Detailed Program

Schedule

Monday, 24

08:45 Welcome

General — Chair : Pierre Ferruit

09:00 **Jonathan Gardner** — James Webb Space Telescope Overview

09:40 H. B. Hammel

10:00 Poster Popups

10:10 Coffee + Poster viewing

10:50 **Nikole Lewis** — Preparing for JWST

11:30 Björn Benneke

11:50 Laura Pentericci

12:10 Lunch

Galaxy Assembly — Chair : Marusa Bradac

13:30 **Alyson Brooks** — Galaxy Evolution Across Cosmic Ages as Seen by JWST

14:10 Alexandra Pope

14:30 Naslim Neelamkodan

14:50 Chris Willott

15:10 Poster Popups

15:20 Coffee + Poster viewing

16:00 Allison Kirkpatrick

16:20 Daryl Haggard

18:30 Cocktail

Tuesday, 25

08:55 Daily announcements

First Light — Chair : Chris Willott

09:00 **Marusa Bradac** — First Light and Reionization

09:40 Pascal Oesch

10:00 Ricardo Amorin

10:20 Poster Popups

10:30 Coffee + Poster viewing

11:10 Stefano Carniani

Exoplanets and Brown Dwarfs — Chair : Chris Willott

11:30 Charles Beichman

11:50 Ray Jayawardhana

12:10 Stanimir Metchev

12:30 Lunch

Solar System — Chair : Heidi Hammel

14:00 **Dave Jewitt** — Solar System Science

14:40 JJ Kavelaars

15:00 Matthew S. Tiscareno

15:20 Andrew Rivkin

15:40 Poster Popups

15:50 Coffee + Poster viewing

16:30 Brenda Matthews

First light — Chair : Heidi Hammel

16:50 Steven Finkelstein

17:10 Andrei Mesinger

17:30 Beer Poster Session

Wednesday, 26

08:55 Daily announcements

Exoplanets — Chair : Nick Cowan

09:00 **David Charbonneau** — Exoplanet Syzygy: A Star, A Planet, and an Infrared Space Telescope

09:40 David Lafrenière

10:00 Stephan Birkmann

10:20 Poster Popups

10:30 Coffee + Poster viewing

11:10 Pierre-Olivier Lagage

First Light — Chair : Nick Cowan

11:30 Stuart Wyithe

11:50 Mia Bovill

12:10 Hakim Atek

12:30 Lunch

Social Activities *or* JWST Proposal Planning and Tools Session

14:00 Janice Lee

14:25 Jennifer Lotz

14:40 Timothy Pickering

15:20 Diane Karakla

16:00 Harry Ferguson

20:00 Public Lecture

Thursday, 27

08:55 Daily annoucements

Star Formation — Chair : Brenda Mathews

09:00 **Ralph E. Pudritz** — The Origin of Stars and Their Planetary Systems

09:40 Will Fischer

10:00 Natsuko Izumi

10:20 Michihiro Takami

10:40 Coffee + Poster viewing

First Light — Chair : Brenda Mathews

11:30 Kirk Barrow

11:50 Brenda Frye

12:10 Christopher Conselice

12:30 Lunch

Stellar Populations — Chair : Tommaso Treu

14:00 **Julianne Dalcanton** — Stellar Populations with JWST

14:40 Dan Weisz

15:00 Kristen McQuinn

15:20 Martha Boyer

15:40 Coffee + Poster viewing

Galaxy Assembly — Chair : Harvey Richer

16:20 Rychard Bouwens

16:40 Michael Maseda

17:00 Jennifer Lotz

Friday, 28

08:55 Daily annoucements

Fundamental Physics — Chair : Brenda Frye

09:00 **Sherry Suyu** — Cosmology with Gravitational Lens Time Delays

09:40 Tommaso Treu

10:00 Andrea Grazian

10:20 Coffee + Poster viewing

Stars — Chair : René Doyon

11:10 Ryan Lau

11:30 Lizette Guzman-Ramirez

11:50 Harvey Richer

General

12:10 Garth Illingworth

12:30 Closing remarks

General Information

Dear JWST-II 2016 participants,

Welcome to Montreal and to the JWST-II 2016 conference! Here are some general information.

Conference Venue

The conference will be held on the campus of the Université de Montréal in the B-2245 auditorium of the Pavillon 3200 Jean-Brillant located at the following address: 3200, rue Jean-Brillant. Additional information can be found on the web site : http://craq-astro.ca/jwst2016/venue_en.php

Registration Desk

The registration desk will open on Sunday from 5:30 pm to 7:30 pm, and from 8:00 am to 5:00 pm during the conference.

Talks

Each speaker must submit a PowerPoint, Keynote or PDF file of their presentation. Files need to be submitted before 11:00 pm the day before being scheduled. Files can be uploaded with the following ftp server:
ftp.astro.umontreal.ca
username : *jwst_talk*
password : *B9nj9ur7!*

Each presentation file name must follow the following format:
Firstname_LastName.pdf (or .ppt or .key)
Ex : *Olivier_Hernandez.key*

Posters

Dimensions: Maximum width: 100cm (40 in) (please do not exceed). Height 115cm (45 in) (an extra 10 cm in height will probably be okay).

The LOC will provide pins or Velcro to mount the posters on the panels. The poster room will open at 7h30 am on Monday at which point posters can be installed at the convenience of the participant.

Poster popups sessions

All participants bringing a poster are invited to give a short presentation of their poster during scheduled pop-up sessions. A popup presentation for a participant is limited to a single slide and 1 minute, no more! The LOC will help you be on time.

Five poster popups sessions are scheduled for a grand total of 47 posters. The detailed schedule is attached. Please check your poster number, and the date and time of your popup presentation. If you do not wish to participate in the pop-up session please inform the LOC.

All poster popup presenters must send a PDF file (one slide) of their presentation by email jwst2016@astro.umontreal.ca before Sunday, October 23, 8:00 pm Montréal time (EDT).

Each presentation file name must follow this format:
PosterNumber_LastName.pdf
Ex: *P2-8_Lachapelle.pdf*

If the name of the file does not follow the prescribed format the file will be rejected and you won't be able to present it!

Special breakout sessions on Wednesday afternoon

Demo JWST Proposal Planning and Tools Session
Please express your interest for the hands-on demo session by sending an email to the LOC to : jwst2016@astro.umontreal.ca
Wednesday, October 26th Main meeting room

Community extragalactic survey discussions
1:00 to 2:00 Wednesday October 26 room B3245 by Steven Finkelstein

Twitter / Social Media

You are invited to tweet about the conference using #JWST2016 hashtag.
You can also follow @iExoplanets https://twitter.com/iExoplanets for announcements and notices during the meeting.

WIFI

The eduroam (https://www.eduroam.org/) network will be available. We will offer also usernames and passwords to connect to the local UdeMs wifi is you do not have access to eduroam. Informations will be available at the registration desk.

Lunches at JWST

Many restaurants near the Université de Montréal (UdeM) can be found on Côte-des-Neiges street and the cafeteria just in front of the conference room can be used at your convenience. Feel free also to ask a LOC member.

Running sessions with the LOC!
Each morning at 7 am (starting on Tuesday), we will have a group of several runners ready to run with you for 5 km or 10 km at different paces! It is a healthy, free of charge activity and a nice way to visit Montréal in the morning! We're looking forward to seeing you!

If you're interested by this activity please contact OLIVIER@ASTRO.UMONTREAL.CA and fill this doodle to find the most suitable starting point for the running session: https://ommastro.doodle.com/poll/4uqvu2fr9gxtcvan

Cocktail Reception
A welcoming cocktail reception will be held on MONDAY, the 24th at 6:30pm in the exhibition hall of the Planetarium de Montréal. We're looking forward to seeing you there. Cocktail is included in your registration fees. During this cocktail, participants will have a free access to the 2 shows:

- We are Stars (http://espacepourlavie.ca/en/we-are-stars)
- One day on Mars (http://espacepourlavie.ca/en/one-day-mars) both on a new and spectacular
360° dome! A must see !!!

Planetarium website: http://espacepourlavie.ca/en/planetarium.

You will be provided with a roundtrip subway ticket to travel to the Planétarium. Members of the LOC will guide participants to the subway station and to the Planetarium.

Banquet - CANCELLED
Unfortunately, due to poor ticket sales the LOC has cancelled the Banquet. A full reimbursement will be provided to participants who bought tickets.

Social activities on Wednesday, October 26th afternoon
The LOC is organizing social activities. Detailed information will be available at the beginning of the meeting. Activities for Wednesday include: A walk to the *Chalet Mont-Royal*, *Musée d'art Contemporain* or a visit to the *Biodôme*. Note that activities are extra, non-included in the conference registration fees. You will be provided with a oneway subway ticket for the social activities. Members of the LOC will guide you. Register at the registration desk.

