a dynamical stability analysis and the results are discussed in the context of recent findings for a "wobbly" Galactic disk.

Author/s of this Distribution:
Ralf-Juergen Dettmar & Chaitra Narayan

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

FELDMANN, Robert
Dept. of Astronomy, University of California, Berkeley, USA

Title talk:
The fate of giant star forming clumps

Talk abstract:
Observations reveal the presence of extended, star forming clumps in the disks of many high redshift galaxies. Many of these clumps form from gravitational instabilities in gas-rich disks and they may play an important role in growing the galactic bulges at those times. A crucial uncertainty is, however, whether giant clumps are disrupted by their own stellar feedback before reaching the center of their host galaxies. I will present new results based on ultra-high resolution cosmological, hydrodynamical simulations of disk galaxies at z~1-2 that include explicit modeling of supernovae and radiation pressure feedback. The feedback model in these simulations has been validated in a number of publications and reproduces empirical relations between stellar mass, halo mass, and metallicity, as well as properties of galactic winds. I will discuss the lifetimes of the simulated clumps, their migration, and their contribution to the growth of the stellar mass and central bulge. I will also demonstrate that mass-weighted stellar ages of clumps are not a good indicator of their actual lifetimes and that clumps with older stellar populations naturally reside closer to the galactic center even in the absence of strong migration. Finally, I will argue that giant clumps at z~1-2 resemble scaled-up versions of local giant molecular clouds (GMCs). They lie on the same mass-radius relation as GMCs and have comparable star formation efficiencies.

Author/s of Contribution:
R. Feldmann, A. Oklopcic, P. F. Hopkins, and others

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

GILMORE, Gerry
IoA Cambridge, U.K.

Title talk:
Carbon, nitrogen and α-element abundances determine the formation sequence of the Galactic thick and thin discs

Talk abstract:
Using the DR12 public release of APOGEE data, we show that the thin and thick discs separate very well in the space defined by [α/Fe], [Fe/H] and [C/N]. Thick disc giants have both higher [C/N] and higher [α/Fe] than do thin disc stars with similar [Fe/H]. We deduce that the thick disc is composed of lower mass stars than the thin disc. Considering the fact that at a given metallicity there is a one-to-one relation between stellar mass and age, we are then able to infer the chronology of disc formation. Both the thick and the thin discs - defined by [α/Fe] - converge in their dependence on [C/N] and [C+N/Fe] at [Fe/H]≈-0.7. We conclude that (1) the majority of thick disc stars formed earlier than did the thin disc stars, (2) the formation histories of the thin and thick discs diverged early on, even when the [Fe/H] abundances are similar and (3) that the star formation rate in the thin disc has been lower than in the thick disc, at all metallicities.

Author/s of Contribution:
Gilmore & Masseron

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

GOULIERMIS, Dimitrios
Zentrum für Astronomie, Heidelberg University, Germany

Title talk:
Hierarchical Star Formation across galactic disks

Talk abstract:
Most stars form in clusters. This fact has emerged from the finding that "embedded clusters account for the 70 - 90% fraction of all stars formed in Giant Molecular Clouds (GMCs)." While this is the case at scales of few 10 parsecs, typical for GMCs, a look at star-forming galaxies in the Local Group (LG) shows significant populations of enormous loose complexes of early-type stars extending at scales from few 100 to few 1000 parsecs. The fact that these stellar complexes host extremely large numbers of loosely distributed massive blue stars implies either that stars form also in an unbound fashion or they are immediately dislocated from their original compact birthplaces or both. The Legacy Extra-Galactic UV Survey (LEGUS) has produced remarkable collections of resolved early-type stars in 50 star-forming LG galaxies, suited for testing ideas about recent star formation. I will present results from our ongoing project on star formation across LEGUS disk galaxies. We characterize the global clustering behavior of the massive young stars in order to understand the morphology of star formation over galactic scales. This morphology appears to be self-similar with fractal dimensions comparable to those of the molecular interstellar medium, apparently driven by large-scale turbulence. Our clustering analysis reveals compact stellar systems nested in larger looser concentrations, which themselves are the dense parts of unbound complexes and super-structures, giving evidence of hierarchical star formation up to galactic scales. We investigate the structural and star formation parameters demographics of the star-forming complexes revealed at various levels of compactness. I will discuss the outcome of our correlation and regression analyses on these parameters in an attempt to understand the link between galactic disk dynamics and morphological structure in spiral and ring galaxies of the local universe.

Author/s of Contribution:
Gouliermis and the LEGUS Team

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

GRAND, Robert
Heidelberg Institute for Theoretical Studies, Heidelberg, Germany

Title talk:
The formation and evolution of Milky Way sized galaxies in high-resolution cosmological zoom simulations.

Talk abstract:
Simulations are playing an increasingly important role in probing the formation history of the Milky Way, including the formation of the thick/thin disc and origin of the metal distribution and chemo-dynamical relations. We introduce the Auriga project, a suite of high resolution cosmological-zoom simulations of Milky Way-sized galaxies simulated with the state-of-the-art cosmological magneto-hydrodynamical code AREPO, and present an analysis of the formation and evolution of the stellar disc(s) from early times to present day. In particular, we show that 'thickened discs' are mainly driven by a bar (if present) and interactions with satellites of masses log10 (M/ M$_\odot$) >= 10, whereas other potential heating mechanisms such as spiral arms, radial migration, and adiabatic heating from mid-plane density growth are all sub-dominant. Interestingly, we find that even in cases of violent satellite interactions the disc reforms quickly (within a few giga years), producing a well-defined disc-bulge system. In nearly all simulations the overall structure of the disc becomes gradually more radially extended and vertically thinner with time, in support of the inside-out, upside-down formation scenario, and without the presence of a thin/thick disc dichotomy. In addition, we comment on the mass distribution of mono-abundance populations and their relation to the bulge and disc components, which are readily comparable to observations from surveys such as APOGEE and Gaia.

Author/s of Contribution:
Robert Grand, Volker Springel, Facundo Gomez, Federico Marinacci, Rüdiger Pakmor, David Campbell, Adrian Jenkins

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

GUSTAFSSON, Bengt
Physics and Astronomy, Uppsala University, SWEDEN

Title talk:
Gravitational scattering in the Galactic disk and the old high-altitude open clusters

Talk abstract:
By means of numerical simulations we have investigated the possibility that the observed heating of the Thin Disk and the existence of old high-altitude open clusters are both the result of gravitational scattering by GMCs and other inhomogeneities in the Galactic potential.

We find consistency between model results and observations, but the results are very dependent on the structure adopted for the GMCs and their surroundings.

Author/s of Contribution:
Bengt Gustafsson, Roy Church, Melvyn Davies, Hans Rickman

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

HALLE, Anaelle
Institut d'Astrophysique de Paris, France

Title talk:
Stellar radial migration in discs: a quantification of churning and blurring

Talk abstract:
Radial stellar migration in galactic discs has received much attention in studies of galactic dynamics and chemical evolution, but remains a dynamical phenomenon that needs to be fully quantified. We present results from Halle et al 2015 and extensions on the churning (change in angular momentum) and blurring (radial epicyclic oscillations) in simulations of bar-dominated discs, and we discuss the influence of radial migration on the dynamical heating of stellar discs.

Author/s of Contribution:
A. Halle, P. Di Matteo, M. Haywood, F. Combes

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

JOG, Chanda
Department of Physics, Indian Institute of Science, Bangalore, India

Title talk:
Role of gas in supporting global spiral structure in galaxies

Talk abstract:
It is well-known that the two-armed spiral density wave in a galactic disk would be destroyed by group transport within about a billion years, as shown in a classic paper by Toomre. We include the low-velocity dispersion component, namely gas, along with stars in the formulation of the density wave theory, and obtain the dispersion relation for this coupled system. We show that the inclusion of gas makes the group transport slower, thus allowing the pattern to persist longer – for several billion years. Though still less than the Hubble time, this allows the spiral structure to be more long-lived. Further, we study NGC 6946, NGC 2997, and M 51, and show that the inclusion of gas is essential to get a stable density wave for the observed values of pattern speeds for these galaxies. Thus, the inclusion of even a small amount of gas (~ 15-20 % by mass) has a significant dynamical effect on the value of pattern speed allowed, and hence on the secular evolution of a galactic disc.

Author/s of Contribution:
Soumavo Ghosh, Chanda J. Jog

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

JOZSA, Gyula I. G.
SKA South Africa/Rhodes University, Cape Town, Republic of South Africa

Title talk:
HI disks in nearby galaxies from the HALOGAS survey.

Talk abstract:
The HALOGAS (Hydrogen Accretion in LOcal GAlaxieS) survey with the Westerbork Synthesis Radio Telescope is the most sensitive systematic survey of the diffuse neutral hydrogen component in nearby spiral galaxies so far. The 5-sigma column density sensitivity reached for the sample of 22 galaxies is ~10^19 atoms cm^-2 over the typical line width of the neutral gas in our target galaxies. The 3D observations are sensitive enough to perform detailed kinematical and dynamical analyses of the extended (vertical) disk structure of our targets. Additionally, we are able to provide a census of the complete cold neutral cloud population above the mass detection limit for individual objects of 10^5 solar masses on average. Our results are relevant in the context of theories describing star formation feedback on the gaseous interface of the galaxy disks with their surroundings, as well as gas accretion from the intergalactic medium. Most notably, we find that the presence of anomalous, slowly rotating extraplanar gas is related to the star formation surface density. I will present the consequences of our observations for the current accretion in local galaxies, and discuss the implied constraints on the accretion process more generally.

Author/s of Contribution:
Gyula I. G. Jozsa and the HALOGAS team

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

JUST, Andreas
ZAH/ARI, Heidelberg University, Germany

Title talk:
The chemo-dynamical evolution of the Milky Way disc.

Talk abstract:
The kinematic properties of the stellar subpopulations in the Milky Way disc are linked to their radial and vertical scale lengths. On the other hand, element abundances and abundance ratios are a signature of the evolution history of the stellar components. Large spectroscopic surveys like SEGUE, RAVE, APOGEE and Gaia-ESO, combined with proper motions and distances (ultimately from the Gaia mission starting with the TEGAS data release in Sept. 2016) are linking the kinematic and chemical properties and provide powerful tests of any Milky Way model.

Our self-consistent local disc model (the JJ-model) with the star formation history (SFR), the dynamical evolution (AVR) and stellar evolution as ingredients reproduces the local kinematics of main sequence stars, SDSS star counts towards the North Galactic Pole, and the metallicity distribution of G dwarfs very well. From local star counts the IMF is determined and we derive the age-metallicity relation (AMR) and the gas infall rate using the alpha-element and iron distributions. Radially extended data from APOGEE and other surveys allow an insight in the inside-out growth of the Milky Way thin disc. Correlations of radial gradients in density, kinematics, abundances, and age are crucial to constrain the evolution scenario of the Milky Way disc.

Author/s of Contribution:
A. Just

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

KASSIN, Susan
STScI, Baltimore, MD, USA

Title talk:
Disc assembly as seen by the SIGMA survey.

Talk abstract:
We will show recent results from the SIGMA survey of internal galaxy kinematics over $1.3 < z < 3.0$ with the Keck/MOSFIRE spectrograph. We find intriguingly smooth average trends of galaxy kinematics with both stellar mass and redshift. The trends are such that at higher redshifts and lower stellar masses, galaxies are less disc-like. When combined with lower redshift data on galaxy kinematics, we find that these smooth trends continue to the present day. We will discuss how this kinematic transition gives important clues to the physical processes behind the formation of the Hubble Sequence for disc galaxies.

Author/s of this Distribution:
Susan Kassin, Raymond Simons, and the SIGMA team

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

KAUFFMANN, Guinevere
Max Planck Institute for Astrophysics, Garching bei München, Germany

Title talk:
The Morphology and Kinematics of Neutral Hydrogen in the vicinity of z=0 Galaxies with Milky-Way Masses – a study with the Illustris Simulation

Talk abstract:
We analyze the properties of the circumgalactic gas (CGM) around 120 galaxies with stellar and dark matter halo masses similar to that of the Milky Way. We focus on the morphology and kinematics of the neutral hydrogen component of the CGM and how this depends on the ratio of gas-to-stellar mass within the optical radius. In gas-rich galaxies, gas temperatures rise monotonically from center of the halo out to the virial radius. Average neutral gas column densities remain higher than 10**19 atoms cm−2 all the way from the center of the galaxy out to radii of 50-70 kpc. In gas-poor galaxies with fg < 0.1, gas temperatures remain fixed at ~10^6 K from the edge of the disk out to radii of 100 kpc. The column density of neutral gas drops below 1019 atoms cm−2 at radii of 10 kpc. The neutral gas distributions are also more asymmetric in gas-poor galaxies. Most of these trends can be explained by the fact that in the Illustris simulation, gas-poor galaxies with Milky Way masses have massive (108M⊙) black holes that accrete at few percent of Eddington, and that energy is being dumped into the halo at large (100 kpc) radii in the form of bubbles of hot gas in these systems. We also find that the circumgalactic gas rotates coherently about the center of the galaxy with a maximum rotational velocity of around 200 km/s. In gas-rich galaxies, the average coherence length of the rotating gas is 40 kpc, compared to 10 kpc in gas-poor galaxies. In the most gas-rich systems, the CGM can rotate coherently over scales of 70-100 kpc. We discuss our results in the context of recent observations of the CGM in low mass galaxies via UV absorption-line spectroscopy and deep 21cm observations of edge-on spiral galaxies.

Author/s of Contribution:
Guinevere Kauffmann, Sanchayeeta Borthakur, Dylan Nelson

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

KODAMA, Tadayuki
National Astronomical Observatory of Japan, Tokyo, Japan

Title talk:
The nature of star forming disc galaxies in proto-clusters.

Talk abstract:
We have been conducting Mahalo-Subaru project which targets ~10 proto-clusters as well as unbiased general fields for comparison over the redshift interval of 1.5<z<3.7 covering the peak epoch of galaxy formation and beyond. We employ unique sets of narrow-band filters to map out line-emitting star-forming galaxies (e.g., Ha, [OIII]) associated to the proto-clusters or in some particular redshift slices in the field.

We show that all the clusters have prominent substructures indicating the early assembly phase, and that star formation activity in the cluster cores is very high at z~2, involving a significant fraction of dusty star-bursting galaxies seen as red emitters or SCUBA2 submm sources.
Such strong activities in proto-cluster cores decline sharply as time progresses as (1+z)^6, and the peak of star formation activity is shifted outwards to surrounding lower density regions, clearly indicating the ``inside-out'' formation of galaxy clusters.

Using HST imaging, AO-assisted narrow-band imaging (Ganba-Subaru), and ALMA observations (Gracias-ALMA), we are now at the stage of resolving internal structures of individual galaxies to know the physical processes of galaxy formation in action and their environmental dependence. I will also review all these on-going projects as well as introducing the up-coming 1-sq.deg. SWIMS-18 survey using 18 filters (6 narrow-bands, 9 medium-bands, and 3 broad-bands).

Author/s of Contribution:
Kodama, T. et al.

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

KRECKEL, Kathryn
MPIA, Heidelberg, Germany

Title talk:
The impact of galactic environment on star formation.

Talk abstract:
While spiral arms are the most prominent sites for star formation in disk galaxies, interarm star formation contributes significantly to the overall star formation budget. However, it is still an open question if the star formation proceeds differently in the arm and inter-arm environment. We use deep VLT/MUSE optical IFU spectroscopy to resolve and fully characterize the physical properties of 428 interarm and arm HII regions in the nearby grand design spiral galaxy NGC 628. Unlike molecular clouds (the fuel for star formation) which exhibit a clear dependence on galactic environment, we find that most HII region properties (luminosity, size, metallicity, ionization parameter) are independent of environment. One clear exception is the diffuse ionized gas (DIG) contribution to the arm and interarm flux (traced via the temperature sensitive [SII]/Halpha line ratio inside and outside of the HII region boundaries). We find a systematically higher DIG background within HII regions, particularly on the spiral arms. Correcting for this DIG contamination can result in significant (70%) changes to the star formation rate measured. We also show preliminary results comparing well-corrected star formation rates from our MUSE HII regions to ALMA CO(2-1) molecular gas observations at matched 1"=35pc resolution, tracing the Kennicutt-Schmidt star formation law at the scales relevant to the physics of star formation. We estimate the timescales relevant for GMC evolution using distance from the spiral arm as a proxy for age, and test whether star formation feedback or galactic-scale dynamical processes dominate GMC disruption.

Author/s of Contribution:
Kathryn Kreckel

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

LANG, Philipp
MPE Garching bei München, Germany

Title talk:
Falling outer rotation curves of star-forming galaxies at z=0.7-2.6 probed with KMOS-3D and SINS/zC-SINF

Talk abstract:
The rotation curves of star-forming galaxies at high redshift are currently well probed in their inner parts through deep IFU kinematics, while their extended shapes reaching to the outer faint levels of the disk are still largely unconstrained.

I will present the results of a project examining the unexplored outer rotation curves of star-forming galaxies at high redshift, exploiting the deep H-alpha IFU kinematic data from the SINS/zC-SINF and KMOS-3D surveys. Through stacking the signal of ~100 massive galaxies at z=0.7-2.6, we are for the first time able to constrain a representative rotation curve out to several effective radii. Our stacked rotation curve exhibits a turnover with a significant decrease in rotation velocity in the outer regions, significantly strengthening the tantalizing evidence previously hinted at in a handful only of individual disks among our sample with the deepest data.

These results are in good agreement with recent studies demonstrating that star-forming disks at high redshift are strongly baryon-dominated; the steep falloff of the outer rotation curve further indicates a significant level of pressure support at large radii, with important implications on the outer disk structure of massive high-redshift galaxies.

Author/s of Contribution:
Philipp Lang, Natascha Förster Schreiber, Reinhard Genzel, Stijn Wuyts, Emily Wisnioski, et al.

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ESO Garching, July 11th – 15th, 2016

LEETHOCHAWALIT, Nicha
Astronomy, California Institute of Technology, Pasadena, USA

Title talk:
High Resolution Studies of Lensed z~2 Galaxies: Kinematics and Metal Gradients

Talk abstract:
We use the OSIRIS integral field unit (IFU) spectograph to secure spatially-resolved strong emission lines of 15 gravitationally-lensed star-forming galaxies at redshift z~2. With the aid of gravitational lensing and Keck laser-assisted adaptive optics, the spatial resolution of these sub-luminous galaxies is at a few hundred parsecs. First, we demonstrate that high spatial resolution is crucial in diagnosing the kinematic properties and dynamical maturity of z~2 galaxies. We observe a significantly lower fraction of rotationally-supported systems than what has been claimed in lower spatial resolution surveys. Second, we find a much larger fraction of z~2 galaxies with weak metallicity gradients, contrary to the simple picture suggested by earlier studies that well-ordered rotation develops concurrently with established steep metal gradients in all but merging systems. Comparing our observations with the predictions of hydronamical simulations, strong feedback is likely to play a key role in flattening metal gradients in early star-forming galaxies.

Author/s of Contribution:
Nicha Leethochawalit, Tucker A. Jones, Richard S. Ellis, Daniel P. Stark, Johan Richard, Adi Zitrin, Matthew Auger

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

LUTZ, Dieter
MPE, Garching bei München, Germany

Title talk:
The star forming region in local galaxies and QSOs: Size and scaling relations

Talk abstract:
We have used Herschel/PACS data with excellent PSF stability to determine the size of the far-infrared emitting (i.e. star-forming) region in ~400 local galaxies and PG QSOs. FIR size and surface brightness scale with FIR luminosity, distance from the main sequence, and FIR color. Ultraluminous infrared galaxies far above the main sequence inevitably have small high surface brightness FIR emitting regions and can be close to optically thick at these wavelengths. Compared to these local relations, first ALMA sizes for the dust emitting region in high-z galaxies suggest larger size at same IR luminosity. We report a remarkably tight relation with 0.15dex scatter between FIR surface brightness and the [CII]/FIR ratio – the [CII] deficit is more closely linked to surface brightness than to luminosity or color. QSO hosts have similar FIR sizes as normal galaxies, supporting a star formation origin of that emission.

Author/s of Contribution:
D. Lutz

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

LUTZ, Katharina
Swinburne University / ATNF, CSIRO, Hawthorn, VIC, Australia

Title talk:
The HIX galaxy survey: the most HI rich discs in the southern hemisphere.

Talk abstract:
When comparing the gas content of galaxies with their current star formation rate, it has been found that the gas consumption time scale is much smaller than the age of galaxies. In addition, the metallicity within galaxies is much smaller than expected from closed box modelling of galaxies. These discrepancies suggest that galaxies must replenish their gas reservoirs by accretion of metal-poor gas from the intergalactic medium.

In order to investigate this process of gas accretion in more detail we target local galaxies that host an atomic hydrogen (HI) disc at least 2.5 times more massive than expected from their optical properties using scaling relations. For this sample of galaxies, we have been collecting a multiwavelength data set consisting of deep ATCA HI interferometry, ANU SSO 2.3m WiFeS optical integral field spectroscopy and publicly available photometry from GALEX (ultraviolet), WISE and 2MASS (both infrared).

We find that these galaxies are normal star-forming spiral galaxies. However, their specific angular momentum is higher than in control galaxies, which allows these galaxies to support a massive HI disc.

With the help of the HI interferometry and the optical IFU spectra, we are searching for signs of recent gas accretion. These signs may include among other things non-circular motion of HI, warped or lopsided HI discs, both of which can be identified through tilted-ring modelling of the HI disc or inhomogeneities in the IFU-based metallicity maps.

In my talk I will first compare the HI rich galaxies to the control sample and the general galaxy population. I will then move on to the most HI massive galaxy in our sample and discuss its HI kinematics and its gas-phase oxygen abundance distribution in more detail. To conclude I will give an outlook on the more detailed HI kinematics of the remaining HI rich sample.

Author/s of Contribution:
Katharina Lutz, Virginia Kilborn, Barbara Catinella, Baerbel Koribalski, Luca Cortese, Helga Denes, Gyula I. G. Józsa, Tobias Brown and Ivy Wong

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

MARGALEF BENTABOL, Berta
University of Nottingham, U.K.

Title talk:
The Formation of Bulges, Discs and Two Component Galaxies in the CANDELS Survey at z<3

Talk abstract:
The most massive galaxies in the local Universe can be classified as disk-dominated and spheroid-dominated (i.e. Hubble type). However, it is unclear how and when these dominant structures form and the possible connection between them. To address this issue we have investigated massive galaxies (logM>10) in the CANDELS fields at the epoch of 1<z<3, when the Hubble sequence forms, by fitting their light profiles with a single Sérsic fit, as well as with a combination of exponential and Sérsic profiles. We split our sample between having 1 component (disc/spheroid-like galaxies) and those formed by an `inner part' or bulge and an `outer part' or disc (2 components). I will show in this talk that the most massive galaxies are more likely to consist of a bulge and a disk compared to lower mass galaxies. The number of such 2-component systems decreases at higher redshift; by a factor of 3 from z=1 to z=3. We find that single `disc-like' galaxies have the highest relative number densities at all redshifts, and that 2-component galaxies have the greatest increase and become at par with discs by z = 1. We also find that the 2-component systems have an increase in the sizes of their outer components, or `discs' by about a factor of three from z = 3 to z = 1.5, while the inner components or `bulges' stay roughly the same size. This suggests that these systems are growing from the inside out, whilst the bulges or protobulges are in place early in the history of these galaxies.

Author/s of Contribution:
Margalef Bentabol, Berta; Conselice, Christopher J.; Mortlock, Alice; Hartley, Will; Duncan, Kenneth; Ferguson, Harry C.; Koekemoer, Anton M.; Dekel, Avishai; Primack, Joel R.

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ESO Garching, July 11th – 15th, 2016

MERRIFIELD, Michael
School of Physics & Astronomy, University of Nottingham, U.K.

Title talk:
Disentangling the Evolution of S0 Galaxies Using Spectral Data Cubes.

Talk abstract:
While it is fairly well accepted that S0 galaxies evolve from spiral disk systems, the mechanism by which they do so is not well determined. A number of processes, ranging from simply running out of gas to environmentally-driven gas removal, interactions and mergers, have been proposed, and the reality is probably that there are multiple routes between these two states.

One key way to explore how the disk and bulge components in S0 galaxies reached their current states is provided by studies of their spectra: stellar population analysis provides information on the sequence in which these components formed, while the kinematic information in these data holds clues to the degree of violence in the transformation process.

With the availability of large integral-field unit (IFU) spectral surveys of nearby galaxies, there is now the potential to extract this information in a systematic way, to address the questions of which evolutionary channels S0 have galaxies evolved down, and whether these channels depend on other properties of the galaxy such as its mass or environment. Accordingly, we have been developing new tools to extract optimally the information contained within such data, to isolate the spectral properties of these galaxies' disks and bulges.

Results to date are already proving interesting, with bulges of S0s in clusters systematically younger than the disks that surround them, implying a last chaotic burst of star formation near their centres in a reasonably violent transition, while those in less dense environments seem to show older bulges, consistent with star formation in a spiral galaxy simply ceasing.

Author/s of Contribution:
Michael Merrifield, Alfonso Aragon-Salamanca, Evelyn Johnston, Martha Tabor

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

NEWMAN, Jeffrey
Physics and Astronomy / PITT PACC, University of Pittsburgh, USA

Title talk:
The Milky Way Disc in its Extragalactic Context

Talk abstract:
We have produced updated estimates of the scale length of the Milky Way stellar disc by applying hierarchical Bayesian (HB) meta-analysis techniques to the extant literature. Our results combine 29 different photometric measurements based on a wide range of observational datasets, Milky Way models and assumptions, and methodologies; the HB technique is robust to systematic errors that affect only a subset of measurements. In this talk, I will discuss the implications of these improved disc scale length estimates, including separate analyses of optical and infrared measurements (which prove to be consistent with each other). A key finding is that the Milky Way's disc scale length is roughly half as large as would be expected from its luminosity (or total stellar mass) and rotation velocity, lying further from the luminosity-velocity-radius relation than roughly 90% of spirals. Tests with simulations suggest that this result could be connected to the known discrepancies between the properties of the Milky Way's satellite population and predictions from LCDM models. Broader exploration of the links between disc properties and satellite populations in extragalactic samples may be a productive avenue for future work.

Author/s of Contribution:
Jeffrey Newman and Timothy Licquia

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

PILLEPICH, Annalisa
Department of Astronomy/Galaxies and Cosmology, Harvard University/MPIA Heidelberg, Cambridge, USA

Title talk:
Ex-situ disks with Eris and the Illustris Simulations

Talk abstract:
In the standard LambdaCDM scenario, hierarchical clustering leads to complex galaxy assembly histories, and the paths leading to the build up of each major stellar component may be different. For example, it is generally accepted that, in late type galaxies, the thin disk naturally forms from the dissipative infall of gas and angular momentum conservation, the bulges can have signature of both early and merger-related formation as well as secular processes that heat the inner disk; and old stars in the thick disk may be brought in by satellites or may result from the dynamical heating of the thin stellar disk by minor mergers, violent relaxation or possibly radial migration.

In this talk, we use the Eris and the Illustris simulations to build a sample of simulated z=0 late-type galaxies and to quantify the occurrence of disk-like, kinematically cold features consisting of stars which have not been formed in situ but have rather been accreted via infalling satellites and mergers: ex-situ disks. We identify the properties of mergers giving rise to such accreted disks, search for observational signatures of their ex situ stars (kinematic and chemical properties, evidences for co-rotation or counter rotation), and connect their presence to possible enhancements of dark matter in the disk plane of Milky-Way like galaxies.

Author/s of Contribution:
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DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

POPPING, Gergö
European Southern Observatory (ESO), Garching bei München, Germany

Title talk:
Understanding the baryonic cycle: Confronting galaxy physics with the mass-metallicity relation and dust content of galaxies over cosmic time.

Talk abstract:
The mass-metallicity relation combines the star formation, metal enrichment, feedback, and baryon accretion history of galaxies and acts as a superb probe of the cycle of baryons through galaxies. Reproducing its cosmic evolution is a stringent constraint on models of galaxy formation. I will present new cosmological models of galaxy formation that include various ejective and preventive feedback schemes and detailed chemical evolution and dust chemistry models. I will present the impact of the different feedback schemes on the evolution of the mass-metallicity relation, compare my predictions with observations, and discuss how this comparison helps us constrain the galaxy physics acting on the baryonic cycle. I will further show that proper accounting for dust emphasizes a serious caveat in our understanding of galaxy formation. Galaxies are too metal enriched at early times.

Author/s of Contribution:
Gergö Popping, Rachel Somerville

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

PORTAIL, Matthieu
MPE, Garching bei München, Germany

Title talk:
Dynamical modelling of the inner Galactic barred disk.

Talk abstract:
Understanding the present state of the Milky Way disk is a necessary first step towards learning about the formation history of our Galaxy. While it is clear from infrared photometry that the inner disk hosts a 5 kpc long bar with a central Box/Peanut bulge, the interplay between the bar and the inner disk remains poorly known. To this end we build N-body dynamical models of the inner Galaxy with the Made-to-Measure method, combining deep photometry from the VVV, UKIDSS and 2MASS surveys with kinematics from the BRAVA, OGLE and ARGOS surveys. We explore their stellar to dark matter fraction together with their bar pattern speed and constrain from the modelling the effective Galactic potential (gravitational potential + bar pattern speed) inside the solar radius. Our best model is able to reproduce simultaneously (i) the Box/Peanut shape of the bulge, (ii) the transition between bulge and long bar, (iii) the bulge line-of-sight kinematics and proper motion dispersions, (iv) the ARGOS velocity field in the bar region and (v) the rotation curve of the Galaxy inside 10 kpc. Our effective potential will be an important input to more detailed chemodynamical studies of the stellar populations in the inner Galaxy, as revealed by the ARGOS or APOGEE surveys.