Public Lecture: David Charbonneau, *How to find an inhabited planet*
A general Public Conference will take place on Wednesday, October 26th, at 8:00PM.
The conference is downtown, on McGill University campus, Leacock Building, 855 rue Sherbrooke Ouest, room 132
Link to the facebook event : https://www.facebook.com/events/1262370417138062/

Contact the LOC
LOC members will identified by their green badges
JWST16@ASTRO.UMONTREAL.CA

Back to schedule ...	Poster pop-ups schedule		
P1-01	Mon, 10:20	**Daniel Durand**	JWST processing in the clouds
P1-02	Mon, 10:21	**Harry Ferguson**	JWST Data Analysis Tools
P1-03	Mon, 10:22	**Jennifer Lotz**	JWST User Documentation
P1-04	Mon, 10:23	**Pierre Bastien**	POMM: a new high precision Polarimeter for the Observatoire du Mont-Mégantic
P1-05	Mon, 10:24	**René Doyon**	The Near-Infrared Imager and Slitless Spectrograph (NIRISS)
P1-06	Mon, 10:25	**Pierre Ferruit**	Observing with JWST/NIRSpec
P1-07	Mon, 10:26	**Maria Pena-Guerrero**	Using Simulated Reference Stars to Test NIRSpec Target Acquisition
P1-08	Mon, 10:27	**Julien Rameau**	Direct Imaging of Exoplanets with NIRISS/AMI
P1-09	Mon, 10:28	**Bernard Rauscher**	Optimizing JWST Near-IR Detector Readout for Bright Objects and Transits
P1-10	Mon, 10:29	**Norbert Pirzkal**	Simulating NIRCAM Slitless Observations
P1-11	Mon, 10:29	**Jonathan St-Antoine**	NOS: NIRISS Optical Simulator
P2-01	Mon, 15:40	**Shunsuke Baba**	Near-infrared spectroscopy of CO ro-vibrational absorption toward AGN obscurers with JWST/MIRI
P2-02	Mon, 15:41	**Dominik J. Bomans**	3D Spectroscopy of intermediate redshift galactic outflows
P2-03	Mon, 15:42	**Matteo Bonato**	Exploring galaxy/AGN co-evolution and dwarf galaxy properties with MIRI serendipitous spectroscopic surveys
P2-04	Mon, 15:43	**Gabriel Brammer**	Wide Field Slitless Spectroscopy, from Hubble to JWST
P2-05	Mon, 15:44	**Thavisha Dharmawardena**	Dust production in M31 and M33
P2-06	Mon, 15:45	**Marie-Lou Gendron-Marso**	AGN feedback in the Perseus cluster
P2-07	Mon, 15:46	**Diane Karakla**	Planning Micro Shutter Array observations of high redshift galaxies in the Hubble Ultra Deep Field
P2-08	Mon, 15:47	**Ciska Kemper**	Crystalline silicates in external galaxies
P2-09	Mon, 15:48	**Ciska Kemper**	A database of computed infrared spectra of proto-silicate clusters and silicate aggregates
P3-01	Tue, 10:20	**Myriam Latulippe**	Deep VLA observations of the massive cluster MACS J1447.4+0827
P3-02	Tue, 10:21	**Annabelle Richard-Laferriè**	The relation between mini-halos and the feedback of supermassive black holes

Poster pop-ups schedule

P3-03	Tue, 10:22	**Tim Rawle**	NIRSpec MOS observations of massive galaxy clusters
P3-04	Tue, 10:23	**Peter Scicluna**	Fitting AGN mid-infrared spectra efficiently
P3-05	Tue, 10:24	**Heath Shipley**	Through the Looking Mass: Comprehensive Photometric Catalogs of Multi-wavelength HST
P3-06	Tue, 10:25	**Henrik Spoon**	The Infrared Database of Extragalactic Observables from Spitzer
P3-07	Tue, 10:26	**Sundar Srinivasan**	Dust in the wind: the mineralogy of newly formed dust in Active Galactic Nuclei
P3-08	Tue, 10:27	**Sofia Wallström**	Massive stars and the crystallinity of interstellar silicates
P4-01	Tue, 15:40	**Tracy M. Becker**	Mid-IR Spectral Search for Salt Signatures on Solar System Bodies
P4-02	Tue, 15:41	**Philip Judge**	Bio-signatures from Enceladus' Geysers using transits from 2023
P4-03	Tue, 15:42	**Stefanie Milam**	JWST operations and capabilities for observations in the Solar System
P4-04	Tue, 15:43	**Micaela Bagley**	Studying the environment around Lyman-alpha emitters during reionization with JWST
P4-05	Tue, 15:44	**Thomas Kemp**	Simulation of High-Redshift Star Forming Galaxy Observations using MIRI.
P4-06	Tue, 15:45	**Ralph Kraft**	James Webb Space Telescope and Chandra X-ray Observatory observations of the Frontier Fields clusters: star formation and black hole growth at high redshift
P4-07	Tue, 15:46	**Brian O'Shea**	Leaving the dark ages: exploring the first galaxies with large-scale cosmological simulations.
P4-08	Tue, 15:47	**Heath Shipley**	The Luminous Polycyclic Aromatic Hydrocarbon Emission Features: Applications to High Redshift Galaxies and Active Galactic Nuclei
P4-09	Tue, 15:48	**Nina Bonaventura**	Red but not dead
P5-01	Wed, 10:20	**Geneviève Arboit**	Simulation of phase-resolved spectroscopic observations of hot Jupiters with NIRISS
P5-02	Wed, 10:21	**Étienne Artigau**	Probing the cloud properties of a benchmark variable T dwarf
P5-03	Wed, 10:22	**Étienne Artigau**	Near-infrared m/s velocimetry: preparing the JWST era in exoplanet characterization
P5-04	Wed, 10:23	**Nicolas Crouzet**	Finding the best low-mass exoplanet targets for JWST using TESS and SPIRou
P5-05	Wed, 10:24	**Lisa Dang**	Rounding Up the Misfit: Full-Orbit Phase Curve of CoRoT-2b
P5-07	Wed, 10:25	**Anthony Moffat**	Wolf-Rayet Stars and Dust Formation in the Early Universe
P5-08	Wed, 10:26	**Joel C. Schwartz**	Exploring the Impact of JWST Measurements on Characterizing Planetary Atmospheres

P5-09	Wed, 10:27	**Ariane Trudeau**	Polarization of A/B stars in the Young cluster NGC 6611
P5-10	Wed, 10:28	**Jason Rowe**	Tools for Slitless Spectroscopy of Extrasolar Planets with NIRISS aboard JWST
P5-11	Wed, 10:29	**Loïc Albert**	Testing Brown Dwarf Models - Secondary Eclipse Observation of LHS 6343
P5-12	Wed, 10:30	**Anand Sivaramakrishnan**	Disambiguating structure in LkCa 15 with aperture masking interferometry

General

Jonathan Gardner NASA GSFC	**James Webb Space Telescope Overview** • Mon, 09:00	**S01-1** •The James Webb Space Telescope continues on schedule for launch in 2018, with the first call for proposals coming in 2017. I will give an overview of the scientific capabilities of JWST. I will show recent progress and the current status of the observatory. I will show the schedule for writing and submitting proposals and show how you can keep up with current progress as we proceed to launch and scientific operations.
H. B. Hammel AURA	**Observing the Solar System with JWST** • Mon, 09:40	**S01-3** •JWST will make significant contributions to planetary science via its infrared capabilities and high sensitivity. The program 'Solar System Observations with the James Webb Space Telescope' (written by H. B. Hammel with S. Milam) was selected by NASA more than 14 years ago, and has been recently updated. We discuss a suite of planned observations for this program, designed to yield high science return, and also to exhibit some or all of the following characteristics: innovation; time criticality; unusual demands on the observatory; and/or challenging for standard peer review in a time allocation committee. The targets run the gamut of Solar System objects: asteroids, satellites, Mars, Jupiter, Saturn, rings, Uranus, and Neptune. In some cases (KBOs, comets, Centaurs, and Titan), we coordinate with other guaranteed time observers to ensure most efficient use of JWST. All techniques are being considered, even occultations. The programs will be sufficiently narrow in science scope to provide room for many other JWST observational programs from the Solar System community.
Nikole Lewis STScI	**Preparing for JWST** • Mon, 10:50	**S01-4** •The James Webb Space Telescope (JWST) will be the most powerful space telescope that we've ever constructed, and it is a critical step towards answering the top science questions outlined in the Astronomy & Astrophysics 2010 and 2020 Decadal Surveys. The fall of 2016 marks the 1 year countdown before the JWST Cycle 1 Call for Proposals; the conversation is now changing from development progress to science planning. In this presentation, I will highlight the unique capabilities of the JWST science instruments and the multiple imaging, coronagraphy, integral field spectroscopy, slit and slitless spectroscopy, and multi object spectroscopic modes that the observatory offers to the community. I will also describe the upcoming science timeline for JWST as we approach launch in Oct 2018. This includes STScI plans for creating a community defined zero proprietary time "Early Release Science Program" for JWST, the timing to releasing an innovative 3D Exposure Time Calculator and simulation tools, the timing for the first General Observer and Guaranteed Time Observer calls for proposals, and the plans for organizing future workshops and science meetings to plan collaborative programs and learn how to reduce JWST data.
Björn Benneke Caltech	**A Large Hubble Space Telescope Survey of Low-Mass Exoplanets** • Mon, 11:30	**S01-5** •The discovery of short-period planets with masses and radii between Earth and Neptune was one of the biggest surprises in the brief history of exoplanet science. From the Kepler mission, we know that these 'super-Earths' or 'sub-Neptunes' orbit at least 40% of stars, likely representing the most common outcome of planet formation. Despite this ubiquity, we know little about their typical compositions and formation histories. In this talk, we will shed new light on these worlds by presenting new results from our 124-orbit HST transit spectroscopy survey to probe the chemical compositions of low-mass exoplanets. We will report on multiple molecular detections. Our unprecedented HST survey provides the first comprehensive look at this intriguing new class of planets by covering seven planets ranging from 1 Neptune mass and temperatures close to 2000 K to a 1 Earth-mass planet near the habitable zone of its host star.
Laura Pentericci INAF-OAR	**VANDELS: getting ready for JWST with ultradeep spectroscopy** • Mon, 11:50	**S01-6** • VANDELS is an ESO public spectroscopic survey that will obtain unprecedented ultra-deep spectra (up to 80 hours integration with VIMOS@VLT) of >2000 star forming galaxies at redshift between 2.5 and 6.5 in the CANDELS UDS and CDFS fields. It will be completed just before the launch of JWST. The VANDELS spectra allow us for the first time to perform a detailed study of the absorption line physics in individual galaxies, determining in particular accurate stellar metallicities and outflows properties and ultimately star formation rates, dust content and total masses. I will show how the combination of these ultra-deep rest-frame UV spectra with JWST-NIRSPEC spectroscopy will provide an unprecedented view of galaxies physical properties, underpinning high redshift galaxy evolution during the peak epoch of assembly.