Author/s of Contribution:
M. Portail, C. Wegg, O. Gerhard

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

PRICE, Sedona
Astronomy, UC Berkeley, California, USA

Title talk:
Kinematics of z~2 star-forming galaxies with MOSDEF, CANDELS, and Massive FIRE

Talk abstract:
The internal kinematics of star-forming galaxies are an ideal probe of the structural evolution of disks over time. Detailed observations of local galaxies constrain the late-time nature of disks, but observations at earlier times are necessary to determine the physical mechanisms behind the structural growth of star-forming galaxies. Recent near-infrared multi-object spectrographs allow us to probe the physical structure of large samples of galaxies at z~2, when galaxies were most rapidly forming their stellar mass. I present gas kinematics of star-forming galaxies at z~2 from the MOSFIRE Deep Evolution Field (MOSDEF) survey combined with structural measurements from HST/CANDELS imaging. We use forward modeling of gas kinematics observed with fixed-angle multi-object spectrographs to measure the kinematics and dynamical masses for galaxies both with and without detected rotation. By comparing the dynamical and baryonic (stellar + gas) masses, we constrain the physical structure (i.e., V/σ) of galaxies for which we do not resolve rotation. Finally, I present mock observations constructed from the MassiveFIRE (Feedback in Realistic Environments) simulation, allowing us to test how well we recover kinematic properties of star-forming galaxies with MOSDEF and from future observations with JWST.

Author/s of Contribution:
Sedona Price, Mariska Kriek, the MOSDEF and FIRE collaborations

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ESO Garching, July 11th – 15th, 2016

SACHDEVA, Sonali
Inter-University Centre for Astronomy and Astrophysics, Pune, Maharashtra, India

Title talk:
Survival of pure disc galaxies over the last 8 billion years.

Talk abstract:
The presence of pure disk galaxies without any bulge component, i.e., neither classical nor pseudo, poses a severe challenge not just to the hierarchical galaxy formation models but also to the theories of internal secular evolution. We discover that a significant fraction of disk galaxies (~ 15-18 %) in the Hubble Deep Field ($0.4 < z < 1.0$) as well as in the local Universe ($0.02 < z < 0.05$) are such pure disk systems (PDS). We trace the evolution of this population to find how they survived the merger violence and other disk instabilities to remain dynamically undisturbed. We find that smooth accretion of cold gas via cosmic filaments is the most probable mode of their growth in mass and size since z~1. We speculate that PDSs are dynamically hotter and cushioned in massive dark matter haloes which may prevent them from undergoing strong secular evolution.

Author/s of Contribution:
Sonali Sachdeva and Prof. Kanak Saha (IUCAA)

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

SCHRUBA, Andreas
MPE, Garching bei München, Germany

Title talk:
The Interstellar Medium Structure and Star Formation Process in Nearby Disk Galaxies

Talk abstract:
State-of-the-art instrumentation like ALMA, NOEMA, JVLA, and VLT/MUSE is revolutionizing our view on the gas structure and star formation process in nearby galaxies. I will highlight recent results obtained with these instruments on (a) the structure of the atomic and molecular gas disk including the separation of the atomic gas into the cold and warm neutral medium, the finding of significant diffuse molecular gas, and observational evidence what drives the atomic-molecular phase balance. (b) Then I will present a characterization of the gas properties at cloud-scales as derived by two methods: a classical peak identification and a newly developed statistical method which are used to identify similarities but also systematic environmental variations in the gas properties. (c) I will discuss how the large-scale gas-star formation (Schmidt-Kennicutt) relation relates to the (varying) cloud-scale gas properties and how this changes between massive disk, low mass, and interacting/starbursting galaxies. (d) Finally, I will highlight ongoing attempts to extract the evolutionary timescales of the gas-star cycle in galaxies.

Author/s of Contribution:
-

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

SIMONS, Raymond
Johns Hopkins University, Baltimore, USA

Title talk:
Using Hydro-Simulations to Interpret Observed Kinematic Maps of Star-Forming Galaxies.

Talk abstract:
Our understanding of disk formation at z~2 is being shaped by several ongoing kinematics surveys using IFUs and slits. Primitive disks that have formed by this epoch are kinematically complex. Several processes that disrupt disks, including clumpy and smooth accretion as well as major mergers, are expected to drive these irregularities and leave signatures in the kinematic maps. While global measurements of rotation and dispersion provide a reasonable description of galaxy kinematics, the rich details of the full kinematic maps have yet to be incorporated into our analyses. In this presentation, I will present new work aimed at exploiting the full information of these data sets. We investigate mock observations (kinematic and photometric maps) for the VELA suite of ART zoom-in cosmological simulations of galaxy formation using a full dust-radiative transfer model with SUNRISE. We find that quantitative morphological indices, once applied to galaxy kinematic maps, are good discriminators of ordered, perturbed and destroyed disks. I will discuss how these indices can be applied to observational data to investigate the disk fraction at z~2.

Author/s of Contribution:
Susan Kassin, Greg Snyder, Joel Primack, Avishai Dekel, Daniel Ceverino, Sandra Faber, David Koo, Nir Mandelker

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

TADAKI, Kenichi
MPE, Garching bei München, Germany

Title talk:
ALMA reveals rapid formation of a dense core for massive disks at z~2.

Talk abstract:
At z~2, massive quiescent galaxies are extremely compact with a dense core while the majority of star-forming galaxies have a more extended stellar disk. However, it remains unknown how the dense core is formed and how galaxies are transformed. We have made 1kpc-resolution ALMA observations at 870 um for 25 massive galaxies on the star formation main sequence at z~2, and compared the spatial distribution of the rest-frame far-infrared emission with stellar mass maps derived from spatially resolved stellar population modeling. The high-resolution ALMA data reveal that the dust continuum emission is mostly radiated from single region close to the galaxy center and its half light radius is more compact by a factor of 2-3 than the rest-frame optical light and stellar component. Given extremely high SFR surface densities measured within a central 1 kpc, the compact starburst can build up a dense core in only a few hundred Myr.

We may be witnessing one of evolutionary pathways from extended star-forming disks to compact galaxies.

Author/s of Contribution:
1

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

TARANU, Dan
Institute: ICRAR/UWA, Crawley, Australia

Title talk:
Dissecting discs and bulges with SAMI and Romulus.

Talk abstract:
Integral field surveys like SAMI are providing spatially-resolved kinematics for thousands of disc galaxies, while cosmological simulations like Romulus resolve galaxy formation on similar scales. However, little progress has been made on methods to measure structural properties - a key to exploiting these rich new datasets. We have developed a new method to fit self-consistent 3D bulge+disc+halo models to multi-wavelength data using Bayesian (MCMC) routines. I will show that our code can simultaneously reproduce deep imaging, SAMI kinematics and unresolved 21cm HI emission of regular spirals, measuring fundamental properties like mass, size and spin with more robust uncertainties than traditional 2D methods. I will also present predictions for disc galaxy scaling relations from the new high-resolution Romulus cosmological simulation, using novel, realistic SAMI-equivalent synthetic observations. Finally, I will outline how these methods will soon converge to a comprehensive picture of disc galaxy evolution from z=1 to today.

Author/s of this Distribution:
The SAMI and Romulus teams

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

TRICK, Wilma
Max-Planck-Institute for Astronomy (MPIA), Heidelberg, Germany

Title talk:
Action-based Dynamical Modelling for the Milky Way Disk.

Talk abstract:
We present Road Mapping, a full-likelihood dynamical modelling machinery, that aims to recover the Milky Way's (MW) gravitational potential from large samples of stars in the Galactic disk. RoadMapping models the observed positions and velocities of stars with a parameterized, action-based distribution function (DF) in a parameterized axisymmetric gravitational potential (Binney & McMillan 2011, Binney 2012, Bovy & Rix 2013).

In anticipation of the Gaia data release in autumn, we have fully tested Road Mapping and demonstrated its robustness against the breakdown of its assumptions.

Using large suites of mock data, we investigated in isolated test cases how the modelling would be affected if the data's true potential or DF was not included in the families of potentials and DFs assumed by Road Mapping, or if we misjudged measurement errors or the spatial selection function (SF) (Trick et al., submitted to ApJ). We found that the potential can be robustly recovered---given the limitations of the assumed potential model---, even for minor misjudgments in DF or SF, or for proper motion errors or distances known to within 10%.

We were also able to demonstrate that Road Mapping is still successful if the strong assumption of axisymmetric breaks down (Trick et al., in preparation). Data drawn from a high-resolution simulation (D'Onghia et al. 2013) of a MW-like galaxy with pronounced spiral arms does neither follow the assumed simple DF, nor does it come from an axisymmetric potential. We found that as long as the survey volume is large enough, Road Mapping gives good average constraints on the galaxy's potential.

We are planning to apply Road Mapping to a real data set---the Tycho-2 catalogue (Hog et al. 2000)---very soon, and might be able to present some preliminary results already at the conference.

Author/s of this Distribution:
Wilma Trick, Jo Bovy & Hans-Walter Rix

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

VAN DE SANDE, Jesse
Sydney Institute for Astronomy, Sydney University, Redfern, Australia

Title talk:
Revealing the assembly history of discs in galaxies through higher-order stellar kinematics with SAMI.

Talk abstract:
Fast-rotating galaxies which host stellar discs show a strong anti-correlation between the higher-order Gauss-Hermite spectral moment h3 (skewness of the line) and the anisotropy parameter v/sigma. Recent cosmological hydrodynamical simulations suggest that these discs could only have formed through gas-rich mergers (Naab et al. 2014); in gas-poor mergers no discs are formed due to the absence of a dissipative gas component. With integral field spectrographs such as SAMI it is now possible to assess these results by classifying galaxies based on their higher-order stellar kinematics signatures alone. In this talk, I will present the stellar kinematic measurements from the SAMI galaxy survey and a first observational attempt to connect the higher-order stellar kinematic moments in galaxies to their cosmological assembly history.

I will show the higher-order kinematic classes that we find within the SAMI galaxy survey, and compare how our new classes correlate with other global galaxy properties. Finally, I will show that our new way of classifying galaxies from their higher-order stellar kinematics signatures shows great potential for revealing possible hidden discs and bars in galaxies.

Author/s of Contribution:
Jesse van de Sande, Joss Bland-Hawthorn, and the SAMI team

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

WUYTS, Stijn
University of Bath, U.K.

Title talk:
KMOS^3D: The mass budget in early star-forming disks

Talk abstract:
We exploit deep integral-field spectroscopic observations with KMOS/VLT of 240 star-forming disks at 0.6 < z < 2.6 to dynamically constrain their mass budget. Our sample consists of massive (> 10^9.8 Msun) galaxies with sizes R_e > 2 kpc. By contrasting the observed velocity and velocity dispersion profiles to dynamical models, we find that on average the stellar content contributes a third, and the total (stellar + gas) baryonic content two thirds of the dynamical mass budget. Nearly all disks at z > 2 are strongly baryon-dominated within R_e. Substantial object-to-object variations in both stellar and baryonic mass fractions are observed, correlating most strongly with measures of surface density. Our findings can be interpreted as more extended disks probing further (and more compact disks probing less far) into the dark matter halos that host them.

Author/s of Contribution:
-

Posters

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

AL-SALDOONI, Ameerah
Department of Physics, Keele University, Stafordshire, U.K.

Poster Title:
The disk-halo interaction in spiral galaxies.

Poster Abstract:
The kinematics and morphology of ionized outflowing gas, provides a clear insight into the evolution of spiral galaxies, which needs a mechanism to sustain the star formation process. The galactic fountain likely plays an important role in recycling gas within the environment of the galaxy.

We trace the ionized outflowing gas from the disk of spiral galaxies that host a starburst/active nucleus. We have observed Halpha emission from two fields in each of the nearby spiral galaxies NGC4945 (edge-on) and NGC300 (face-on), by using the Robert Stobie Spectrograph Fabry-Perot single etalon of the Southern African Large Telescope (SALT), with medium-resolution. We study the disk-halo interaction in spiral galaxies in order to verify morphological evidence in terms of extended outflowing gas from the disk and infalling gas from the halo toward the disk. Furthermore, we study the kinematics, distribution of diffuse ionized gas and physical conditions, which clarify the origin of extended ionized gas. Specifically, we are looking for signs of interaction between outflows from H II regions or an active nucleus on the one hand, and disk, halo or infalling matter on the other. The partially obscured nuclear region of NGC4945 shows a very clear extended emission to the north-east of the nuclear region, and some complexes of Halpha emission are likely giant H II regions within the disk. With upcoming observations, we will study NGC4945 entirely with Halpha, Hbeta, [S II], and [N II] emission. There is a clear dust lane covering a wide area of this galaxy. Hence, we intend to construct an extinction map to correct for the reddening. In NGC300, we aim to trace the kinematics of the escaping material from the star-forming disk. This material could be ionized gas that is shock heated and located at the base of the galactic fountain.

Author/s of Contribution:
Ameerah-Al-Sadooni & Jacoo van Loon

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

AUMER, Michael
Rudolf Peierls Centre for Theoretical Physics, University of Oxford, U.K.

Poster Title:
Age velocity dispersion relations and heating laws in disc galaxies

Poster Abstract:
We use a large set of controlled N-body simulations of growing galactic discs within live dark matter haloes to study disc heating generated by non-axisymmetric structures and by Giant Molecular Clouds (GMCs). GMCs in our models exist as short-lived massive particles drawn from realistic mass functions. We analyze both archeological age velocity dispersion relations (AVRs), as they are recovered in the Milky Way or other local discs, and the intrinsic heating laws which coeval populations in disc galaxies undergo over cosmological timescales. We discuss how AVRs and heating laws relate/differ for in-plane and vertical heating. We analyze how they depend on the radial growth history, the star formation history, the GMC properties and the disc-to-dark matter mass fraction of the models. We also examine how age errors and age biases of solar neighbourhood (Snhd) surveys influence the recovered AVRs. We discuss under which conditions our models can reproduce both in-plane and vertical AVRs found in the Snhd.

Author/s of Contribution:
Michael Aumer, James Binney and Ralph Schoenrich

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

BEHRENDT, Manuel
MPE, Garching bei München, Germany

Poster title:
Clusters of Small Clumps Can Explain The Peculiar Properties of Giant Clumps in High-Redshift Galaxies

Poster abstract:
Giant clumps are a characteristic feature of observed high-redshift disk galaxies. We propose that these kpc-sized clumps have a complex substructure and are the result of many smaller clumps self-organizing themselves into clump clusters (CC). This bottom-up scenario is in contrast to the common top-down view that these giant clumps form first and then sub-fragment. Using a high resolution hydrodynamical simulation of an isolated, idealized gas disk we analyze the initial fragmentation process and the evolution of the clumps over several hundred Myrs.

Using a high resolution hydrodynamical simulation of an isolated, idealized gas disk we analyze the initial fragmentation process and the evolution of the clumps over several hundred Myrs.

By mimicking the observations from Genzel et al. (2011) at z ~ 2 of the evolved disk, we find remarkable agreement in many details. The CCs appear as single entities of sizes R_HWHM ~0.9-1.4 kpc and masses of ~1.5-3 x 10^9 Msol representative of high-z observations. They are organized in a ring around the center of the galaxy. The origin of the observed clumps' high intrinsic velocity dispersion ~50-100 km/s is fully explained by the internal irregular motions of their substructure in our simulation. No additional energy input, e.g. via stellar feedback, is necessary. Furthermore, in agreement with observations, we find a small velocity gradient V_grad ~8-27 km/s/kpc along the CCs in the beam smeared velocity residual maps which corresponds to net prograde and retrograde rotation with respect to the rotation of the galactic disk.

Author/s of Contribution:
Manuel Behrendt, Andreas Burkert, Marc Schartmann

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ESO Garching, July 11th – 15th, 2016

BIAN, Fuyan
Research School of Astronomy and Astrophysics, Australian National University

Poster title:
Local Analogs for High-redshift Galaxies: Understanding Interstellar Medium Conditions and Metallicities in High-redshift Galaxies.

Poster abstract:
In the last few years, an offset between low- and high-redshift star-forming galaxies has been found in the [OIII]/Hbeta versus [NII]/Halpha BPT diagram. I will present a method to select high-redshift analog galaxies based on the location on the BPT diagram. These local analog galaxies share the same region as z~2 -3 galaxies in the BPT diagram and closely resemble the properties of z~2-3 galaxies, including high specific SFRs and compact sizes, particularly, high ionization parameters and electron densities. These analogs provide a unique local laboratory to study high-redshift galaxies. I will discuss how use these analogs to understand potential major physical mechanism(s) to drive star-forming BPT locus evolution and improve high-redshift metallicity empirical calibrations and better constrain the evolution of mass-metallicity relation over cosmic time.

Author/s of Contribution:
Fuyan Bian, Lisa Kewley, Michael Dopita, Stephanie Juneau

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

BIZYAEV, Dmitry
Department of Astronomy, Apache Point Observatory/NMSU, Sunspot, USA

Poster Title:
Stellar disks and dark halos in super thin galaxies.

Poster Abstract:
We present new spectroscopic and photometric observations of a large sample of edge-on super thin galaxies. We define galaxies as super thin if the radial-to-vertical scale ratio in their stellar disk exceeds nine. The optical spectroscopy was performed with the R~5000 spectrograph on the 3.5m telescope at the Apache Point Observatory (APO, New Mexico, USA) for more than thirty super thin galaxies. Most of them were also observed with the Near-Infrared (NIR) imager in the H and K on the 3.5m telescope at APO.

The stellar disk structural parameters and the ionized gas rotation curves derived from the observational data are a basis of our constrained rotation curve modeling that enables us to reliably estimate parameters of the dark halos in the super thin galaxies.

We discuss the properties of dark halos and dynamical features of the stellar disks that make the super thin galaxies unique.

Author/s of Contribution:
Dmitry Bizyaev and Stefan Kautsch

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ESO Garching, July 11th – 15th, 2016

BLANA, Matias
Max Planck Institute for extraterrestrial Physics (MPE)

Poster title:
Andromeda chained to the Box: Dynamical Models for M31's Bulge & Bar

Poster abstract:
Andromeda is our nearest neighbour disk galaxy and therefore a prime target for detailed modelling of the evolutionary processes that shape disks. Here we present our research of the nature of M31's bar and triaxial bulge with an extensive set of N-body disk galaxy models, which include Box/Peanut (B/P) bulges as well as initial classical bulges. From the comparison with IRAC 3.6μm data, only one model finally matches simultaneously all the properties of M31's bulge, and it requires a classical bulge with ~1/3 of the total stellar mass of the bulge and a B/P bulge with ~2/3. We also apply a Made-to-Measure method on this model using new IFU kinematic observations to constrain the mass distribution in M31's inner disk region.

Author/s of Contribution:
M. Blana, C. Wegg, O. Gerhard, P. Erwin, M. Portail, M. Opitsch, R. Saglia, R. Bender

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ESO Garching, July 11th – 15th, 2016

BURKERT, Andreas
Department of Physics, University of Munich, Germany

Poster Title:
Origin and structure of massive clumps in high-redshift disk galaxies.

Poster Abstract:
Giant clumps are a characteristic feature of observed high-redshift disk galaxies. We propose that these kiloparsec-sized clumps have a complex substructure and are the result of many smaller clumps self-organizing themselves into clump clusters (CCs). This bottom-up scenario is in contrast to the common top-down view that these giant clumps form first and then sub-fragment. Using a high-resolution hydrodynamical simulation of an isolated, fragmented massive gas disk and mimicking the observations from Genzel et al. at z ~ 2, we find remarkable agreement in many details. The CCs appear as single entities of sizes 0.9–1.4 kpc and masses of 1.5–3.0e9 Msolar , representative of high-z observations. The observed clumps' high intrinsic velocity dispersion of 50–100 km/s is fully explained by the internal irregular motions of our CC's substructure. No additional energy input, e.g., via stellar feedback, is necessary. The CC scenario could have strong implications for the internal evolution, lifetimes, and the migration timescales of the observed giant clumps, bulge growth, and active galactic nucleus activity, stellar feedback, and the chemical enrichment history of galactic disks.

Author/s of Contribution:
Behrendt,M. and Marc Schartmann

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ESO Garching, July 11th – 15th, 2016

CHOUDHURY, Omar
Leibniz-Institute für Astrophysik, Potsdam (AIP), Germany

Poster title:
The resolved enrichment histories of quiescent disk galaxies - a benchmark for the Milky Way.

Poster abstract:
We study the star-formation and enrichment histories of quiescent disks to gain insights on how the chemical enrichment developed in the past and how the quenching of star-formation proceeds in otherwise normal disk galaxies. We use spatially resolved spectroscopy from the CALIFA survey of nearby quiescent disk galaxies to infer the stellar population properties [Fe/H], [alpha/Fe] and age. We analyze the data to recover not only overall light-weighted average properties, but also properties of age-separated subpopulations within each spectrum. The results obtained for the bulges are in agreement with studies on early-type galaxies. However, the stellar population properties of the disk surprisingly show intermediate age (4-6 Gyr), alpha-enriched ([alpha/Fe]~0.2) stellar populations. We speculate on several scenarios, with strong outflows in the early Universe as a plausible candidate. Our results allow to put the Milky Way disk enrichment history into the context of large samples of disk galaxies and will thus help understanding the formation of disks in general.

Author/s of Contribution:
O. S. Choudhury, C. J. Walcher, & CALIFA collaboration

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

COLE, David
University of Oxford, U.K.

Poster title:
Self-consistent distribution function modelling of the Milky Way and what it tells us about its dark-matter halo.

Poster abstract:
Models of the Milky Way will play an increasingly crucial role in understanding the results of large scale stellar surveys. It is important that these models are fully dynamical taking account of the equations of motion and gravitational interactions between its constituent particles. Using distribution functions for each of the Galaxy's components which are based on analytic functions of the actions J_i, we have built self-consistent models of the Milky Way. By searching multi-dimensional model space we have constructed models which satisfy observational constraints on the space density and kinematics of stars in the extended solar neighbourhood, and constraints from gas, masers and SgrA* on the Galaxy's rotation curve. We discuss how including the constraints of microlensing data affects our results and the shape of the dark matter halo.

Author/s of Contribution:
David Cole, James Binney

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ESO Garching, July 11th – 15th, 2016

CURTI, Mirko
Università degli Studi di Firenze - INAF Osservatorio Astrofisico di Arcetri

Poster title:
New direct and fully empirical calibrations for strong-line metallicity indicators in star forming galaxies

Poster abstract:
I will present a work aimed at obtaining new fully empirical calibrations for the most widely used strong-line metallicity diagnostics in star forming galaxies, thanks to a uniform application of the direct method over the whole metallicity range probed by the Sloan Digital Sky Survey. We stacked spectra of more than 110000 galaxies from the SDSS in bins of log[OII]/Hβ - log[OIII]/Hβ in order to detect and measure the fluxes of the faint auroral lines needed to compute the electron temperatures and apply the direct method. Our calibrations are entirely defined on a uniform abundance scale for galaxies, they span more than 1 dex in metallicity and provide consistent metallicity estimates to within 0.05 dex. Moreover, our staking scheme does not assume any dependence of metallicity on mass, being therefore different from other attempts.

As a first application we adopted our new calibrations to derive a new Mass-Metallicity Relation in the local Universe and we applied them to a sample of high redshift ($1.5 < z < 2.5$) galaxy spectra obtained through AO assisted observations with ARGOS and LUCI at the Large Binocular Telescope.

Author/s of Contribution:
Università degli Studi di Firenze - INAF Osservatorio Astrofisico di Arcetri

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ESO Garching, July 11th – 15th, 2016

DESMOND, Harry
Stanford University, Stanford, USA

Poster title:
Dynamical Constraints on the Galaxy-Halo Connection

Poster abstract:
We use the relation between the visible and dark mass in galaxies -- as described by the Tully-Fisher (TFR), Faber-Jackson (FJR) and mass discrepancy-acceleration (MDAR) relations, and Fundamental Plane (FP) -- to test the galaxy-halo connection under the abundance matching ansatz. We develop an approximate Bayesian computation framework to evaluate models by comparing the predicted and observed values of a number of summary statistics of the relations. We find that abundance matching naturally accounts for several important statistics, including the slope and normalization of the TFR, the tilt of the FP, and the "characteristic acceleration scale" of the MDAR. Others imply specific constraints on galaxy formation physics: haloes expand in response to disc formation, galaxy and halo specific angular momenta are similar, spirals occupy less massive haloes than ellipticals at fixed stellar mass, and surface brightness is correlated with halo mass or concentration. Several aspects of the relations, however, remain discrepant with model predictions across our parameter space; these include the correlation of velocity and size residuals in spirals, and the scatter in the FP and MDAR. These problems likely indicate correlations of galaxy and halo variables beyond the scope of standard abundance matching.

Author/s of Contribution:
Risa Wechsler

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ESO Garching, July 11th – 15th, 2016

DESSAUGES-ZAVADSKY, Miroslava (Mirko)
Geneva Observatory, Sauverny, Switzerland

Poster title:
Toward the intrinsic stellar mass spectrum of star-forming clumps in z=1-3 galaxies

Poster abstract:
Deep and high-resolution HST imaging has revealed clumpy, rest-frame UV morphologies among z=1-3 galaxies. The majority of these galaxies has been shown to be dominated by ordered disk rotation, which have led to the conclusion that the observed giant clumps, resolved on kpc-scales, are generated from disk fragmentation due to gravitational instability. Despite the high resolution attained by the most advanced ground- and space-based facilities, the intrinsic typical masses and scale sizes of these star-forming clumps remain unconstrained, since they are barely resolved at z=1-3. Very recent numerical simulations have indeed shown that the massive clumps observed at high redshifts with stellar masses as high as 10^9-10^10 Msun may suffer from low resolution effects, being unresolved conglomerates of less massive star clusters. Thanks to the amplification and stretching power provided by strong gravitational lensing, we find a stellar mass spectrum two orders of magnitude smaller for the clumps observed in lensed galaxies with M*~ 10^7-10^8 Msun, and thus confirm the recent simulation predictions.

Author/s of Contribution:
M. Dessauges-Zavadsky, D. Schaerer, L. Mayer, A. Cava, V. Tamburello

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

EGUSA, Fumi
NAOJ

Poster title:
Gas and stellar spiral arms and their offsets in the grand-design spiral galaxy M51

Poster abstract:
Theoretical studies on the response of interstellar gas to a gravitational potential disk with a quasi-stationary spiral arm pattern suggest that the gas experiences a sudden compression due to standing shock waves at spiral arms. This mechanism, called a galactic shock wave, predicts that gas spiral arms move from downstream to upstream of stellar arms with increasing radius inside a corotation radius. In order to investigate if this mechanism is at work in the grand-design spiral galaxy M51, we have measured azimuthal offsets between the peaks of stellar mass and gas mass distributions in its two spiral arms. The stellar mass distribution is created by the spatially resolved spectral energy distribution fitting to optical and near infrared images, while the gas mass distribution is obtained by high-resolution CO and HI data. For the inner region (r<150"~6kpc), we find that one arm is consistent with the galactic shock while the other is not. For the outer region, results are less certain due to the narrower range of offset values, the weakness of stellar arms, and the smaller number of offset measurements. Furthermore, we discuss the nature of two spiral arms in the inner region, taking into account offsets between CO and Hα measured by Egusa et al. (2009).

Author/s of Contribution:
Fumi Egusa, Erin Mentuch Cooper, Jin Koda, Junichi Baba

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

ERWIN, Peter
MPE

Poster title:
Antitruncations: Halos, Disks, and Star Formation

Poster abstract:
About one-third of disk galaxies have surface-brightness profiles which become shallower at large radii: these are Type III or "antitruncated" profiles. Analysis of inclination-limited subsamples shows that about half of Type III profiles in S0--Sb galaxies are due to light from rounder components (mostly luminous stellar halos distinct from any central bulge and mostly not scattered light from extended PSFs) superimposed on single-exponential or truncated-exponential disks. The remainder are genuinely antitruncated disks; such disks have a roughly constant frequency of 20% across the entire Hubble disk sequence, including late-type dwarfs. The only clear property distinguishing galaxies with antitruncated disks is a strong tendency to be weakly barred or unbarred; strongly barred disks are almost never antitruncated. Results from the H-alpha Galaxy Groups Imaging Survey suggest that -- in contrast to truncated profiles -- very few if any antitruncated profiles are the result of in-situ star formation, and that antitruncations are more common in passive galaxies. This is indirect evidence for interactions and mergers as formation mechanisms.

Author/s of Contribution:
Peter Erwin, Dave Wilman, John E. Beckman, Sandesh Kulkarni, Leonel Gutierrez

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

GADOTTI, Dimitri
Zentrum für Astronomie, Heidelberg University, Germany

Poster title:
Establishing the formation redshift of the first dynamically cold galaxy discs with MUSE

Poster abstract:
We use MUSE to study the kinematics, chemistry and star-formation history across NGC 4371, an early-type massive barred galaxy in the core of the Virgo cluster. We complement this study with multi-component decompositions using images from HST and Spitzer. We show that the rotationally supported inner components in NGC 4371, i.e. an inner disc and a nuclear ring - which, according to the predominant scenario, are built with stars formed from gas brought to the inner region by disc instabilities such as bars - are vastly dominated by stars older than 10 Gyr. Our results thus indicate that the formation of the bar in NGC 4371 occurred at a redshift of about $z=1.8^{+0.5}_{-0.4}$ (error bars are derived from 100 Monte Carlo realizations), and that bar-built central structures can be dominated by old stellar populations. Furthermore, our results imply that the disc in NGC 4371 is already dynamically mature at z~1.8, because bars do not form in dynamically hot discs. We are now extending this study to a volume-limited sample drawn from the S4G (the Spitzer Survey of Stellar Structure in Galaxies) with a range of stellar masses. This allows us to provide constraints to the formation of galaxy discs, and test the downsizing scenario, in which more massive discs form first.