Galaxy Assembly

Alyson Brooks Rutgers University	**Galaxy Evolution Across Cosmic Ages as Seen by JWST** • Mon, 13:30	**S02-1** •JWST will be a powerful instrument for advancing our knowledge of galaxy evolution at all cosmic epochs. I will highlight science cases across time. At high redshift, JWST will probe the first stars and galaxies and the evolution of the early luminosity function down to low mass galaxies that may reionize the Universe. It will also examine the long stretch of time in which the morphology of galaxies is set. When do disks and spheroids form? What is the role of mergers and feedback? Finally, JWST will also probe galaxy evolution locally, allowing us to connect our local Universe to the evolution examined at high redshift.
Alexandra Pope University of Massachusetts Amherst	**Using JWST to measure the evolving interstellar medium in high redshift galaxies** • Mon, 14:10	**S02-3** •The prominent peak in the history of star formation and black hole accretion at z∼1-3 suggests strong evolution in the mechanisms that grow stars and black holes in galaxies. Mid-infrared observations can quantify both the energy balance between star formation and active galactic nuclei (AGN) activity, and constrain the composition and conditions of the gas and dust available to form new stars. In order to measure and understand the evolution of the interstellar medium (ISM) in high redshift galaxies, I combine diagnostics from mid-IR spectroscopy, far-IR/(sub)mm continuum and CO molecular lines. While ground-based facilities such as ALMA and the Large Millimeter Telescope (LMT) probe the cold ISM, JWST will be crucial for measuring the warm ISM and small dust grains. I will discuss new programs for JWST that leverage the existing and planned observations of the cold ISM in order to determine how the conditions of the ISM evolve with cosmic time.
Naslim Neelamkodan NAOJ	**Molecular hydrogen in the interstellar medium of galaxies** • Mon, 14:30	**S02-4** •Tracing molecular gas in metal-poor environment of nearby galaxies is crucial for understanding the process of star formation in the early universe. Unfortunately, the most abundant molecule, H2, remains largely undetectable due to its symmetric structure and the lack of a permanent dipole moment. Therefore, to quantifying the molecular gas reservoir, we usually rely on the second most abundant molecule, CO, using a CO-to-H2 conversion factor. However, CO can have difficulties in tracing all of the molecular gas under certain conditions, such as low-metallicity environment when substantial H2 may exist outside of CO emitting regions (Remy-Ruyer et al. 2014; Chevance et al. 2016). In a metal-poor ISM, due to the reduced dust-to-gas ratio, most of the CO can be photo-dissociated by hard UV radiation field, however H2 is self-shielded from the UV radiation field and expect to reside everywhere in the ISM. The pure rotational 0-0 transitions of H2 due to the molecule's quadrupole moment are more direct tracers of the H2 gas, although they are only excited at higher temperatures than those prevalent in molecular cloud interiors. These mid-infrared transitions trace the bulk of the warm molecular gas with temperatures between 100 and 1000 K, which is a small but non-negligible fraction of the total molecular gas reservoir. The infrared spectrograph on the Spitzer space telescope enabled us to detect these weak H2 transitions in many nearby low-metallicity galaxies including our neighbours, the Magellanic Clouds, and establish that around 10% of the gas was in the warm molecular phase (Naslim et al. 2015). However, The uncertainty of the amount of H2, physical properties and excitation conditions in galaxies are exacerbated due to the relatively weak detection threshold of H2. Our earlier work (Naslim et al. 2015) was based on 1' IRS spectral maps obtained with Spitzer. The pure rotational 0-0 transitions of H2 at 28.2 (S(0)) and 17.1 μm (S(1)) are detected, however the higher level transitions are almost exclusively upper-limit measurements. The single-temperature fits through the lower transition lines give temperatures in the range 86-137 K. The bulk of the excited H2 gas is found at these temperatures and contributes $5-17$ percent to the total gas mass. We found a tight correlation of the H2 surface brightness with polycyclic aromatic hydrocarbon and total infrared emission, which is a clear indication of photoelectric heating in photo-dissociation regions. The excitation of H2 by this process is equally efficient in both atomic- and molecular-dominated region and we cannot rule-out the possibility of shock excitation of H2 in our samples. The H2 transitions are found to be important diagnostic tool for shocks in many galactic and extragalactic environments. The excitation diagram of H2 is generally characterized by 1) the excitation temperature of the thermal component 2) the ortho/para ratio of non-thermal component. In order to clearly calibrate the ortho/para ratio and for a satisfactory explanation of excitation mechanism we require the detection of H2 higher transitions at higher sensitivity. This will be possible with the unique capability of JWST. The mid-IR spectrograph (MIRI) on JWST covering a wavelength range 4.6-28.6 μm will be able to detect and characterize H2 0-0 rotational transitions in nearby metal-poor galaxies at a higher sensitivity and spectral resolution. MIRI's integral field unit will allow us to investigate the physical state and kinematics of warm molecular gas that is dynamically heated by star formation or shocks. We plan to probe H2 emission in galaxies of different metallicities and study their physical conditions and excitation mechanisms to investigate any trend with metallicity.

Back to schedule ...	Contributed talks	
Chris Willott NRC-Herzberg	**Galaxy Evolution with NIRISS Slitless Spectroscopy** • Mon, 14:50	**S02-5** •I will describe use of the wide-field slitless spectroscopy mode of NIRISS for studies of galaxy evolution. This mode provides high-multiplex spectroscopy of both emission lines and broad absorption features. I will present the NIRISS Guaranteed Time Observing plan for a slitless survey to address several key JWST science topics.
Allison Kirkpatrick Yale	**How Prevalent are Dust Obscured AGN at z=1-2?: Predictions for MIRI/JWST Samples** • Mon, 16:00	**P02-6** •The buildup of stellar and black hole mass peaked during z=1-3, making this a key epoch in the era of JWST. IR luminous galaxies dominate the stellar growth during this period, and many are harboring a hidden active galactic nucleus (AGN), feedback from which may quench star formation. I quantify the contribution of AGN heating to the infrared emission of 343 IR luminous galaxies from z=0.5-2.8 using Spitzer mid-IR spectroscopy, available for every source, providing an unique opportunity for predicting the demographics of samples selected with MIRI/JWST. I classify sources as star forming galaxies, AGN, or composites based on the presence of mid-IR continuum emission due to a dusty torus. I quantify the percentage of AGN sources at different flux thresholds as a function of wavelength and find that obscured AGN comprise >40% of even the faintest samples. The composites are a separate class of galaxy which show a true mix of star formation and obscured AGN activity, and mid-IR emission alone can predict total IR luminosity of the AGN in composite systems, important for calculating correct star formation rates. I use my spectroscopic sample to calibrate new color selection diagnostics well suited for JWST, and I use my diagnostics to find previously unidentified AGN and composites in a large sample of main sequence, quiescent, and quenching galaxies from CANDELS. I find that dust obscured AGN and composites are preferentially located on the main sequence, indicating my IR selection techniques are ideal for finding luminous AGN in star forming galaxies prior to quenching.
Daryl Haggard McGill University	**Multiwavelength Observations of the Galactic Center and Sgr A*** • Mon, 16:20	**S02-7** •The last several years have seen increasingly ambitious multiwavelength campaigns targeting the Galactic Center and Sgr A*. Most recently, we have undertaken joint Spitzer-Chandra observations to achieve uninterrupted, simultaneous IR/X-ray monitoring of Sgr A* and other Galactic Center transients (including a magnetar and several NS or BH X-ray binary systems) covering several 24 hour intervals. These remarkable programs are designed to study the flare activity and variability of Sgr A*, our closest supermassive black hole. I will outline these and other multiwavelength campaigns targeting the Galactic Center and discuss how these studies can be advanced by JWST, e.g., via JWST/NIRISS high resolution imaging with aperture mask interferometry, which will probe scales from hundreds to thousands of AU at 4.8 μm (Ford et al. 2014), and complement future studies of Sgr A* from the Event Horizon Telescope and 30 m-class adaptive optics enabled telescopes on the ground.

First Light

Marusa Bradac UCDavis	**First Light and Reionization** • Tue, 09:00	**S03-1** •In the recent years HST enabled us to detect galaxies as far as z∼11. They are likely beacons of the epoch of reionization, which marked the end of the so-called "Dark Ages" and signified the transformation of the universe from opaque to transparent. However very little is known about those galaxies, and a confirmation of their redshift is mostly still out of our hands. I will present the latest efforts to study first galaxies and their link to reionization.
Pascal Oesch Geneva University	**JWST's Spectroscopy at the Cosmic Dawn** • Tue, 09:40	**S03-2** •JWST's revolutionary capabilities will result in a quantum leap forward in our exploration of the earliest phases of galaxy formation in the distant universe. In particular, JWST/NIRSPEC's unprecedented spectroscopic capabilities extending out to ∼5 micron open up a completely new parameter space of exploration. This will finally provide us with a much more detailed understanding of the physical and chemical properties of galaxies in the epoch of reionization out to the most distant galaxies currently known. In this talk, I will summarize recent progress in our spectroscopic exploration of the most distant galaxies both from space with HST grism spectra as well as from the ground with efficient multi-object NIR spectrographs. I will also highlight some of the exciting possibilities that lie ahead with JWST to push the spectroscopic frontier to the cosmic dawn and what insights we may be able to obtain from this spectroscopy at different redshifts.
Ricardo Amorin INAF-Osservatorio Astronomico di Roma	**Analogs of primeval galaxies at z∼3: Studying the early build-up and chemical enrichment of young galaxies before the arrival of JWST** • Tue, 10:00	**S03-3** •The physical mechanisms governing the birth and early evolution of galaxy's life are still hidden to our exploration. Deep observations have revealed that young luminous galaxies at $z > 6$ have more extreme properties compared to typical star-forming galaxies studied at lower redshift, namely, different emission line properties, higher specific star formation rates, lower masses, and smaller sizes. However, until the arrival of the James Webb Space Telescope, detailed spectroscopic studies of their abundances and ionization properties are unfeasible, strongly limiting our understanding of the physics driving early galaxy build-up and chemical enrichment. In this talk I will present the discovery of a rare population of small, sub-L$*(z = 3)$ young galaxies at redshift z∼2.5-3.5 that exhibit all the rest-frame properties expected from primeval galaxies in the first billion year of cosmic time. Our sample is selected by their strong nebular UV emission lines (including CIII]1908, OIII]1663 and, in some cases, CIV1550 and HeII1640) from thousands of targets in the VIMOS Ultra Deep Survey (VUDS). They are extremely compact, low-mass galaxies showing hard radiation fields and low metal abundances, which suggest that they are caught in their first epoch of assembling and chemical enrichment. I will discuss their rest-frame spectrophotometric properties, highlighting their use as a benchmark for comparison studies with $z > 6$ galaxies, which will be routinely discovered, e.g., with JWST-NIRSpec.
Stefano Carniani University of Cambridge, UK	**The assembly of "normal" galaxies at z∼7** • Tue, 11:10	**S03-4** •In studying the formation and assembly of protogalaxies in the early Universe ($z > 6$) we are still concerned about the galaxies responsible for the end of the Dark Ages, that are expected to be primarily low mass galaxies with modest star formation rates (<10 $M_\odot$/yr).We will present deep ALMA observations targeting the [CII]158μm and [OIII]88μm line in a spectroscopically confirmed Lyman Break Galaxy at z∼7.1 with SFR∼7 $M_\odot$/yr. We detected [CII] and [OIII] emission fully consistent with Ly-alpha redshift, but spatially offset by $0.7''$ (∼4 kpc) from the optical emission and displaced [CII] and [OIII] emission are also visible in recent studies of star-forming galaxies at $z > 5$. These results suggest that the molecular clouds in the central parts of primordial galaxies are rapidly disrupted by stellar feedback, resulting in [CII] and [OIII] emission mostly arising from more external accreting/satellite clumps of neutral gas. Some of these clumps reveal star-formation in situ that are not visible in the deepest HST near-IR images and only JWST will allow the identification of counterparts for these FIR-line emitters leading to an in-depth study on their properties.