Author/s of Contribution:
Dimitri A. Gadotti, Paula Coelho, Jesus Falcón-Barroso, Francesca Fragkoudi, Boris Häußler, Bernd Husemann, Evelyn Johnston, Adriana de Lorenzo-Cáceres, Marie Martig, Inma Martinez-Valpuesta, Juan Carlos Muñoz-Mateos, Isabel Pérez, Patricia Sánchez-Blázquez, Marja K. Seidel, Glenn van de Ven

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

GALAZ, Gaspar
Institute of Astrophysics, P. Universidad Catolica de Chile

Poster title:
Unveiling the disc and spiral structure of the giant low surface brightness galaxy Malin 1

Poster abstract:
In this poster we summarize results obtained with Magellan/Megacam in the optical for the giant low surface brightness galaxy Malin 1. In spite of the fact that this spiral galaxy exhibit one of the largest and faintest (surface brightness) disks, no deep images with modern telescopes has been published so far. Therefore the internal structure of the disk remained a mystery for decades. Our deep photometry of more than 3 hrs exposure time, and reaching nearly 29 mag arcsec^-2 reveals that the disk of Malin one is not only huge, but is also extremely rich: gigantic and textbook extremely faint spiral arms surround the galaxy, several gas regions are present in the disk and spiral arms, and very clear structures not yet well defined are present across the galaxy. This work constitute the first step toward a better understanding of the disk of this extended and badly understood galaxy, giving insight about what regions are plausible to be pinpointed with ALMA for, at last, detecting molecular gas.

Author/s of Contribution:
Gaspar Galaz, Carlos Milovic, Vincent Suc, Luis Busta, Guadalupe Lizana, Leopoldo Infante, Santiago Royo

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ESO Garching, July 11th – 15th, 2016

GIMENO, German
Dept. of Science, Gemini Observatory, La Serena, Chile

Poster Title:
Observations of stellar disk kinematics in S0 galaxies.I

Poster Abstract:
We present results from observations of the stellar disks of two S0 galaxies within a Compact Group, obtained with GMOS-S at the Gemini South telescope using imaging and nod&shuffle spectroscopy techniques. From the data derived from photometric and kinematic observations we perform a bulge/disk decomposition in order to retrieve the stellar kinematics of the disks and assess their dynamical state, in particular disk (over)heating, and discuss the connection to the environment.

Author/s of Contribution:
G.Gimeno

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

GIRARD, Marianne
Astronomy, Geneva Observatory, Switzerland

Poster Title:
Physics of a lensed clumpy galaxy at a redshift of 1.6

Poster Abstract:
Observations of high-redshift galaxies show now evidence of massive star-forming clumps in their internal structure. One way to study in details these clumps with a higher spatial resolution is by exploiting the power of strong gravitational lensing which stretches images on the sky. Here, we want to present results for the galaxy A68-HLS115, which is strongly lensed by a massive galaxy cluster by a magnification factor of 15 at a redshift of 1.5859. Clumps in this galaxy were first identified by HST, and a detail study of the integrated physical properties of this galaxy has already been done in the B-band to the sub-millimeter and in CO by our group. We have now results from the observations with VLT/SINFONI in the near-infrared, where we detect several nebular emission lines (Ha, Hb, [OIII]5007, [NII]6548,6584, [SII]6717,6731). These lines allow us to study the kinematics, star formation rate, extinction, and metallicity of each individual clump and to put these results in relation with the observations at other wavelengths.

Author/s of Contribution:
M. Girard, M. Dessauges-Zavadsky, D. Schaerer, K. Nakajima, J. Richard, P. Sklias, E. Egami, M. Zamojski

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

GOMEZ, Facundo
Max Planck Institute for Astrophysics

Poster title:
The interplay between the outskirts of disks and galactic halos

Poster abstract:
Recent studies based on different astrometric catalogues have revealed a complex vertical structure in the outer Galactic disk. Using fully cosmological hydrodynamical simulations, I will show how this structure can be the result of a satellite - host halo - disk interaction. Even low-mass low-velocity fly-by encounters, with pericentric distances as large as 80 kpc, can excite well-defined vertical patterns on pre-existing galactic disks. I will also show the mechanism behind these perturbations and show how such interactions could be enough to induce the formation of observed features such as the Monoceros Ring. Our study highlights the strong connection between the inner and outer galactic regions and shows how it is possible to study the outskirts of galaxies by characterizing their galactic disks.

Author/s of Contribution:
Gomez, Facundo A.

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ESO Garching, July 11th – 15th, 2016

GRISDALE, Kearn
FEPS, University of Surrey, Guildford, U.K.

Poster title:
The impact of stellar feedback on shaping and driving the turbulent interstellar medium,

Poster abstract:
The effects of stellar feedback processes from massive stars, e.g. ionising radiation, winds and supernovae feedback, on the Interstellar Medium (ISM) is a debated topic. I will present a new suite of high resolution hydro+N-body simulations of isolated Milky Way, SMC and LMC-like disc galaxies, using RAMSES. The aim is to explore the affects of stellar feedback on the ISM structure, quantify these effects and compare to observations of a range of nearby galaxies.

I give special attention to the following topics:
- Power spectra of the density and velocity fields from simulations and observations (i.e. The HI Nearby Galaxy Survey (THINGS)) as a method to determine the range of scales over which feedback processes are important
- The determination of whether feedback or gravity drives the turbulence observed in the ISM and on which scale the driving occurs e.g. large scales (galactic) driving or small scales (feedback) driving

Author/s of Contribution:
Kearn Grisdale

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GROSBOEL, Preben
ESO, Eching, Germany

Poster Title:
Estimates of the strength of spiral perturbations in disk galaxies

Poster Abstract:
For dynamic studies of disk galaxies, it is essential to have an accurate potential for their disks including spiral perturbations. Unfortunately, estimates of surface density variations associated to arms in spiral galaxies are rather uncertain due to the varying mass-to-light ratio and attenuation by dust across the arms. Different estimators for the strength of spiral arms are presented for 8 grand-design spiral galaxies with deep K-band images from HAWK-I/VLT. Measures based on texture analysis of unresolved stellar clusters in the disks indicate a typical azimuthal variation of the surface density due to spiral arms in the range of 10-20%. This is significant lower than estimates derived from direct K-band surface photometry.

Author/s of Contribution:
Preben Grosboel (ESO) and Patos Patsis (RCAAM, GR)

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GUÉROU, Adrien
ESO, Garching / IRAP-OMP-UPS

Poster title:
MUSE reveals the interplay between the ionised gas and stars of intermediate redshift disk galaxies

Poster abstract:
Intermediate to high redshift galaxies have been, so far, mostly spectroscopically characterised through their ionised and molecular gas, often residing in disks since early epochs. The basic properties of their stellar content (masses, kinematics, metallicities, etc.) are thus still poorly constrained. Understanding the interplay between the gas and stellar content of intermediate redshift galaxies will give important constraints on the early formation and evolution history of present day galaxies. Using the deepest MUSE IFU observations so far, a 27 hours exposure of the Hubble Deep Field South (Bacon et al. 2015), I will present the first resolved stellar kinematics and population analysis of a small sample of intermediate redshift galaxies, from z~0.3 to z~1.3, and show strong observational evidence that stellar disks were already in place 5 to 7 Gyr after the big bang. I will compare their newly probed stellar properties to these of their ionised gas content (Contini et al. 2016) and discuss an updated and more complete picture of galaxies “early” evolution.

Author/s of Contribution:
Adrien Guérou (presenting author), Contini et al. (2016)

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GUILLARD, Nicolas
Excellence Cluster (LMU)/ESO

Poster title:
From galactic discs to Nuclear Clusters

Poster abstract:
Observations show that more than 70% of galactic discs exhibit compact and massive stellar cluster in their nuclei, known as Nuclear Clusters (NCs). With a size of a few parsecs, these clusters co-evolve with their galactic host. The formation and evolution of NCs ultimately depend on internal processes, both on pc-scale (e.g. turbulence) and kpc-scale (e.g. density waves, accretion, feedback). Understanding the physics associated with the assembly of NCs is thus key for the more global comprehension of disc evolution. So far, such processes have been studied numerically at resolution from 100 to 50pc, leaving out the galaxy scale coupling leading to the main nuclear structures (e.g., nuclear discs at the 10-50 pc scale).

Using state of the art hydrodynamical simulations of discy galaxies at parsec resolution, I will emphasise the main processes involved in the formation of NCs. I will further focus on the impact of star formation, stellar driven feedback and galactic environment, and finally provide a context view of the formation and evolution of NCs in galaxy discs.

Author/s of Contribution:
Nicolas Guillard

DISCS 2016: DISCS IN GALAXIES
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HART, Ross
School of Physics and Astronomy, University of Nottingham, U.K.

Poster title:
Galaxy Zoo: Linking spiral arm structure with star-formation properties of galaxies

Poster abstract:
Galaxy discs can display very different types of spiral structure, with some discs having two strong arms, and others having many flocculent arms. Building a complete picture of the physical processes that are responsible for different types of spiral structure is challenging, as the interplay between stellar and gas discs must be considered in detail. I will present a sample of low-redshift spiral galaxies in the Sloan Digital Sky Survey, using the visual classifications from Galaxy Zoo 2. By studying and correcting for classification bias, a sample of 18,000 galaxies with reliable measurements of spiral arm multiplicity has been defined. These data enable us for the first time to gain an understanding of the processes that play a role in forming different types of spiral structure. In this talk I will present data on the colour, gas content and the presence of bars in local spiral galaxies. We find that many-armed spiral galaxies display much bluer colours compared to two-armed spiral galaxies, whilst occupying similar ranges of stellar mass and local environmental density. Using two-component star-formation history models I will show that two-armed structure is ubiquitous in star-forming disks, while many-armed spiral structure appears to be a short-lived phase, associated with much more recent star-formation activity. This study allows for the comparison of the properties of spiral galaxies with a sample of unprecedented size, meaning that the processes that play a role in their formation and evolution can be studied in detail.

Author/s of Contribution:
Ross Hart

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HESSMAN, Frederic V.
Institut für Astrophysik, Georg-August-Universität Goettingen, Germany

Poster title:
Revisiting Disk Mass: Estimating the baryonic masses and stability of face-on spiral galaxies with IFU spectroscopy.

Poster abstract:
The kinematic dispersions of disc stars can be used to measure the dynamic contributions of baryons to the rotation curves of spiral galaxies and hence to trace the amount and distribution of the remaining dark matter.
However, the conversion of stellar dispersions to dynamic surface densities is fraught with many uncertainties. The use of too-simple models for the local gravity, stellar kinematics, and ISM densities results in dynamically determined stellar masses -- and hence the amounts of dark matter -- that can be either under- or over-estimated, depending both upon radius and upon global parameters like the radial scale-length.

The presence of a thick-disc component has more severe consequences than expected in a simple model, particularly if its radial scale-length is smaller than that of the thin-disc. When a more realistic model for the dynamic surface density is used and an allowance made for more gas, the generic tendency is to lower the stellar surface masses for gas-rich galaxies, increase them in gas-poor galaxies, and to change the radial gradient of the mass-to-light ratios.

The baryonic surface densities are generally larger/smaller than those derived by the Disk Mass Survey for disc radii lower/larger than 2.3 times the radial scale-length.

Author/s of Contribution:
Frederic V. Hessman

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IODICE, Enrichetta
INAF - Astronomical Observatory of Capodimonte, Naples, Italy

Poster title:
Fornax Deep Survey with VST: mapping the disk in NGC1365 out to the faintest levels of mu_r~31 mag/arcsec^2

Poster abstract:
The Fornax Deep Survey (FDS) at the VLT Survey Telescope, is a new, deep, multi-imaging survey of the Fornax cluster. It aims to cover the whole Fornax cluster out to the virial radius, with an area of about 26 square degrees around the central galaxy NGC 1399, including the region where NGC1316 is located. The FDS will provide an unprecedented view of the structures of the cluster members, ranging from giant early-type galaxies to small spheroidal galaxies. The multi-band deep images allow us to map the light distribution and colors of cluster galaxies out to 8-10 effective radii, in order to study the inner disks and bars, the faint stellar halo, including the diffuse light component, and the tidal debris as signatures of recent cannibalism events.

In this poster we show the photometric analysis in the u, g, r, i and Halpha bands for the barred spiral galaxy NGC1365. This allows us to map the structure of the several components, which are the central bulge, the bar, inner ring, spiral arms and the faint stellar halo out to 108 kpc from the galaxy centre and down to surface brightness of about 31 mag/arcsec^2 in the r band.

Author/s of Contribution:
FDS core Team

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IORIO, Giuliano
Unibo, Bologna, Ital & INAF-OAB, Bologna, Italy

Poster title:
Little Things in 3D: Kinematics of the HI discs in dwarf Irregular galaxies

Poster abstract:
Dwarf Irregular galaxies (dIrrs) are the smallest stellar systems with extended HI discs. The study of the kinematics of such discs is a powerful tool to estimate the total matter distribution at this very small scale. In this work, we study the HI kinematics of 20 galaxies extracted from the 'Local Irregulars That Trace Luminosity Extremes, The HI Nearby Galaxy Survey' (LITTLE THINGS). Our approach differs significantly from previous studies as it fully exploits the information offered by HI datacubes fitting directly 3D models (2D spatial dimensions and 1D spectral dimension) using the software 3DBAROLO. For each galaxy we derive the geometric parameters of the HI disc (inclination and position angle), the radial distribution of the surface density, the velocity dispersion and the rotation curve. The rotation curve is then corrected for the asymmetric drift to obtain a final circular velocity curve that traces the galactic potential. As a scientific application, we used the kinematic results to obtain a baryonic Tully-Fisher relation (at small scale of the dIrrs). The final products of this work are high-quality and ready-to-use kinematic data (rotation
curves in particular) that can be used to perform dynamical studies and improve our
knowledge of the very low-mass end of the galaxy mass function.

Author/s of Contribution:
Giuliano Iorio, Filippo Fraternali, Carlo Nipoti

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JOHNSON, Helen
Centre for Extragalactic Astronomy, Durham University

Poster title:
The Spatially Resolved Dynamics of Star-forming Galaxies as a Function of Redshift and Environment

Poster abstract:
Integral field spectroscopy has truly defined the beginning of a new era for observational astronomy. With the current generation of instruments, not only are our observations immensely detailed, but we can build large, representative samples faster than ever before. In this talk I will present observations using FLAMES, KMOS and MUSE, and discuss how we can exploit these vast datasets to explore galaxy evolution as a function of redshift and environment. I will describe our recent pilot study of dusty starburst galaxies in a massive, intermediate redshift cluster, combining IFU data with far-infrared imaging and millimetre spectroscopy. Our results provide new insight into which mechanisms may achieve the spiral to S0 transition observed in high density environments. I will also discuss the progress of the KMOS Redshift One Spectroscopic Survey (KROSS), which explores the spatially resolved properties of ~ 800 typical star-forming galaxies at z=1. We will measure the dynamics, gas fractions and metallicity gradients of this large sample, and aim to address key issues such as the origin of disc turbulence and the evolution of specific angular momentum.