Exoplanets and Brown Dwarfs

Charles Beichman NExScI	**Exoplanet Science With JWST** • Tue, 11:30	**S04-1** •I will summarize the plans of the NIRCam instrument team for exoplanet science. In collaboration with other instrument teams and GTOs we will study carry out a number of distinct programs: direct imaging and spectroscopy of known planets; spectroscopy of transiting systems; imaging of debris disks; spectroscopy of the coolest, Jovian mass brown dwarfs; and a search for low mass planets around nearby young stars.
Ray Jayawardhana York University	**Exploring "Rogue Planets" with JWST** • Tue, 11:50	**S04-2** •Deep surveys in nearby star-forming regions have revealed sub-stellar objects down to very low masses, and have begun to determine their characteristics. Results to date suggest that brown dwarfs likely represent the extension of the stellar mass function. However, surveys with follow-up spectroscopy tend to be incomplete below $\sim$10 $M_{\rm Jup}$, and particularly below $\sim$5 $M_{\rm Jup}$. A large population of 'rogue planets', formed in disks around nascent stars and then ejected, is expected in young star clusters. With the James Webb Space Telescope, we will be able to search for and confirm such free-floating siblings of giant exoplanets for the first time. In particular, our GTO program, using the Wide-Field Slitless Spectroscopy mode of NIRISS, will be able to identify, confirm and perform basic characterization of young planetary-mass sub-stellar objects in one go, making it a compelling and exciting early science initiative for JWST. We outline the planned observations, and discuss the implications of this first direct exploration of Jovian-mass rogue planets for star and planet formation.
Stanimir Metchev University of Western Ontario	**Weather on Other Worlds: Implications for JWST Phase Mapping of Variable Brown Dwarfs** • Tue, 12:10	**S04-3** •The series of investigations under the Weather on Other Worlds program with Spitzer have shown that photospheric inhomogeneities – large-scale spot or cloud structures – are virtually ubiquitous on brown dwarfs. Continued variability monitoring is now divulging the range of characteristics of non-irradiated substellar objects, with spots now also found on planetary-mass objects. Phase mapping of rotating (variable) objects reveals longitudinal variations, while wavelength-dependent monitoring enables a vertical probe of cloud layers and of temperature-pressure profiles. Such differential approaches are effective because they measure perturbations around an otherwise constant set of atmospheric conditions. Thus, spectroscopic phase mapping allows a higher-precision determination of the 3-D atmospheric structure than is attainable by forward or inverse modelling of non-variable objects. The $0.6 - 28.5\,\mu$m wavelength grasp of JWST will offer unprecedented insights into brown dwarf and exoplanetary atmospheres. With brown dwarf variability science emerging mostly in the post-cryogenic Spitzer era, spectrophotometric phase mapping with JWST will for the first time probe the dominant condensate opacity source in the atmospheres of L and T type dwarfs: silicate dust clouds. We present results from optical/near-infrared spectroscopic monitoring of variable brown dwarfs that have enabled us to develop tomography tools to probe the cloud structure of brown dwarf and exoplanet atmospheres with JWST.

Solar System

Dave Jewitt UCLA	**Solar System Science - Invited Review** • Tue, 14:00	**S05-1** •The solar system is the only planetary system we can study in detail, offering many opportunities for science and raising many important questions. Unlike most other branches of astronomy, solar system science benefits both from in-situ studies using spacecraft and from remote studies using telescopes. The two approaches are highly complementary and contribute roughly equally to our knowledge. In this talk, I will provide a broad overview of recent results obtained by planetary astronomers, focusing on new areas relevant to JWST and on big-picture issues regarding solar system formation and evolution.
JJ Kavelaars NRC	**TNOs surfaces in the JWST era.** • Tue, 14:40	**S05-2** •We will explore the constraints on planet formation in our solar system that can be derived via a precise accounting of the surface ice inventories of objects in the trans-Neptunian region. In July 2015 the New Horizons Pluto flyby revealed a much more complex ice environment than had been anticipated. In January 2019 we will fly the New Horizons spacecraft to an encounter with the small Kuiper belt object 2014 MU69. What will we learn from this encounter is currently very speculative as we have nearly no information about the surface of such small members of the Kuiper belt. In the JWST era we will be in a position to acquire spectra and broad-band SEDs for a large sample of TNOs. I will summarize the current understand of such surfaces, as determined from ground and space based surveys, and explore what we may learn in the JWST era.
Matthew S. Tiscareno SETI Institute	**Observing rings and small moons with JWST** • Tue, 15:00	**S05-3** •The James Webb Space Telescope (JWST) will provide unprecedented opportunities to observe the rings and small moons in our solar system, accomplishing three primary objectives: 1) discovering new rings and moons, 2) unprecedented spectroscopy, and 3) time-domain observations. We give details on these science objectives and describe requirements that JWST must fulfill in order to accomplish the science objectives.
Andrew Rivkin JHU/APL	**The Promise of JWST for Asteroid Studies** • Tue, 15:20	**S05-4** •Many aspects of small body science that are of great current interest are addressable by JWST, and just as HST observations of asteroids set the stage for in situ measurements of these objects, we expect JWST to extend our understanding further still. In particular, NIRSpec observations in the 3-m region and MIRI observations will provide data unobtainable from the ground save for a handful of the brightest asteroids. In contrast, JWST will allow these measurements to be made for practically every known main belt asteroid and a large fraction of near-Earth asteroids, enabling study of their mineralogies and volatile inventories. We will describe the science cases for several possible JWST asteroid projects, including study of a Ceres-like asteroid and members of its dynamical family, a reconnaissance of objects co-orbiting with major planets, and observations of select, intriguing near-Earth objects unrepresented in our meteorite collections, all at wavelengths and with a sensitivity unachievable from Earth. These possible projects will all provide high-priority planetary science and showcase JWST's unique capabilities.
Brenda Matthews NRC Herzberg	**Observations of circumstellar dust with JWST** • Tue, 16:30	**S05-5** •I will discuss the potential science enabled by JWST in the detection of extrasolar circumstellar dust around stars of various ages. In particular, I will emphasize the impact on detections of warm dust due to collisional processes around young and intermediate age main sequence stars, as well as the insights that will be gained about the composition of such systems in comparison to our own Solar System.

First light

Steven Finkelstein The University of Texas at Austin	**Using an improved model of reionization to craft a legacy JWST galaxy evolution survey** • Tue, 16:50	**S06-1** •I will present the results of our new analysis of the contribution of both galaxies and AGNs to the reionization of the intergalactic medium (IGM). The time evolution of reionization, and the ionizing sources, are poorly constrained primarily due to the lack of knowledge about the escape fraction of ionizing photons from star-forming galaxies. Using the results of detailed zoom-in hydrodynamical simulations, we parameterize the escape fraction as a function of halo mass and combine this with observations of the evolution of the galaxy luminosity function at high redshift. This fiducial model does not complete reionization by z=6. We then run a MCMC analysis, using the observations of quasars and the electron scattering optical depth to the CMB to constrain a number of free parameters, including a scale factor applied to the simulation escape fraction results, a contribution from AGN, minimum halo mass for star formation, and the Lyman continuum photon production efficiency, finding that star-forming galaxies alone can fully reionize the universe by z∼6 with an escape fraction of only ∼5% (∼4% if AGNs contribute significantly). This model makes a number of important predictions for the number density and ionizing efficiency of galaxies at $z > 8$, and I will discuss these in the context of the design for a JWST extragalactic legacy survey.
Andrei Mesinger Scuola Normale Superiore	**Galaxies during the Epoch of Reionization** • Tue, 17:10	**S06-3** •The first galaxies are thought to play a leading role in the Epoch of Reionization (EoR). By extending our current census of high-z galaxies, JWST will shed light on this as-yet uncharted phase transition of our Universe. I will show how simple galaxy number counts can be used to provide: (i) Bayesian priors on galaxy astrophysics (such as the evolution of the ionizing escape fraction), and (ii) constraints on a possible small-scale cut-off in the matter power spectrum (as suggested by some alternative Dark Matter models). Moreover, the observability of Lyman alpha emission with JWST spectroscopy can be used as a sensitive probe of the EoR, using both: (i) the drop in the fraction of color-selected galaxies with strong Lyman alpha emission; (ii) the clustering of high-z Lyman alpha emitters.