Author/s of Contribution:
Helen Johnson

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KASPAROVA, Anastasia
Sternberg Astronomical Institute, Moscow State University, Russia

Poster title:
The variety of thick discs.

Poster abstract:
The formation scenario of thick galactic discs still remains a matter of debate in spite of the widespread that structure components. Spectroscopic observations of thick discs are challenging because of low surface brightness and thus require long exposures using large telescopes. We collected deep spectra of thick discs in some edge-on early-type disc galaxies using the Russian 6-m telescope BTA. In two objects we see intermediate age metal rich stellar populations that support their formation via minor merger induced disc heating over an extended period of time. In other case the thick disc is old (10 Gyr) and its alpha-element abundance suggests a 1.5-2 Gyr long formation epoch making it consistent with the turbulent rapid thick disc formation at high redshifts suggested by numerical simulations. Our results prove the diversity of thick disc formation scenarios.

Author/s of this Distribution:
Kasparova A., Katkov I., Chilingarian I., Silchenko O., Moiseev A., Borisov S.

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KAUTSCH, Stefan J.
Nova Southeastern University, Fort Lauderdale, USA

Poster title:
The Catalog of Genuine Edge-On Disk Galaxies in SDSS and the Properties of Superthin Disk Galaxies.

Poster abstract:
We present EGIS, the catalog of Edge-on disk Galaxies in SDSS. It contains 5747 genuine edge-on galaxies, and includes the morphological types Sa, Sb, Sc, Scd, and Irr. We derive structural parameters (stellar disk thickness, radial scale length, and central surface brightness) from the photometric profiles in the g, r, and i galaxy images. We use this catalog to select superthin disk galaxies with stellar disk scale-length-to-thickness ratios greater than nine, independent of the bulge contribution. We find that the superthins are dark-matter dominated, low surface-brightness galaxies with low stellar volume densities and low star formation rates. We investigate potential scenarios that lead to the formation and survival of superthin galaxies.

Author/s of Contribution:
Stefan J. Kautsch and Dmitry V. Bizyaev

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KITAGAWA, Yutaro
the University of Tokyo/JAPAN

Poster Title:
PARADISES: Pa- Alpha Resolved Activity and Dynamics of Infrared Selected Extreme Starbursts

Poster Abstract:
In this presentation we report a study on distribution of star-forming regions traced by Pa_alpha emission in nearby luminous infrared galaxies (LIRGs). The rest-frame Pa_alpha line is good tracer to study dusty starburst activity because it is less affected by dust obscuration than the other star formation indicators such as rest-frame optical lines and UV continuum. We therefore have conducted narrow-band imaging survey named *PARADISES* (Pa- Alpha Resolved Activity and Dynamics of Infrared Selected Extreme Starbursts), using the IRCS and MOIRCS/Subaru. As a first result we have detected the Pa_alpha emission from ~20 LIRGs and will briefly discuss spatially resolved SFR-M* relation.

Author/s of Contribution:
Yutaro Kitagawa (the University of Tokyo/JAPAN), Yusei Koyama (Subaru Telescope, NAOJ/JAPAN), Kentaro Motohara (the University of Tokyo/JAPAN)

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KRUK, Sandor
Department of Physics, University of Oxford, Merton College, U.K.

Poster title:
Galaxy Zoo: Studying stellar populations in barred galaxies using structural decomposition of multiband galaxy images

Poster abstract:
Bars are an important part of the secular evolution of galaxies, considering that at least one third of the local disc galaxies are barred. In this work we study the stellar populations in disc galaxy structures (discs, bulges and bars) using morphological classifications from the Galaxy Zoo citizen science project. Using data from SDSS we have created a large sample of ~2,000 local barred galaxies ($z < 0.06$), which have been visually inspected for the presence of a bar. We have performed a three-component (disc/bulge/bar) multiwavelength parametric decomposition in five SDSS bands, *ugriz*, on this largest sample of barred galaxies to date using the novel GALFITM software developed by the MegaMorph project. Using detailed structural analysis we estimate physical quantities such as the bar and bulge-to-total luminosity ratios, Sérsic indices and the colour distribution of these components. By comparing the barred galaxies with a mass-matched sample of unbarred late-type galaxies, we examine the connection between the presence of a large-scale galactic bar and the properties of discs and bulges. We observe a clear difference in colour between the corresponding discs and bulges of the barred and unbarred galaxies suggesting different underlying stellar populations and star formation rates. We also notice and study the properties of a population of disc galaxies with an odd offset between the galactic discs and bars.

Author/s of Contribution:
Chris Lintott and the Galaxy Zoo Science Team

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LEE, Minju
Dept. of Astronomy, Graduate school of Science, The University of Tokyo, Japan

Poster title:
Disk or not, and the properties of gaseous disks at z~2.5 in a protocluster seen by ALMA

Poster abstract:
We have undertaken a pilot study to unveil an environmental effect that would transform `disk' (or star forming) galaxies into elliptical galaxies during an early stage of cluster formation, i.e., in a protocluster at high redshift, provided massive ellipticals already taking in place at high redshift (z~2) and large number massive ellipticals existing in clusters at local universe. In this talk, we report recent results from ALMA CO(3-2) observation toward a protocluster at z = 2.49. We have exploited the ALMA observations that targeted 22 HAEs those being the members of the protocluster 4C23.56. We confirm 7 detections in CO(3-2) and four among them have continuum detections in 1.1 mm. The resolution achieved in CO(3-2) and dust continuum is ~5-6 kpc in physical scale at z=2.5. Although both relatively low resolution and the sensitivity (S/N ~ 4-8) of the ALMA observations challenge the interpretation of the results, we indeed find diversity of disk properties that are inferred from the 3D data cubes (i.e., velocity-integrated intensity map, velocity field, dispersion) as well as from 2D spectrum. I will discuss the prospects of the observational facts and conclude with suggestions of future observations.

Author/s of Contribution:
Ling Zhu (MPIA), Remco van den Bosch (MPIA), Glenn van de Ven (MPIA), Mariya Lyubenova (Kapteyn Institute), Jesus Falcon-Barroso (IAC)

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LESLIE, Sarah
MPIA, Heidelberg, Germany

Poster Title:
Is the dust in disc galaxies different at z=0.7?

Poster Abstract:
Disc galaxies at z~0.7 in the COSMOS sample have been found to be more opaque than their local counterparts, suggesting an evolution in dust properties. In the local universe galactic discs behave like optically thick systems as far as integrated photometric properties in the UV and visual are concerned. Infrared emission on the other hand is produced by warm dust and radio data provide a unique unobscured look at star-forming galaxies.

We compare the measured luminosities of face-on and edge-on star-forming galaxies in different wavelengths (UV, mid-IR, far-IR and radio) for two well matched samples: a local SDSS-selected sample at z~0.07 and a sample of COSMOS discs at z~0.7. By measuring the amount of attenuation in inclined galaxies at these different wavelengths, we can probe the global dust properties both locally and at z~0.7 in a consistent way.

Author/s of Contribution:
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LIPPA, Magdalena
Max Planck Institute for extraterrestrial physics, Garching bei München, Germany

Poster title:
Spatially resolved molecular gas and star formation in star-forming galaxies around redshift 1.

Poster abstract:
We analyze spatially resolved observations of six massive star-forming galaxies, namely CO-imaging spectroscopy from PHIBSS as a tracer of molecular gas and HST V-I-J-H photometry (rest-frame UV/optical/NIR) representing young and older stellar populations. This rich data set allows a unique insight into sub-galactic scales around the peak of cosmic star formation at redshifts $z \approx 1$. One of our recent findings is that fitting the stellar mass distribution derived from the photometry recovers the position angle as determined from the CO kinematics very reliably while fitting the individual HST brightness distributions can be off by more than 40 degrees in this respect.

Author/s of Contribution:
Magdalena Lippa

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MARTINSSON, Thomas
IAC, San Cristóbal de La Laguna, Santa Cruz de Tenerife, Spain

Poster title:
Baryonic and dark matter mass distributions in disk galaxies.

Poster abstract:
We present results on luminous and dark matter mass distributions in 30 disk galaxies from the Disk Mass Survey. Our derived baryonic mass distributions give us the relative fraction of stars, molecular gas, and atomic gas as a function of radius. As expected for normal disk galaxies, we find that, on average, the stars dominate the mass budget in the inner region of the disk and the molecular gas often dominate over the atomic gas within one optical scale length. However, at four scale lengths the atomic gas starts to become the dominant contributor to the baryonic mass surface density. Unexpectedly, we find that the total baryon to dark matter fraction within a galaxy appears to stay rather constant with radius from one out to at least six scale lengths, ranging from ~15-50% among galaxies.

Author/s of Contribution:
Thomas Martinsson, David Andersen, Matthew Bershady, Rob Swaters, Marc Verheijen, Kyle Westfall

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M, Honey
Indian Institute of Astrophysics

Poster title:

Near-Infrared Imaging of Barred Low Surface Brightness Galaxies

Poster abstract:

We present the results of our near infrared (NIR) imaging study of barred Low Surface Brightness (LSB), their 2D disk decomposition using optical images and how their bar morphologies vary with central disk velocity dispersion. LSB galaxies are extreme late type galaxies that have low luminosity stellar disks but large, neutral hydrogen (HI) gas disks. They are poor in star formation and are dark matter dominated systems. Bars are not common in halo dominated disk systems. Using a large sample of LSB galaxies from the literature, we found that the fraction of barred LSB galaxies is only ~ 8.3%. Using our NIR images, we examine their bar morphology, to see the properties of bars in the dark matter dominated systems and how they differ from normal galaxies. Our analysis of the NIR images shows that the bars in LSB galaxies are similar to those found in normal galaxies. To get a more accurate picture we did the 2D disk decomposition of their optical images. We find that most of the LSB barred galaxies have bulges that are oval or boxy in shape; this suggests that there is slow internal evolution occurring in these systems. We also examined their central velocity dispersion using their optical nuclear spectra, which can tell us about the central mass concentration in these galaxies. We examined how this varies with bar ellipticities. We compare our observations with simulations of bar formation in dark matter dominated galaxies and discuss the implications of our results.

Author/s of Contribution:

M. Honey, M. Das, J.P. Ninan, M. Puravankara

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OOSTERLOO, Tom
Netherland Institute for Radio Astronomy & Groningen University, Groningen, The Netherlands

Poster title:
The Disk-Halo conspiracy Fast-Rotating Early-Type Galaxies.

Poster abstract:
I will present results on the HI Tully-Fisher relation and its baryonic variant for a sample of 16 fast-rotating early-type galaxies, taken from the ATLAS3D sample and which all have very regular HI disks extending well beyond the optical body (>~5 Reff). The extent of these disks allows to estimate the circular velocity at large radii. We find that the Tully-Fisher relation for our early-type galaxies is offset by about 0.5−0.7 mag (K band) from the relation for spiral galaxies, in the sense that fast-rotating early-type galaxies are dimmer for a given circular velocity. The residuals with respect to the spiral Tully-Fisher relation correlate with estimates of the stellar mass-to-light ratio, suggesting that the offset is mainly driven by differences in stellar populations. As a result, the baryonic Tully-Fisher relation of our sample is distinctly tighter than the standard one. Our analysis increases the range of galaxy morphologies for which the baryonic Tully-Fisher relations holds, strengthening previous claims that it is a more fundamental scaling relation than the classical Tully-Fisher relation, underlining the strong coupling between dark and visible matter in galaxies.

The data are also used to investigate the shape of the overall mass distribution out to large radius. The circular velocity at large radius of the sample galaxies is typically 25% lower than the maximum circular velocity derived at ~ 0.2 Re from stellar dynamical models. Under the assumption of power-law total density profiles, the data imply an average logarithmic slope of 2.18 ± 0.03 out to 5-15 Re. The average slope and scatter agree with recent results obtained from stellar kinematics alone.

Author/s of Contribution:
-

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ESO Garching, July 11th – 15th, 2016

PATSIS, Panos
Research Center for Astronomy, Academy of Athens, Greece

Poster Title:
Gaseous and stellar flows in the spiral arms of *barred-spiral* models

Poster Abstract:
The morphology, the strength and the longevity of the spiral arms in galaxies are directly linked to the dynamical mechanisms that form and support them. In the standard paradigm for the flow in galactic discs' material (stars and/or gas) rotates around the galactic center. The stellar flow has as backbone a set of elliptical, stable, periodic orbits, which precess as their Jacobi constant varies monotonically. In the corresponding gaseous flow, the spiral arms are condensations produced by a shock wave, formed as gas flows into the potential minima of an effective spiral potential; thus material flows through the arms. On the other hand, according to the more recent idea of "chaotic spirals", i.e. of spirals supported by stars in chaotic motion beyond corotation, the flow is *along* the spiral arms. In the present work I compare the stellar and gaseous flows in *barred-spiral* models having corotation at various radii in their disks. I investigate the dynamical conditions under which clumps of over-densities may appear on the spiral arms in ordered and in "chaotic" gaseous spirals and I underline the dynamical differences between the spiral arms of non-barred and barred-spiral galaxies.

Author/s of Contribution:
P.A. Patsis & L. Tsigaridi

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PEREZ MARTINEZ, Jose Manuel
University of Vienna

Poster title:
Galaxy Kinematics and Tully-Fisher analysis in the z=1.4 XMMUJ2235-2557 cluster field.

Poster abstract:
To put strong constraints on environmental impact on galaxies we investigate quantitatively the evolutionary status of 18 cluster members at the onset of cluster assembly of XMMU J2235-2557 at z=1.4, and 9 additional field galaxies in the same field of view. We exploit very deep MXU spectroscopy with FORS at ESO's VLT to primarily determine internal kinematics and star formation rates. Superb HST and HAWKI imaging enables us to measure accurately structural parameters and morphologies. By modeling the velocity field of each galaxy we construct its rotation curve. In case of a regular rotating disk we then determine its maximum velocity and estimate the total dynamical mass. We exploit different representations of the Tully-Fischer Relation (TFR) for 11 regular galaxies in order to study the environmental dependence of disk galaxy scaling relations at the highest redshift up to date. On average we find that cluster members present the same luminosity in B-band but smaller scale lengths by a factor of 1.5 respect to the field galaxies at similar redshift presented by Miller et al. 2011 in the TFR and velocity-size relation (VSR). Our results altogether yield constraints on galaxy and cluster formation models.

Author/s of Contribution:
Jose Manuel Pérez

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PEREZ VILLEGAS, Angeles
MPE, Germany

Poster Title:
Inner Stellar Halo in the Milky Way: Predicted Shape and Kinematics

Poster Abstract:
We have used N-body simulations tailored to the Milky Way to investigate the kinematic properties of the stellar halo in the inner region of the Galaxy. In particular, we discuss how the shape and kinematics of the stellar halo evolve during the formation and evolution of the Galactic bar and box/peanut bulge.

Author/s of Contribution:
Angeles Pérez-Villegas, Matthieu Portail & Ortwin Gerhard

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

PFENNIGER, Daniel
Astronomy, Geneva Observatory, Switzerland

Poster Title:
New methods to determine pattern speeds.

Poster Abstract:
Several new methods are presented for determining pattern speeds in 2D and 3D particle systems. The different methods are compared in N-body simulation snapshots of barred galaxies.

Author/s of Contribution:
Pfenniger, Kanak \& Wu, 2016, A&A, in preparation

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

PINNA, Francesca
Instituto de Astrofísica de Canarias, La Laguna, Spain

Title talk:
Unveiling the sources of disk heating in spiral galaxies with the CALIFA survey.

Abstract talk:
The stellar velocity ellipsoid (SVE) quantifies the amount of velocity dispersion in the vertical, radial and azimuthal directions. Since different disk heating mechanisms (e.g. spiral arms, giant molecular clouds, minor mergers, etc) affect these components differently, the SVE can constrain the sources of heating in disk galaxies. At present the 3D nature of the SVE can only be directly measured in the Milky Way but, thanks to integral-field surveys like CALIFA, we are now in position to carry out the same kind of analysis in external galaxies. For this purpose, we have gathered a sample of ~30 intermediate inclined disk galaxies along the Hubble sequence (S0 to Scd types) with high quality stellar kinematic maps. This allowed us to probe the SVE for each galaxy from different line-of-sights in different regions, and thus provide strong constraints on its shape. In this presentation we will relate our findings to realistic numerical simulations of disks with different formation histories (quiescent vs mergers), and we will also put the results of the Milky Way in context with the general population of spiral galaxies.

Author/s of Contribution:
F. Pinna, J. Falcon-Barroso, M. Martig, G. van de Ven, M. Lyubenova, R. Leaman

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

SABUROVA, Anna
Sternberg Astronomical Institute of Moscow State University, Russia

Poster title 1:
On the Effective Oxygen Yield in the Disks of Spiral Galaxies

Poster abstract 1:
The factors that influence the chemical evolution of galaxies are poorly understood. Both gas inflow and gas outflow reduce the gas-phase abundance of heavy elements (metallicity), whereas ongoing star formation continuously increases it. To exclude the stellar nucleosynthesis from consideration, we analyze for a sample of 14 spiral galaxies the radial distribution of the effective yield of oxygen yeff, which would be identical to the true stellar yield (per stellar generation) yo if the evolution followed the closedbox model. As the initial data for gas-phase abundance, we used the O/H radial profiles, based on two different calibrations (the PT2005 and KK2004 methods).

In most of the galaxies with the PT2005 calibration, which we consider the preferred one, the yield yeff in the main disk increases with radius, remaining lower than the empirically found true stellar yield yo. This may indicate the inflow of less-enriched gas predominantly to the inner disk regions, which reduces yeff. We show that the maximal values of the effective yield in the main disks of galaxies, anticorrelate with the total mass of galaxies and with the mass of their dark halos enclosed within optical radius R25. It allows us to propose the greater role of gas accretion for galaxies with massive halos. We also found that the radial gradient of oxygen abundance normalized to R25 has a tendency to be shallower in the systems with lower dark halo to stellar mass ratio within the optical radius, which, if confirmed, gives evidence of the effective radial mixing of gas in galaxies with a relatively light dark matter halo.

Author/s of Contribution:
A. Saburova, A. Zasov

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

SABUROVA, Anna
Sternberg Astronomical Institute of Moscow State University, Russia

Poster title 2:
The results of rotation curve mass-modelling: true or false?

Poster abstract 2:
The best-fit mass-modelling represents the popular method to evaluate the parameters of both disc and dark halo, despite the fact that it has problems. We examined the reliability of the results of best-fit modelling for pseudo isothermal, Burkert and NFW dark halos. To do it we constructed the chi^2 maps for the grid of the parameters of dark halos for a sample of 14 disc galaxies from THINGS with high quality rotation curves. The disc mass-to-light ratios and bulge surface densities were considered as free parameters. We showed that in a half of considered galaxies the best fit mass-modelling results are questionable. The reliability of the estimates of the parameters for both dark and visible components depends on the shape and the extension of rotation curve and on the availability of detailed data for the central parts of the rotation curves. We also made tests showing how the parameters of halo and disc change in the cases of a lack of kinematic data in the central or peripheral areas and for different spatial resolutions.

We found degeneracy between the central density and radial scale of dark halo. From our analysis it follows that disc-halo conspiracy can be realized for the set of different pairs of DM parameters, corresponding, however, to the small variation of the dark halo mass within optical borders.

The modeling with NFW profile fails more often in comparison to other profiles. The NFW profile usually corresponds to the dark halo masses that are two times higher than that for two other forms of a halo and to systematically lower disc mass-to-light ratios.

Author/s of Contribution:
A. Saburova, A. Kasparova, I. Katkov

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

SÁNCHEZ GIL, Carmen
Statistics and Operational Research, Universidad de Cádiz, Jerez de la Frontera, Spain

Poster title:
Hierarchical Bayesian approach for estimating physical properties in nearby galaxies.

Poster abstract:
One of the fundamental goals of modern Astronomy is to estimate the physical parameters of galaxies from images in different spectral bands. We present a hierarchical Bayesian model for obtaining age maps from images in the Halpha line (taken with Taurus Tunable Fliter, TTF), ultraviolet band (far UV or FUV, from GALEX) and infrared bands (24, 70 and 160 microns, from Spitzer). As shown in Sánchez Gil (2011) (2011MNRAS.415..753S), we present the burst ages for young stellar populations in a sample of nearby and nearly face on galaxies.

As shown in the previous work, the Halpha to FUV flux ratio is a good relative indicator of the very recent star formation history (SFH). As a nascent star-forming region evolves, the Halpha line emission declines earlier than the UV continuum, leading to a decrease in the Halpha/FUV ratio. Through a specific star-forming galaxy model Starburst99 (SB99),
modified to include the probabilistic formalism by Cerviño & Luridiana (2006) (2006A&A...451..475C), and allowing for a variable fraction of ionizing photons in the clusters, we obtain the corresponding theoretical ratio Halpha/FUV to compare with our observed flux ratios, and thus to estimate the ages of the observed regions.

Due to the nature of the problem, it is necessary to take into account the mean uncertainties, and the interrelationships between parameters when the Halpha/FUV flux is obtained. We propose a Bayesian hierarchical model, where a joint probability distribution is defined to determine the parameters (age, metallicity, correlation between Halpha and FUV), from the observed data, in this case the observed flux ratios Halpha/FUV. The joint distribution of the parameters is described through an i.i.d. (independent and identically distributed random variables), generated through MCMC (Markov Chain Monte Carlo) techniques.

Author/s of Contribution:
M. Carmen Sánchez-Gil, Angel Berihuete, Emilio J. Alfaro, Enrique Pérez, Miguel Cerviño, Luis M. Sarro

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

SANCHEZ-BLAZQUEZ, Patricia
Pontificia Universidad Catolica, Madrid, Spain

Poster title:
Spatially resolved stellar populations in disk galaxies. The CALIFA survey.

Poster abstract:
I will present the latest results on the spatially-resolved analysis of the stellar populations and ionized gas of disk-dominated galaxies based on Calar Alto Legacy Integral Field Area (CALIFA) data. CALIFA is an integral field spectroscopy (IFS) survey of galaxies in the Local Universe that has already obtained spectroscopic information up to ~2.5 re with a spatial resolution better than ~1 kpc for a total number of more than 600 galaxies of different morphological types. Unlike previous studies of stellar population in disk galaxies, based on a few galaxies, we have a sample large enough to analyse the spatially resolved mean ages and stellar abundances of the disk region as a function of other properties, like the mass, morphology, presence of bar, etc. We will use these results to constrain the different scenarios for disc formation and the sub-grid physics in numerical simulations.

Author/s of Contribution:
Patricia Sanchez-Blazquez, Sebastian Sanchez, Jairo Mendez-Abreu, Jesus Falcon-Barroso

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

SARZI, Mark
Centre for Astrophysics Research, Univ. of Hertfordshire, U.K.

Poster title:
Nuclear stellar disks as clocks for the assembly history of early-type galaxies.

Poster abstract:
Nuclear stellar disks NSDs, from a few tens to hundreds of parsecs across, are dynamically fragile systems that are easily destroyed during a major galactic encounter involving their host galaxy. Such a fragility could turn NSDs into unique tools to constrain the merging history of galaxies, and in particular of early-type galaxies where NSDs are commonly found. In fact, if NSDs are indeed swept away during galaxy mergers, their stellar age could serve to place tight limits on the epoch since their host galaxies last experienced such a catastrophic event.

In this talk, I will review the incidence of NSDs, show numerical simulations aimed at quantifying their fragility against galaxy mergers, and present integral-field data for the ETG NGC 4458 that demonstrated how the stellar age of NSDs can indeed be measured very accurately with integral-field spectroscopy (based on Ledo, Sarzi et al. 2010; Sarzi, Ledo & Dotti 2015 and Sarzi et al 2016).

Author/s of this Distribution:
Sarzi

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

SCHOENRICH, Ralph
University of Oxford, U.K.

Poster Title:
On inverse gradients in discs

Poster Abstract:
Recent observations hint at inverse (i.e. positive d[Fe/H]/dR) metallicity gradients in some disc galaxies as well as an inverse relation between mean rotational velocity and metallicity (smaller rotation velocity for more metal-poor stars) for local Milky Way thick disc stars, which have been commonly interpreted as a hint for inverse gradients in the star-forming gas of the early Milky Way. I will show that these inverse gradients in stellar populations do not imply inverse gradients at any time in the star-forming ISM, but are dominated by other factors in the evolution of the disc. If time permits, I will link these signatures and their causes to peculiarities in stellar abundances, and also to the heating problem for the Galactic thick disc.

Author/s of Contribution:
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DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

SEMCZUK, Marcin
N. Copernicus Astronomical Center of the Polish Academy of Sciences, Warsaw, Poland

Poster title:
N. Copernicus Astronomical Center of the Polish Academy of Sciences.

Poster abstract:
The observed morphology-density relation places spiral galaxies in regions of low density: the field or outskirts of clusters. While reasons for this arrangement are more or less known, the origin of spiral structure in galactic disks still remains a mystery. One of the probable scenarios for the creation of two-armed, grand-design spiral arms involves tidal interactions with external objects. We use N-body simulations to study the evolution of a Milky Way-size galaxy in a Virgo-like cluster. The galaxy is placed on a few orbits of different size but similar eccentricity. We find that grand-design spiral arms form on each of them, but are most pronounced for the most extended orbit where tidal forces are relatively mild. We measure the properties of the arms, such as the pitch angle, the strength and the pattern speed as a function of time. The arms found in simulations are approximately logarithmic, but are also dynamic, transient and recurrent. They are triggered by pericentric passages and after that they wind up and dissipate. We interpret the results in the context of the Hubble sequence.

Author/s of Contribution:
Marcin Semczuk

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

SHABANI, Faiezeh
Astronomisches Rechen-Institut- Heidelberg, Germany

Poster Title:
The spiral structure of NGC628, M83 and NGC 156 as traced by their star clusters

Poster Abstract:
We present a study of the star cluster population in the star-forming spiral galaxies NGC628, M83 and NGC 156 based on the Legacy Extra Galactic UV Survey (LEGUS). This is a Hubble Space Telescope (HST) cycle 21 Treasury program that obtained HST/WFC3 and HST/ACS NUV,U,B,V and I band imaging of 50 star-forming galaxies at distances of 4-12 Mpc.

Specifically, we explore the clusters surface density, average mass, and age as a function of location along and across spiral arms, inter-arm and outer-arm regions, and of distance from the galaxy center. These correlations yield important information on the formation and evolution of star clusters as well as on the interplay between galaxy spiral structure and star formation processes.

Author/s of Contribution:
Faiezeh Shabani, Eva K. Grebel, Anna Pasquali (Heidelberg University) and the LEGUS collaboration

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

SILCHENKO, Olga
Sternberg Astronomical Institute of the Lomonosov Moscow State University, Moscow, Russia

Poster title:
Outer disks of lenticular galaxies: stellar populations and gas supply.

Poster abstract:
Lenticular galaxies lie on the red sequence and are thought to be former spirals having quenched their star formation a few Gyr ago. We have studied the stellar population properties of the nearby lenticulars in groups and in the field and have found that S0 disks differ strongly from the contemporain thin stellar disks of spiral galaxies: they are very old, magnesium-overabundant, and rather metal-poor resembling so the stellar population of the thick disk in our Galaxy. In sparse environments nearby lenticular galaxies possess often extended gaseous disks, and sometimes current star formation can be noticed in the outer ring-like structures. While decoupled kinematics implies the origin of the gas by acquisition from outside, homogeneously solar metallicity of the star forming gas excludes its accretion from the cosmological filaments and poses some problems with its advanced chemical evolution.

Author/s of Contribution:
Sil'chenko O.K.

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

SUZUKI, Tomoko
Department of Astronomical Science, SOKENDAI, Tokyo, Japan

Poster Title:
Star formation activity of active galaxies before the peak epoch traced by [OIII] emission line

Poster Abstract:
The epoch of z~3-3.7 is crucial to understand the scenario of galaxy formation and evolution because this epoch corresponds to about 1-2 Gyr before the peak epoch of the star formation activity of galaxies, and also because it is said that the progenitors of massive, compact, and quiescent galaxies (red nuggets) appear at this epoch. In order to investigate how the star formation activity and internal structure of galaxies have evolved from z>3 towards the peak at z~2, a coherent sample of star-forming galaxies at z>3 with high angular resolution images is required.

We have constructed a sample of z>3 active galaxies by tracing their [OIII]λ5007 emission line through our systematic narrow-band imaging survey with Subaru/MOIRCS (Mahalo-Subaru). We have investigated physical quantities, such as stellar mass, star formation rate (SFR), and size, for the [OIII] emitters in the SXDF-UDS-CANDELS field. The [OIII] emitters at z>3 show a clear correlation on the stellar mass-SFR diagram. Comparing with star-forming galaxies at z~2 on this diagram, the [OIII] emitters show an offset along the main sequence. Our results indicate a significant mass growth of star-forming galaxies from z>3 towards the peak at z~2.

Recently, we have performed a NIR spectroscopic observation for 10 [OIII] emitters at z>3 in the COSMOS field. We will also discuss detailed physical conditions of [OIII] emitters at z>3 by combining with their integrated physical quantities.

Author/s of Contribution:
T. Kodama, K.-i. Tadaki, M. Hayashi, Y. Koyama, I. Tanaka, Y. Minowa, R. Shimakawa, M. Yamamoto

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

TOYOUCHI, Daisuke
Astronomical institute, Tohoku university, Aoba-ku Sendai, Japan

Poster Title:
Chemo-dynamical structure of the Milky Way disk as revealed from the radial velocity distributions of APOGEE red clump stars.