Exoplanets

David Charbonneau Harvard University	**Exoplanet Syzygy: A Star, A Planet, and an Infrared Space Telescope** • Wed, 09:00	**S07-1** •When exoplanets pass in front of or behind their stars, we are granted unprecedented opportunities to study the chemical composition and physical conditions of their atmospheres. Space is the natural venue from which to undertake these studies. However, previous efforts with Spitzer and HST have been photon starved, and have not granted sufficient spectral resolution and wavelength coverage. Based on the results from the Kepler Mission, we know that the optimal transiting exoplanets for atmospheric study have yet to be identified. I will first discuss the strategies and timescales for finding them, and then I'll show SNR realizations of mock observations, and discuss how JWST will allow penetrating insights into alien skies.
David Lafrenière Université de Montréal - iREx	**Characterization of exoplanets with NIRISS** • Wed, 09:40	**S07-2** •This talk will present a brief overview of the capabilities of the Near-Infrared Imager and Slitless Spectrograph (NIRISS) onboard the James Webb Space Telescope for the study of exoplanets, as well as the broad lines of the exoplanet component of the Guaranteed Time Observation program of the NIRISS science team. The Single Object Slitless Spectroscopy (SOSS) mode of NIRISS, specialized for transiting exoplanet spectroscopy, provides a resolving power of 500-1400 across the 0.6-2.8 um range simultaneously. Observations of exoplanet in transits using SOSS should typically reach a precision of several tens of ppm per resolution element over a single transit. NIRISS SOSS is thus a unique and very powerful mode for the atmospheric characterization of transiting exoplanets, from hot Jupiters to super-Earths. NIRISS also features an aperture masking interferometry (AMI) mode that will enable moderate-contrast ($< 9\,$mag) imaging observations of faint companions at small angular separations ($0.05''$-$0.4''$) from their host star in the 3.6-5.0 μm range; this mode reaches closer-in than the telescope diffraction limit. It will enable flux measurements of known exoplanets not observable at these wavelengths from the ground, as well as searching for planets around stars not amenable to ground-based extreme adaptive optics observations.
Stephan Birkmann European Space Agency	**JWST/NIRSpec: capabilities for exoplanet characterisation** • Wed, 10:00	**S07-3** •The Near Infrared Spectrograph (NIRSpec) is one of the science instruments on the James Webb Space Telescope that is on schedule for launch in October 2018. NIRSpec has a dedicated mode and aperture for taking time series data of bright sources that can be used to perform transit and eclipse spectroscopy of exoplanets. The instrument has a prism and six gratings, provides a wide wavelength coverage from 0.6 to 5.3 micron, and spectral resolutions of up to $\sim$3000. We present the instrument's characteristics and features relevant for exoplanet transit, eclipse and phase curve observations, and provide an update on expected source brightness limits and instrument performances, as well as examples for spectra of exoplanet atmospheres as they will be seen by NIRSpec.

Pierre-Olivier Lagage
CEA Saclay

Characterization of the Atmosphere of Exoplanets with MIRI

• Wed, 11:10

S07-4 •The characterization of the atmosphere of exoplanets is one of the three large programs (100 hours each) to be conducted in the framework of the Guaranteed Time Observations (GTO) of the European MIRI consortium. The aim of the program is twofold : 1) to constrain the atmospheric models of exoplanets with no equivalent in the Solar system, 2) to constrain giant planet formation models from the determination of the molecular composition of the atmosphere (C/O, metallicity) or of the bolometric luminosity in the case of isolated young giant exoplanets. The wavelength coverage of MIRI (5 - 28 microns) is particularly well adapted to get precise measurements of the bolometric luminosity of 'warm/cold' exoplanets, to determine the molecular composition of the exoplanet atmosphere, to characterize the nature of clouds or hazes which may be present in the atmosphere, ... Indeed several dust features due to silicates and other dust species are present in the 10 microns region; most of the key molecules possibly present in the atmosphere of an exoplanet have features in the mid-Infrared; some, such as NH3, O3, C2H2, have their strongest bands in the mid-IR. So far spectroscopic studies of exoplanet atmospheres in the mid-IR wavelength range have been sparse. Only a couple of transiting exoplanets has been observed spectroscopically with Spitzer. No observations beyond 5 microns of an exoplanet detected by direct imaging have been yet reported. Making possible observations over a large spectral range is definitely an advantage of the JWST. The capabilities of MIRI to characterize exoplanet atmospheres will be illustrated by going through the various observing MIRI modes to be used for GTO exoplanet observations. We plan to perform spectroscopic observations of transiting exoplanets of various masses, gravity, temperature, using the slitless low resolution spectroscopic mode of MIRI (wavelength range: 5 -12 μm; spectral resolution: 100 at 7.5 microns); the mode has been specifically developed for exoplanets observations. Most of the observations will be eclipse observations, complemented, when possible in terms of high enough signal to noise ratio in one transit, by transmission observations; a phase curve of one exoplanet (WASP 43-b) is under consideration. We plan to perform coronagraphic observations with the three phase masks specifically developed to detect the NH3 line at 10.65 μm expected in the spectra of young giant exoplanets at temperature lower than about 1000 K. We plan to use the Integral Field Unit medium resolution spectroscopic (MRS) mode (5-28 microns, spectral resolution between 1000 - 3500) to observe wide separation planetary mass companions, as well as one or two free floating planets. Note that we also plan to use the MRS to observe a sample of brown dwarfs.

First Light

Stuart Wyithe University of Melbourne	**Origins and fate of the highest known redshift galaxy: Implications for JWST** • Wed, 11:30	**S08-1** •We have investigated the formation mechanisms and eventual fate of the recently identified z∼11 galaxy GN-z11 using analog galaxies identified in the DRAGONS simulations. The modelling suggests that galaxies of similar luminosity to the remarkably bright GN-z1 (M_{UV}=-22.1) may not be as rare as extrapolations of lower redshift observed luminosity functions suggest, and that JWST will be able to detect the progenitors of GN-z11 analogues out to z∼15. By modelling the size-luminosity relation we also show that JWST will be able to resolve the GN-z11 like progenitors, pushing the frontier of galaxy-formation observation to the very earliest stages of cosmic reionization. GN-z11 analogs are found to have smooth stellar mass growth histories with consistently high star formation rates and UV luminosities, indicating that their brightness is not transient. Moreover, although GN-z11 analogues are relatively rare outliers from the full galaxy population at z∼11, they are no longer the most massive or brightest systems among the well studied population of galaxies at z∼6.
Mia Bovill STScI	**Detectability of "First" Light with JWST** • Wed, 11:50	**S08-2** •The first Pop III stars at $z > 20$ will be beyond the reach of even JWST without extremely strong gravitational lensing. However, in the presence of a LW background, a subset of halos which cross the Lyman limit at late times ($z < 15$) may contain pristine gas, allowing either direct collapse to $\sim 10^5$ $M_\odot$ black holes or the formation of a $10^4 - 10^5$ $M_\odot$ cluster of Pop III stars. The latter would be detectable by JWST. Here we present predictions for the number and detectability of these late forming Pop III galaxies as well as a more general overview of the detestability of Pop II galaxies and early massive black holes with JWST.
Hakim Atek Ecole Polytechnique Federale de Lausanne	**Combining JWST With Gravitational Telescopes to detect the Galaxies Responsible For Cosmic Reionization** • Wed, 12:10	**S08-3** •The identification of the first generation of galaxies and the possible sources of cosmic reionization is one of the foremost challenges in modern astrophysics. Great progress has been made in characterizing galaxy populations at redshift $z = 6 - 7$ through photometric observations in blank fields. A complementary approach is to exploit the power of gravitational lensing offered by massive galaxy clusters, which gives access to the faintest sources at high redshift. Using director discretionary time, the Hubble Frontier Fields (HFF) initiative is aiming to peer deeper into the distant Universe by observing six lensing clusters down to a magnitude limit of ∼29 AB. I will present here the latest HFF results from three lensing clusters, where we detect about 250 magnified galaxies at $z = 6 - 8$ down to an absolute magnitude of $M_{uv} = -15$. I will show how combining JWST capabilities with gravitational telescopes will be a very efficient way to study the faintest galaxy populations ever observed at those redshifts and to demonstrate that galaxies are the main sources of cosmic reionization.

JWST Proposal Planning and Tools Session

Janice Lee STSCI	**Directors Discretionary Early Release Science Program** • Wed, 14:00	**S09-1** • Hands-on Demo
Jennifer Lotz STSCI	**The JWST User Documentation** • Wed, 14:25	**S09-2** • Hands-on Demo
Timothy Pickering STSCI	**The JWST Exposure Time Calculator** • Wed, 14:40	**S09-3** • Hands-on Demo
Diane Karakla STSCI	**The JWST NIRSpec Micro-Shutter Arrays Planning Tool** • Wed, 15:20	**S09-4** • Hands-on Demo
Harry Ferguson STSCI	**JWST Data Analysis Tools** • Wed, 16:00	**S09-5** • Hands-on Demo

Star Formation

Ralph E. Pudritz McMaster University	**The Origin of Stars and Their Planetary Systems** • Thu, 09:00	**S10-1** •JWST presents us with a unique opportunity to probe one of the deepest questions in astrophysics - namely - how do stars and their associated planetary systems form? Is the formation mechanism for stars universal or does it depend upon their mass or environment? How is star and planet formation linked to the formation and properties of protostellar disks? One of the central insights gleaned over the last decade is that star formation occurs in cores within filaments probably by gravitational instability. They also form preferentially in clusters that are born in particularly rich filamentary environments. How is cluster formation driven and how it is connected to these filamentary flows? Do feedback processes ultimately limit cluster masses? On smaller scales, to what extent do disk properties and masses depend upon cluster formation and evolution? This review will span several decades of physical scales, ranging from processes operating in clusters/filaments down to the formation of protostellar disks and the first stages of planet formation within them.
Will Fischer NASA Goddard Space Flight Center	**Understanding Accretion in the Youngest Protostars with MIRI Spectroscopy** • Thu, 09:40	**S10-2** •With our published WISE color criteria, we have identified deeply embedded Class 0 protostar candidates in regions not imaged by Spitzer/MIPS. Follow-up spectroscopy of these and other Class 0 sources with JWST's MIRI instrument has the potential to detect atomic hydrogen lines, allowing confirmation of their protostellar nature and determination of temperatures, densities, and mass accretion rates. This will address the long-standing question of whether the youngest protostars accrete most of their mass steadily or stochastically, in episodic outbursts. I will highlight representative WISE Class 0 candidates and present radiative transfer models that we developed to interpret line ratios at MIRI wavelengths. I will also discuss early successes of the radiative transfer models in interpreting near-IR spectra of T Tauri stars and a SOFIA mid-IR spectrum of a nova.
Natsuko Izumi National Astronomical Observatory of Japan	**Observing star-forming regions in the outer Galaxy with JWST** • Thu, 10:00	**S10-3** •The outer Galaxy beyond the outer arm (Rg>13.5 kpc) offers an interesting opportunity to study star formation in a significantly different environment from that in the solar neighbourhood with much lower gas density ($<1/10$) and lower metallicity ($\sim$1/10). However, star-forming regions in the outer Galaxy have never been comprehensively surveyed and listed due to the difficulties in detecting them at such large distances. Therefore, we searched for star-forming regions with WISE MIR all-sky survey data and FCRAO CO outer Galaxy survey data to identify new 711 star-forming regions in 240 molecular clouds up to Rg $\sim$20 kpc (Izumi et al., in prep, 2016). Our new sample star-forming regions enable statistical studies of star formation processes up to extreme outer Galaxy for the first time. We estimated star-formation efficiency per molecular clouds for converting H2 gas to stars to find that the efficiency may not depend on environmental parameters including gas density and metallicity. However, the internal structure of those star-forming regions cannot be spatially resolved with the WISE resolution. We need to understand detailed properties of star-formation activity such as initial mass function, apparent age spread, and triggering mechanisms in the outer Galaxy with JWST. Individual young stellar objects (YSOs) less than 0.1 $M_\odot$ can be detected using JWST because of its high spatial resolution and sensitivity. We are also able to estimate spectral energy distribution for each YSOs with both near and mid-infrared data, which enable us to classify their evolutional state accurately. Furthermore, combining with data from ALMA, we would be able to study the relationship between dense core formation and star formation processes in the outer Galaxy. Investigating the large number of YSOs in our sample star-forming regions and their surrounding structures is probably related to reveal environmental dependence of star formation processes.
Michihiro Takami ASIAA, Taiwan	**Revealing accretion and evolution of heavily embedded high-mass protostars** • Thu, 10:20	**S10-4** •The theoretical and observational understanding of the formation of high mass stars has remained a tricky puzzle. After a certain evolutionary phase accretion should be inhibited by radiation pressure. Disk accretion is regarded as the most promising formation scenario to resolve this issue. However, prior observations have not provided convincing evidence that accretion from the innermost disk region to the protostar is ongoing. Furthermore, the high extinction in these objects makes observing emission arising directly from the protostar and inner disk very challenging, leading to ambiguous estimates of their mass and evolutionary status. Studies made by our group suggest that the extended infrared emission associated with many high mass protostars is due to scattered continuum. This makes emission from the inner disk region or protostar accessible through observations of the scattered light. We will explain how spectroscopy of such emission with JWST-NIRSpec and future instrumentation could produce a breakthrough for this research field. In addition, we will briefly comment on how observations with JWST-MIRI, as well as SPICA, could impact this research topic.

First Light

Kirk Barrow Georgia Institute of Technology	**First Light: Exploring the Spectra of Galaxies in the Early Universe** • Thu, 11:30	**S11-1** •We present synthetic JWST observations for galactic halos forming during the epoch of reionization. Due to the strong impact of nebular emission lines and the relatively compact scale and dynamics of HII regions, high resolution cosmological simulations and a robust suite of analysis tools are required to properly simulate spectra. Using cosmological radiation hydrodynamic simulations of the first galaxies, we created a software pipeline consisting of FSPS, Hyperion, Cloudy and our own tools to generate synthetic IR observations from a fully three-dimensional arrangement of gas, dust, and stars. Our prescription allows us to include emission lines from a complete chemical network and incorporate the effect of dust extinction and scattering in the line of sight of the observer. We provide spectra, imaging, and photometry for both HST and JWST IR filters, luminosity relationships, and emission line strengths for nearly 1700 galaxies in the overdense region of the Renaissance Simulation (Xu et al. 2013). Our resulting synthetic spectra show high variability between galactic halos with a strong dependence on stellar mass, metallicity, gas mass fraction, viewing angle, and formation history.
Brenda Frye University of Arizona	**The Best "Optics" for JWST** • Thu, 11:50	**S11-2** •A picture is emerging in which star forming galaxies are rare at the highest redshifts ($z > 10$) owing to the nearly catastrophic drop in the galaxy number counts for $z > 7 - 8$. Coupled with this, the recent downward revision of the Planck polarization optical depth suggests a rather low epoch of reionization ($z < 8$ for the case that it is instantaneous). The implication is that even with JWST the characteristic luminosities may potentially be too low to detect the highest redshift objects. This result was unexpected at the time of JWST design. Such a handicap imposed on detecting the First Light sources, one of the four prime directives of JWST, is a cause of much concern. Of the different approaches to get past this limitation, the one we have chosen is to take advantage of the lensing effect to sample the background sources ∼2-3 magnitudes further down the faint end of the luminosity function. We address the pressing need to find the best lensing clusters for JWST in two ways: (1) to identify the most massive ($M \sim 10^{15}\ M_{\odot}$), most dark-matter dense (c = 3-8) lenses in existing data, and (2) to search for submillimeter giant arcs in the fields of all-sky survey data such as Planck and Herschel as pointers to entirely new massive lensing cluster fields. We present here our best candidates to promote as additional 'optics' to use in the JWST light train to offer a viable route to discover the First Light sources.
Christopher Conselice Nottingham Uni	**Observing High Redshift Galaxies with JWST: What should we expect?** • Thu, 12:10	**S11-3** •I will present results from HST observations of both the deep CANDELS fields and the Frontier Fields which have implications for studies of JWST. This includes the physical evolution of these galaxies through stellar mass functions and merger histories up to z=8. As JWST will go beyond what we can do with Hubble and 10m telescopes today, the physical properties of galaxies beyond their star formation rates and UV mass functions will be possible. What we are learning now will directly feed into how we should plan for JWST, and what we might discover. i will also discuss plans for a GTO programme to study the first galaxies through lensed groups and how these observations will provide unique perspective on this problem.

Stellar Populations

Julianne Dalcanton University of Washington	**Stellar Populations with JWST** • Thu, 14:00	**S12-1** •Resolved stars are a superb tool for untangling the history of galaxy formation and the timescales and energetics of stellar feedback. JWST's combination of high resolution and large aperture will take such studies into new regimes, by resolving stars to greater depth and in dustier environments. I will review the potential of resolved stellar population studies in general, highlighting areas where JWST is likely to have the largest imact.
Dan Weisz UC Berkeley	**The Local Deep Field** • Thu, 14:40	**S12-2** •I will illustrate the fundamental connection between the stellar fossil record of Local Group (LG) dwarf galaxies and the properties of the faintest high-redshift galaxies imaged in the Hubble and JWST Deep Fields. Using star formation histories measured from the stellar fossil record as revealed by HST imaging, I will show that (i) the ancestors of LG galaxies such as Fornax and Leo A were the likely drivers of cosmic reionization, while even fainter systems such as Leo T and Hercules, were its victims; and (ii) the steep slope of the faint end of the UV luminosity function at z$\sim$7 inferred from high-redshift observations over-predicts local galaxy counts by a factor of $\sim$10. Reconciling this tension requires a break in the slope at $M_{UV}(z\sim7)=-13$. Continued HST and JWST imaging of the stellar fossil record of nearby dwarf galaxies will provide unique insight into the relationship between galaxies and cosmic reionization at low-masses and faint magnitudes that are otherwise impossible to directly observe with HST and JWST in the distant Universe. This 'Local Deep Field' science is thus highly complementary to ongoing and planned deep field surveys with HST and JWST.
Kristen McQuinn UT at Austin	**Using JWST to Efficiently Probe Different Epochs of Star Formation through Resolved Stars** • Thu, 15:00	**S12-3** •In the era of HST, star formation histories derived from the resolved stars have helped shape what we know about many epochs of star formation in low-mass galaxies. HST observations have probed the ancient histories of a growing number of local low-mass satellites of the Milky Way and M31, contributing near-field cosmological constraints on the earliest epochs of mass assembly in satellite dwarfs.In the era of JWST, the larger aperture and greater sensitivity holds the promise of potentially reaching photometric depths more efficiently, extending SFH work to greater distances, and allowing us to explore the star formation histories of galaxies in a range of environments and over a wider parameter space. Here, through extensive simulations, we quantify the efficiency of different JWST filter combinations at different photometric depths and compare accuracies of star formation rates at z $\sim$5 from resolved stellar populations. These results can be used to help guide observing strategies for resolved stellar populations with the JWST.
Martha Boyer STScI	**Transformative Studies of Stellar Dust Production with JWST: The DUSTiNGS Pathfinding Surveys** • Thu, 15:20	**S12-4** •Studies of the Milky Way and Magellanic Clouds suggest that evolved stars such as Asymptotic Giant Branch (AGB) stars and red supergiants supply a sizeable fraction of a galaxy's infrared flux and inject significant amounts of dust into the interstellar medium, rivalling the dust injected by supernovae. Determining the effect of environment on stellar dust production is therefore essential for understanding the role evolved stars play in the chemical enrichment and dust evolution of galaxies and the effect these stars have on the observable properties of their host galaxies. The James Webb Space Telescope will, for the first time, enable the detection and spatial resolution of entire evolved stellar populations in star-forming galaxies more distant than the Magellanic Clouds at wavelengths where dust emission peaks (5-20 μm). The diverse sample of galaxies reachable with JWST and its unique capabilities will allow for an unbiased analysis of the effects of metallicity and age on the dust chemistry and formation efficiency, which are currently unconstrained and highly uncertain. I will describe some preparatory surveys designed to identify interesting targets in a diverse set of galaxies for further study with JWST. These include the DUST in Nearby Galaxies with Spitzer (DUSTiNGS) program, which identified candidate dust-producing stars (especially AGB stars) in 50 dwarf galaxies out to 1.5 Mpc and the follow up HST and Spitzer programs that are classifying and monitoring the DUSTiNGS candidates. These surveys are intended to enable efficient targeting of a large sample of diverse sources with the JWST MIRI and NIRSpec spectrographs for detailed analysis of the dust properties (see Bernard-Salas et al., presented at this conference). In particular, we target metal-poor dwarf galaxies that are representative of galaxies at high redshift to provide insight into the key role played by evolved stars in galaxy evolution at early epochs.