Poster Abstract:
We investigate the structure and dynamics of the Milky Way (MW) disk stars based on the analysis of the Apache Point Observatory Galactic Evolution Experiment (APOGEE) data, to infer the past evolution histories of the MW disk component(s) possibly affected by radial migration and/or satellite accretions. APOGEE is the first near-infrared spectroscopic survey for a large number of the MW disk stars, providing their radial velocities and chemical abundances without significant dust extinction effects. We here adopt red-clump stars, for which the distances from the Sun are determined precisely and analyze their radial velocities and chemical abundances in the MW disk regions covering from the Galactocentric distance, R, of 5 kpc to 14 kpc. We investigate their dynamical properties, such as mean rotational velocities and velocity dispersions, as a function of R, based on the MCMC Bayesian method. We find that at all radii, the dynamics of alpha-poor stars, which are candidates of young disk stars, is much different from that of alpha-rich stars, which are candidates of old disk stars. We find that our Jeans analysis for our sample stars reveals characteristic spatial and dynamical properties of the MW disk, which are generally in agreement with the recent independent work by Bovy et al. (2015) but with a different method from ours.

Author/s of Contribution:
Daisuke Toyouchi, Masashi Chiba

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

ÜBLER, Hannah
MPE, Garching bei München, Germany

Poster title:
The Tully-Fisher relation at 0.6<z<2.7 with KMOS^3D

Poster abstract:
Understanding the concurrent evolution of galaxies and their host dark matter haloes across cosmic time is a major challenge in astrophysics. The Tully-Fisher relation (TFR), one of the fundamental empirical scaling relations for disk galaxies, is extensively studied in the local Universe. There is, however, considerable tension in the recent literature regarding the possible evolution of the TFR with cosmic time. So far, it has not been possible to test for evolution of the TFR at intermediate to high redshift with an inherently consistent sample and coherent methods.

We present results from a stellar mass and baryonic TFR study based on the mass-selected KMOS^3D survey of star-forming galaxies at 0.6<z<2.7. Implications for the evolution of baryonic and dark matter fractions in disk galaxies are discussed.

Author/s of Contribution:
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DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

WEGG, Chris
MPE, Garching bei München, Germany

Poster Title:
A Low Dark Matter Fraction and a Maximum Disk in the Inner Milky Way: Constraints from MOA-II Microlensing

Poster Abstract:
The Milky Way is a prototypical disk galaxy for which we have unique observational tools and data to study its current state and unravel its evolutionary history. Most of the mass of the disk of the Milky Way lies towards the inner Galaxy but its density structure there is poorly known. We have used Red Clump Giants (RCGs) as standard candles and combined data from the VVV, UKIDSS, and 2MASS near-IR photometric surveys to recover the shape of the inner Galaxy. We find the barred bulge smoothly transitions to a thinner bar with half length 5kpc which is aligned to the barred bulge. We conclude that the Milky Way contains a central box/peanut bulge which is the vertical extension of a longer, flatter bar, similar to both external galaxies and N-body models.

While the dynamical mass in the bulge is well constrained this is degenerate between the stellar and dark matter contributions, analogous to disk-halo decompositions of external galaxies. However microlensing of Milky Way bulge stars is a unique tool to break this degeneracy. We have combined N-body dynamical models fitted to the shape of the RCGs in the bulge with disk models, and computed the microlensing properties. Comparing MOA-II microlensing data to our predicted microlensing optical depths we find that a low dark matter fraction and short disk scale length is required. At the peak of the corresponding baryonic rotation curve we find that its contribution is >75% making the Milky Way a maximal disk.

Author/s of Contribution:
Chris Wegg, Ortwin Gerhard and Matthieu Portail

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

WILMAN, David
USM & MPE, Munich, Germany

Poster title:
Tracing the Inside-out Growth & Outside-In Quenching of Disks over ~85% of cosmic time.

Poster abstract:
With radial profiles of HAlpha emission from a unique combination of KMOS^3D and HAGGIS surveys, I will describe how star formation drives the spatial growth, evolution and quenching of galaxy disks over ~85% of cosmic time. The 75 night KMOS^3D survey on the VLT with up to 20hour on-source in 600+ mass-selected galaxies at z~0.7-2.8 traces star formation and the kinematics of the ionized gas into the outer disk. Most galaxies at this gas-rich epoch contain turbulent star forming disks which are more extended than their stellar disks, even in galaxies with low SFR for their stellar mass, and especially in isolated galaxies. In the local Universe, in contrast, HAlpha profiles from HAGGIS demonstrate that the star forming disks of most central galaxies are similar in size to their stellar disks, while outside-in removal of star forming gas is common, especially in satellite galaxies of group-mass halos. These also have compact stellar disks and anti-truncated stellar disk profiles, emphasizing the role of gravitational processes. Our combined results suggest that the evolution of many galaxies is characterized by galaxy-wide, rapid accretion and star formation at z>1 and by the slower, subtler accumulation of gravitational effects on an otherwise stable, low mass star forming disk at lower redshifts.

Author/s of Contribution:
D. Wilman, KMOS^3D Team, HAGGIS Team

DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

WU, Po-Feng
Institute for Astronomy, University of Hawaii, Honolulu, USA

Poster title:
The Origin of the Dependence of the Mass-Metallicity Relation on Environment

Poster abstract:
The gas-phase oxygen abundance of galaxies and environment have a positive correlation, where galaxies in higher local density regions and clusters have higher gas-phase metallicities on average. Base on an analytical model, the dependence of the mass-metallicity relation on environment can be solely interpreted as a variation in the gas content of star-forming galaxies. At a fixed stellar mass, galaxies in low density environments have lower metallicities because they are more gas-rich than galaxies in high density environments. Modeling the shape of the mass-metallicity relation may provide an indirect means to probe the gas content of star-forming galaxies. With coming large scale spectroscopic surveys, this method may be applied at higher redshifts, where direct measurement of gas mass is not yet available.

Author/s of Contribution:
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DISCS 2016: DISCS IN GALAXIES
ESO Garching, July 11th – 15th, 2016

WU, Yu-Ting
Research School of Astronomy and Astrophysics, Australian National University

Poster title:
Time-dependent Corotation Resonance in Barred Galaxies

Poster abstract:
Many theories of dynamical investigations of disk galaxies are based on the assumption that the non-axisymmetric structures are a small perturbation of an axisymmetric background potential, rotating with a constant pattern speed. However, the dynamical consequences of the bar-bar or bar-spiral pattern interactions have not been fully elucidated. With high quality N-body simulations, we localize the instantaneous equilibrium points of a galaxy with double bars and spiral pattern and find that their radii as well as their azimuths oscillate substantially which is contrary to the commonly adopted assumption that in the bar rotating frame the corotation region should possess four stationary equilibrium points (Lagrange's points). This implies that both the angular momentum and the energy of the particles around the corotation region are not conserved and not coupled by the Jacobi integral, so chaotic motion must be much more widespread than in the time-independent case. As a consequence, the effect of the corotation resonance in such galaxies on stellar migration is more diffusive than estimated in analytic theories assuming time-independent dynamics.

Author/s of Contribution:
Yu-Ting Wu, Daniel Pfenniger and Ronald E. Taam

HOW TO REACH ESO

The workshop venue can be easily reached with the underground train / metro (U-Bahn) destination “Garching Forschungszentrum” - line **U6**. The underground / metro station in Garching is centrally located, within close reach of all hotels and indicated with a large white "U" on a blue blackground.

Take the U6, with destination "Garching Forschungszentrum" (*Garching Research Campus*) - this is the last stop on line U6. Exit the station at the rear end of the train, go up the stairs towards the street, straight on for about 500 meters. On your left, past the parking space, you will find ESO with the gradual gangway to the main reception desk after entering ESO premises.

For different public transport travel schedules you can check the public journey planner (http://www.mvv-muenchen.de/en/tickets-fares/tickets/index.html).

For participants lodging in Garching it is cheaper to buy a card with 10 strips called “Streifenkarte” and to stamp one strip per journey before entering the train or after entering a bus. One “Streifenkarte” costs 13 EUR which can be used for 10 rides within Garching. You can purchase these cards at any Ticketing Machine (Fahrkartenautomat) at the airport, inside the metro/train stations or from bus drivers if you use a bus (nos. 292 or 230) instead of the metro.
For those who are lodged in Munich City Centre it is advisable to buy a ticket for one week, valid for rings 1 - 7. This weekly ticket costs 32.70 EUR and allows you to make as many journeys as you wish during the week within the 7 rings.

WORKSHOP VENUE

The workshop is held in the New Auditorium “Eridanus”. Please walk through the ESO main entrance and follow the signs to the workshop area.

REGISTRATION

Registration at the entrance to the New Auditorium Eridanus/new cafeteria takes place on **Monday July 11th, 2016, between 12:00-13:30** hrs. You will be given a name badge and some general information. Should you arrive later, your name badge will be left at the ESO main reception desk to be picked up.

PLEASE NOTE THAT FOR SECURITY PURPOSES, YOU SHOULD WEAR YOUR NAME BADGE AT ALL TIMES DURING THE WORKSHOP!

REGISTRATION FEE

The registration fee should have been paid by April 29th, 2016. It covers the workshop, a welcome reception, a social dinner on Wednesday, July 13th, 2016, administration services and all coffee breaks.

INTERNET AND EMAIL

Open wireless internet is available in most parts of the ESO buildings. In addition, 3 laptops (1x Mac, 1x Dell with Windows, 1x Dell with Linux) and a printer will be made available in room Pavo (A.2.01) for internet and email connections (only via WEBMAIL service). Signs with the respective account name and password will be placed in the room as well as in the workshop area (Auditorium "Eridanus"). There is a phone as well for calls within ESO.

TALKS

Mac and Windows laptops with standard presentation software will be available. To smooth the switchover from one speaker to the next we request that speakers bring their presentations to the workshop on a USB/Memory stick and to hand it over to any of the LOC members at the laptop station (front of the Eridanus Auditorium). This must be done at least one session prior to your scheduled session or earlier, i.e. if your talk is in the morning, your presentation should be handed over the previous afternoon at the latest. If your talk is in the afternoon, you should hand it over at the beginning of the day at the latest to test it well ahead of time. Should you have any complicated animations etc., please make sure that all required files are included and contact us about a rehearsal during the break prior to your talk. To be on the safe side, save your presentation in PDF or PPT formats.
To see what session your presentation is in, check the program here as soon as the program has been set up:
http://www.eso.org/sci/meetings/2016/Discs2016/program.html

PLEASE NOTE THAT USING YOUR OWN LAPTOP IS STRONGLY DISCOURAGED, EXCEPT IF AGREED BEFOREHAND WITH THE WORKSHOP CHAIRMAN.

POSTER PAPERS

The poster papers will be on display around the glass pillar opposite to the meeting rooms ‘Pavo’ (A.2.01) and ‘Tucana’ (A.2.02) throughout the workshop. The poster panels are 120cm high and 100cm wide, allowing posters of up to A0 portrait size. Pins and plastic sleeves for additional A4 size posters will be pinned on the boards. The poster boards are numbered according to the poster paper list published on the workshop webpage a few days prior to the workshop. Please place your poster on the board carrying the number mentioned next to your name in this list.

N.B.: We ask that you remove your posters by 13:00 on Friday, July 15th, 2016. ESO will not store posters. The janitors are charged with disposing of all remaining posters after the workshop has ended.

WELCOME RECEPTION

Monday July 11th at 18:15 in the Eridanus Foyer, ESO premises.
We will serve fingerfood and non-alcoholic beverages in the Foyer of the New Auditorium at the end of the first workshop day. All workshop participants are welcome to join.

SOCIAL DINNER

Wednesday July 13th, 2016 at 19.00 hrs (Brunnwart, Munich Schwabing - http://brunnwart.com/page/raeumlichkeiten.php)

We ask participants who won't attend the social dinner to inform the LOC well in advance so that a realistic number of guests can be confirmed to the restaurant. Please inform us also if you wish to have a vegetarian/vegan meal; arrangements can be made accordingly. If the weather is nice, the Social Dinner will take place in the Restaurant's beer garden.

TAXI

Taxis can be ordered 20 mins. before departing from ESO.

There will also be a sign-up sheet for those wanting a taxi at the end of the workshop. This list will be made available at the workshop reception desk until Thursday, 14.07.2016 at 16.00 hrs. Please enter your name if you wish for a taxi. After 16.00 hrs on that day, the list will be handed over to the main reception desk, who will group and arrange taxi transportation according to preferred departure times. You will find a sheet carrying all scheduled taxi pick-ups at the ESO main reception desk on the last day of the workshop.

LUNCH

Lunch will be provided on all days during the workshop.

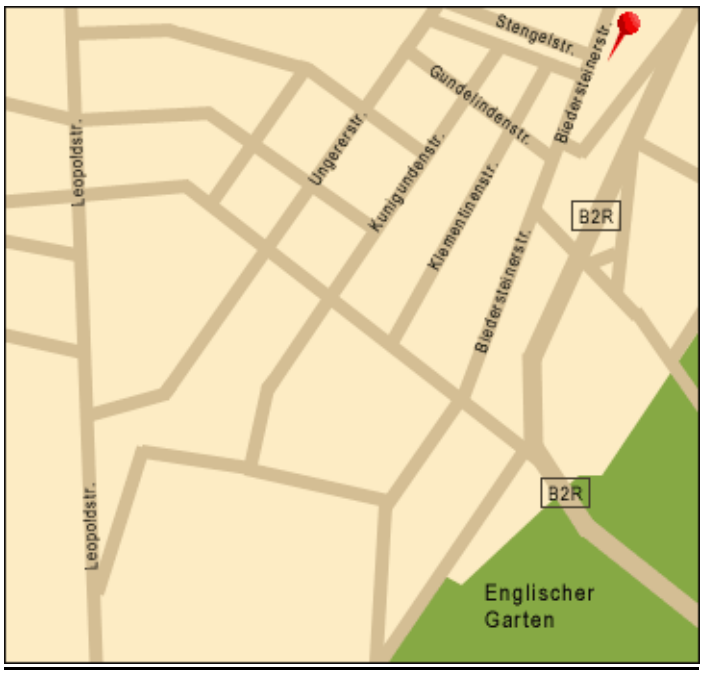
BANK SERVICES

There are banks and cash-points in Garching city. All main credit and debit cards are accepted (with PIN code). Please note that the banks may close during lunch time and have otherwise opening hours grossly different from shops.

WEATHER

Munich weather in July can be nice, with average temperatures around 15 - 18 C and high temperatures reaching 20 - 30 C. For more information, see http://www.weatheronline.co.uk/Germany/Munich.htm.

Zum Brunnwart



Wegbeschreibung :

1. über den Mittleren Ring von dem Olympiazentrum Richtung Osten (Effnerplatz) : vorbei an der Autobahnzufahrt Nürnberg , unter der Ungerestr. hindurch, danach erste Abfahrt rechts und an der Kreuzung wieder rechts = Biedersteinerstr.

2. über Schwabing kommend , Leopoldstr. in nördlicher Richtung stadtauswärts : nach der Münchner Freiheit die Ungererstr. rechts - dann 5-te Straße wieder rechts (Sengelstraße) - am Ende dieser Straße steht man direkt vor dem Brunnwart.