Galaxy Assembly

Rychard Bouwens Leiden University	**Combining the Power of JWST with Gravitational Lenses to Constrain the Properties of Extremely Low-Luminosity Galaxies** • Thu, 16:20	**S13-1** •The Hubble Frontier Fields program is an ambitious and visionary campaign enabling astronomers to look at the potential of gravitational lensing by massive galaxy clusters to probe the properties of ultra-low luminosity galaxies in the early universe. Thanks to the deep observations available over these clusters from Hubble+Spitzer and the supporting spectroscopy from the ground, astronomers are in the position to calibrate these gravitational telescopes very precisely using a variety of techniques and then to apply them to background galaxies, allowing for a probe of the faint-end of the UV luminosity function from z=2-10+. In this presentation, I will provide an overview of the new state-of-the-art results we have obtained from the soon-to-be-completed Hubble Frontier Fields program, the lessons we have learned from this program, and the prospects for improving upon these results using the unique capabilities of the James Webb Space Telescope, both in terms of results on the UV luminosity function and also in terms of the prospects for characterizing the individual properties of ultra-faint galaxies. Particular attention will be given to the issue of systematic errors in the discussion we provide.
Michael Maseda Leiden Observatory	**The Prevalence of CIII Emission at** $1 < z < 4$ • Thu, 16:40	**S13-2** •While large samples of $z > 6$ galaxies have been constructed using deep optical and near-IR imaging using the Lyman-break technique, relatively few of those candidates have been confirmed spectroscopically. Much of the difficulty is caused by the increasingly neutral intergalactic medium at these redshifts, which would attenuate the Lyman-alpha emission that is relied upon to confirm the redshifts. Some authors have posited that other, relatively strong emission lines can be used to confirm redshifts at $z > 6$, namely semi-forbidden CIII] 1907/9. While observed in a small sample of lensed galaxies at high-z, it is not understood exactly what correlates with the strength of CIII] emission. Here we combine extremely deep optical spectroscopy with MUSE in the UDF and HDF-S to systematically obtain a sample of (unlensed) $1.2 < z < 3.8$ CIII] emitters. With a number of significant detections of CIII], we investigate the prevalence of the emission with properties such as M*, sSFR, UV luminosity, and rest-optical emission (from near-IR spectroscopy with 3D-HST) compared to the non-emitting population. The presence of CIII] and other rest-UV lines (such as CIV, HeII, and OIII) in the deep MUSE data motivates us to obtain deep, high-S/N spectroscopy with NIRSpec, which will be useful to both confirm galaxy redshifts when the strong rest-optical emission features are redshifted out of coverage ($z > 12$) and also to allow us to understand the physical properties of galaxies at all redshifts.
Jennifer Lotz STScI	**Galaxy Mergers and Assembly in the Early Universe** • Thu, 17:00	**S13-3** •Galaxy mergers are expected to be extremely frequent in the early universe, and can play a critical role in the star-formation and assembly histories of galaxies. JWST will detect the first galaxy mergers, and provide spatially-resolved kinematic and gas-ionization properties. I will discuss our current understanding of the role of galaxy mergers during the first few billions years of the universe, and the prospects for tracing galaxy mergers with JWST.

Fundamental Physics

Sherry Suyu Max Planck Institute for Astrophysics	**Cosmology with Gravitational Lens Time Delays** • Fri, 09:00	**S14-1** •Gravitational lensing provides powerful means to study dark energy and dark matter in the Universe. In particular, strong lens systems with measured time delays between the multiple images can be used to determine the "time-delay distance" to the lens, which is primarily sensitive to the Hubble constant. Measuring the Hubble constant is crucial for inferring properties of dark energy, spatial curvature of the Universe and neutrino physics. I will describe the ingredients and newly developed techniques for measuring accurately time-delay distances with a realistic account of systematic uncertainties. A program initiated to measure the Hubble constant to $<$3.5% in precision from gravitational lens time delays is in progress, and I will present the first results and their implications. An exciting recent discovery of the first strongly lensed supernova has offered a rare opportunity to perform a true blind test of our modeling techniques. The hundreds of new time-delay lenses that are expected to be discovered in current/upcoming imaging surveys, together with the high-resolution imaging capabilities of JWST for efficient followup, make gravitational lens time delays an independent and competitive cosmological probe.
Tommaso Treu UCLA	**GLASS: science highlights and lessons for JWST** • Fri, 09:40	**S14-2** •Strong lensing studies of galaxy clusters provide unique insights into the properties of dark matter in the cluster itself, and on the distant universe via the magnification of background sources. Even in the era of JWST, gravitational telescopes will remain the only way to study faintest and most compact sources. The Grism Lens-Amplified Survey from Space (GLASS) is a large HST cycle-21 program targeting for grism spectroscopy 10 massive galaxy clusters with extensive HST imaging from CLASH and the Frontier Field Initiative. I will present some of the highlights from GLASS. I will conclude by discussing the lessons learned from GLASS and their implications for the optimization of the science return from the JWST mission.
Andrea Grazian INAF-Osservatorio Astronomico di Roma	**Warming up the Universe: JWST deep lensing field as a tool to constrain fundamental physics** • Fri, 10:00	**S14-3** •Several critical issues affect Cold Dark Matter (CDM) galaxy formation models on small scales. A possible solution is the so called Warm Dark Matter (WDM) component, constituted by a particle mass of the order of few keV, possibly in the form of sterile neutrinos. A natural prediction of the WDM model is a sharp cut off in the halo mass function at small scales ($M_{\rm halo} \sim 10^8$-10^9 $M\odot$), due to the enhanced free streaming of the lighter and faster WDM particles wrt the heavier CDM ones. A sterile neutrino mass of 7 keV is consistent with the observations of a 3.5 keV emission line from the Perseus cluster, as a possible signature of the decay processes of this particle into two energetic photons. We have used deep HST observations of galaxies at $z > 6$, magnified by strong lensing by two clusters of galaxies observed under the Hubble Frontier Field (HFF) program, to put one of the most stringent limit to the thermal relic WDM particle mass ($mX > 2.9$ keV at 68% c.l.), free from assumptions related to baryonic physics (Menci et al. 2016). We propose here a very deep JWST survey on a HFF cluster with high magnification in order to derive the galaxy number densities down to extremely faint intrinsic luminosities ($M_{\rm uv} = -10$) at $z > 6$. The expected cumulative number densities correspond to a constraint of $mX > 4$ keV, which is a critical regime to distinguish between the cold and warm dark matter scenarios. These observations will demonstrate that JWST can be used as a unique tool to constrain fundamental physics.

Stars

Ryan Lau Caltech/JPL	**Characterizing Infrared Transients with JWST** • Fri, 11:10	**S15-1** •Spitzer is pioneering a systematic exploration of the dynamic infrared sky. Our SPitzer InfraRed Intensive Transients Survey (SPIRITS) has discovered 147 explosive transients and 1948 eruptive variables. Of these 147 infrared transients, 35 are so red that they are devoid of optical counterparts and we call them SPRITEs (eSPecially Red Intermediate luminosity Transient Events). The nature of SPRITEs is unknown and progress on deciphering the explosion physics depends on mid-IR spectroscopy. Multiple physical origins have been proposed including stellar merger, birth of a massive binary, electron capture supernova and stellar black-hole formation. As the SPRITEs evolve and cool, the bulk of the emission shifts to longer wavelengths. JWST/MIRI will be the only available platform in the near future capable of characterizing SPRITEs out to 28um. Specifically, mid-IR photometry and low resolution spectroscopy will determine dust mass, grain chemistry, ice abundance and energetics to disentangle the proposed origins.
Lizette Guzman-Ramirez Leiden Observatory, The Netherlands	**The mixed-chemistry problem in planetary nebulae** • Fri, 11:30	**S15-2** •Planetary nebulae (PNe) represent the last stage of evolution of intermediate mass stars (0.8 to $8M_{\odot}$) and, hence, by their very nature are fundamental to galactic evolution. The massive envelopes ejected during their earlier evolution (AGB phase) are an important source of recycled material in the form of dust and molecular gas into the interstellar medium. A small fraction of PNe show both O- and C-rich dust features and are therefore classified as mixed-chemistry objects. The origin of their mixed-chemistry is still uncertain. Our chemical models show that the PAHs, C-rich dust, may form in irradiated dense tori, and HST images confirm the presence of such tori in some of the objects. Using the VISIR/VLT, we identified that PAHs are present at the outer edges of the tori in a sample of Galactic Bulge PNe (Guzman-Ramirez, et al., 2011, 2014, 2015). On the other hand, in the Galactic Disk, very few PNe have shown to harbour these mixed-chemistry phenomenon. There are two scenarios that we predict for the formation of PAHs in these O-rich environments:1. If the CO photodissociation is the main producer of PAHs, then we should observe these molecules in the dense tori. 2. If the central star just became C-rich, then the PAHs must be observed in the outflows of the PNe while the silicates will be in the tori.JWST will allow us to study the spatial distribution of the PAHs and silicates in these planetary nebulae.
Harvey Richer University of British Columbia	**Observing Globular Star Clusters with JWST** • Fri, 11:50	**S15-3** •JWST will have enormous capabilities when it comes to globular star cluster research. Its light gathering power coupled with its high sensitivity in the infrared provide the community with unparalleled opportunities. Among these capabilities will be novel ways to derive cluster ages, test theories on the origin of multiple stellar populations and to search for evidence of planets in these ancient systems.

General

Garth Illingworth UCSC	**Maximizing the Science Return from JWST: Seven Years of JSTAC Deliberations and Recommendations.** • Fri, 12:10	**S01-2** •The JWST Advisory Committee was constituted in 2009 to advise the STScI Director on how to optimize the scientific output of JWST, expressed most succinctly as "give advice to maximize the science return from JWST". The importance of maximizing the science return grew greatly when the ICRP report in 2010 resulted in a rescaling of the lifecycle cost to $8.8B. The public commitment to what is one of the highest cost science missions ever undertaken necessitated a careful evaluation to make JWST as scientifically productive as possible. JSTAC's deliberations and the resulting public letters have offered advice over a wide range of topics, some of which have generated considerable discussion beyond the committee! A number of JSTAC's key recommendations and their implications will be discussed, with consideration for their impact on the science programs being carried out by JWST.

General

Daniel Durand — National Research Council Canada - CADC	**JWST processing in the clouds** Mon, 10:20 • P1-01	We are presenting a cloud environment framework for JWST processing. A system is already in place for HST processing using services provided by the Canadian Astronomy Data Centre tools and the CANFAR infrastructure deployed on Compute Canada Science cloud. Once the JWST system is in place, users will be able to run JWST processing on a virtual machine with access to latest versions of the JWST pipeline software, python user tools and calibration reference files. The system will support collaboration and data sharing amongst teams.
Harry Ferguson — Space Telescope Science Institute	**JWST Data Analysis Tools** Mon, 10:21 • P1-02	The JWST Data Analysis tools development effort centers on making it convenient for JWST users to inspect, manipulate, and model their data. Basic capabilities familiar to users of IRAF, STSDAS and IDL will be available (many already are) in the python/astropy software ecosystem. The tools are being built to understand JWST data structures, including uncertainties, detector geometries, data associations, and data quality flags. Basic tools will have a consistent python API and command-line interface. Extensible visualization tools are being developed for certain interactive workflows such as inspection of 1d spectra, multi-object spectroscopy (MOS), and integral field unit (IFU) data and are highlighted here.
Jennifer Lotz — STScI	**JWST User Documentation** Mon, 10:22 • P1-03	The James Webb Space Telescope will provide unprecedented capabilities to observe the universe. Integrated, well-written, and searchable JWST user documentation is critical for supporting the astronomy community and maximizing the scientific return. We describe the philosophy and timeline for JWST documentation development.
Pierre Bastien — Université de Montréal - iREx	**POMM: a new high precision Polarimeter for the Observatoire du Mont-Mégantic** Mon, 10:23 • P1-04	A new Polarimeter has been built for the Observatoire du Mont-Mégantic, POMM, and is currently undergoing commissioning. It is optimized to reach a precision of one part per million, a factor of 100 better than its predecessor. The characteristics that make this goal possible and the observational projects envisioned will be presented. The instrument is particularly well-suited to study low-level polarization variations in bright stars. Hot Jupiters are expected to produce orbital variations at the level of a few parts per million. The polarization is produced by Rayleigh and dust scattering of stellar photons in the atmosphere of the planet. There is a controversy about the detection of exoplanet HD 189733 b, claimed and refuted by various observers. Additional data should help understand this system. Orbital variations in stellar binaries, such as Wolf-Rayet stars, will also be studied.
René Doyon — Université de Montréal - iREx	**The Near-Infrared Imager and Slitless Spectrograph (NIRISS)** Mon, 10:24 • P1-05	NIRISS, one of the four science instruments onboard JWST, provides four observing modes: broad-band imaging, low-resolution (R$\sim$150) wide-field slitless spectroscopy from 0.9 to 2.2 μm, single-object slitless spectroscopy at moderate resolution (R$\sim$1000) with simultaneous wavelength coverage from 0.6 to 2.8 μm, and aperture masking interferometry providing moderate-contrast ($10^{-3} - 10^{-4}$) high-angular ($0.1 - 0.4''$) imaging from 2.7 to 4.8 μm. These observing modes will enable a wide range of scientific programs including the study of the early universe, exoplanet atmosphere characterization and high-angular resolution imaging programs such exoplanet detection and circumstellar disk works. I will provide an overview of the NIRISS instrument and its expected performance.
Pierre Ferruit — ESA/ESTEC	**Observing with JWST/NIRSpec** Mon, 10:25 • P1-06	The Near-Infrared Spectrograph (NIRSpec) is one of the four instruments of the James Webb Space Telescope (JWST). NIRSpec covers the wavelength range from 0.6 to 5.3 micron and features a multi-object spectroscopy (MOS) mode, an integral field unit (IFU) and a suite of slits for high contrast spectroscopy of individual objects. In this contribution, I will give an overview of NIRSpec capabilities and performances with a strong focus on information useful for future observers.
Maria Pena-Guerrero — Space Telescope Science Institute	**Using Simulated Reference Stars to Test NIRSpec Target Acquisition** Mon, 10:26 • P1-07	The Near-Infrared Spectrograph (NIRSpec) is the main spectrograph at 1-5 microns for the James Webb Space Telescope (JWST). For any observing mode with NIRSpec, accurate Target Acquisition (TA) is required. In order to accurately place targets in the Micro-Shutter Arrays (MSAs) with $0.2 \times 0.45''$ in size, highly precise astrometry taken with space-based telescopes is required. NIRSpec TA will use a set of 5 to 20 reference stars to correct the alignment and orient of the telescope. This poster briefly describes the TA the experiments we have done with 5, 8, and 20 simulated reference stars, generated with the NIRSpec instrument performance simulator.

Back to schedule ...	Posters	
Julien Rameau — iREx, U. de Montréal	**Direct Imaging of Exoplanets with NIRISS/AMI** Mon, 10:27 • P1-08	The Aperture Masking Interferometry mode of NIRISS provides a unique opportunity to probe the close-in ($0.1 - 0.5''$) of extrasolar planetary systems in the thermal infrared regime (3-5 μm). This wavelength coverage will be critical to obtain unbiased estimates of the effective temperature of known directly imaged planets thanks to gravity-insensitive photometric measurements in this regime. The small inner working angle capability of the AMI mode will also be very complementary to ground based AO instruments to search for additional planets behind their blind spots, especially for Sco-Cen systems, a niche of young planetary systems. I will demonstrate this opportunity with applications to the putative multiple system around HD 95086.
Bernard Rauscher — NASA Goddard Space Flight Center	**Optimizing JWST Near-IR Detector Readout for Bright Objects and Transits** Mon, 10:28 • P1-09	JWST's near-IR instruments do not currently include detector readout patterns that are fully optimized for bright objects including transiting exoplanets. We describe some of the readout options that are currently implemented, and our thoughts for new readout patterns that would be better adapted to bright targets, yet still be compatible with existing JWST hardware and software systems.
Norbert Pirzkal — STScI	**Simulating NIRCAM Slitless Observations** Mon, 10:29 • P1-10	We present results from our effort to generate new simulations of slitless NIRCAM observations. This simulator fully supports both the R and C mode of NIRCAM (or any other HST or JWST slitless grism). The work shown was enabled by a new Grism Configuration format and a small Python. Combined, they provide users with easy access to the functions that are necessary to compute the transformation from direct images to dispersed images. This makes it possible to either simulate or extract spectra from grism data. We also show examples produced from a Position Angle Simulator. This software was designed to facilitate observation planning by allowing an observer to quantatively predict the amount of spectral contamination in planned observations.
Jonathan St-Antoine — UdeM, iREx	**NOS: NIRISS Optical Simulator** Mon, 10:29 • P1-11	The Near Infrared Imager and Slitless Spectrograph (NIRISS) Optical Simulator (NOS) is a laboratory simulation of the single-object slitless spectrograph and aperture masking interferometry modes of the NIRISS instrument onboard the James Webb Space Telescope (JWST). A transiting exoplanet can be simulated by periodically eclipsing a small portion (1% - 10ppm) of a super continuum laser source (0.7 - 2.9 μm) with a dichloromethane filled cell. Dichloromethane exhibits multiple absorption features in the near infrared domain hence the net effect is analogous to the atmospheric absorption features of an exoplanet transiting in front of its host star. The NOS uses an HAWAII-2RG and an ASIC controller cooled to cryogenic temperatures. A separate photometric beacon provides a flux reference to monitor laser variations. The telescope jitter can be simulated using a high-resolution motorized pinhole placed along the optical path. Laboratory transiting spectroscopy data produced by the NOS will be used to refine analysis methods, characterize the noise due to the jitter, to characterize the noise floor and to develop better observation strategies. We report in this paper the second exoplanet transit event simulated by the NOS. The performance is currently limited by relatively high thermal background in the system and high frequency temporal variations of the continuum source.

Galaxy Assembly

Shunsuke BABA — ISAS/JAXA, the University of Tokyo	**Near-infrared spectroscopy of CO ro-vibrational absorption toward AGN obscurers with JWST/MIRI** Mon, 15:40 • P2-01	An obscuring torus is a key element in the active galactic nuclei (AGNs) unified model in which the torus plays an essential role of attenuating the central radiation and dichotomizing AGNs into types 1 and 2. For the verification of the unified model, it is critical to confirm the existence of the torus and to investigate its physical properties. Typical size of obscuring tori is so small (∼10 pc) that it is very difficult to make spatially-resolved observations of them in sub-millimeter observations of CO rotational emission lines. Hence we have been promoting near-infrared spectroscopic observations of CO ro-vibrational absorptions (band center 4.7 micron), which are expected to trace warm gas in the molecular tori heated by the central radiation. Those absorption lines can be observed simultaneously and provide us with detailed information of the physical properties of the molecular gas (column density, temperature, and velocity width). In previous researches, Shirahata et al. (2013) conducted high-spectral-resolution observations of the CO absorption band toward the obscured AGN IRAS 08572+3915 with a ground-based telescope Subaru, and Spoon et al. (2004) and Baba et al. (in preparation) studied the absorption with space telescopes Spitzer and AKARI, respectively. These observations have clearly demonstrated the effectiveness of the near-infrared observations of CO in absorption to trace warm gas possibly in the putative molecular tori. However, the size of a sample that ground-based telescopes can observe is highly limited due to the limited wavelength range in the M-band (or redshift of the target) and their relatively shallow detection limits due to very high background. On the other hand, while sensitivities of space telescope (Sitzer and AKARI) are superb, spectral resolving powers of Spitzer and AKARI are insufficient to resolve each rotational level, and detailed analysis is difficult. Hence JWST/MIRI (its medium spectral resolution of R∼3000) is a unique opportunity for this study because it can resolve rotational levels of the CO absorption band with superb sensitivity and enables us to study what temperature components of warm gas exist around AGNs and to discuss the geometry of central obscurers.
Dominik J. Bomans — Astronomical Institute Ruhr-University Bochum	**3D Spectroscopy of intermediate redshift galactic outflows** Mon, 15:41 • P2-02	Galactic outflows and winds are key ingredients for the birth and live of galaxies in the intergalactic medium. Via outflows the halos of galaxies are structured, heated and enriched with heavy elements. Using integral field spectroscopy data (mostly from the CALIFA survey using the CAHA 3.5m/PPAK and some early data from VLT/MUSE) we currently explore the properties and frequency of outflows/winds based on a large, complete sample of intermediate and high mass galaxies in the local universe. Based on the results I will extrapolate to the possibilities of JWST and especially NIRSPEC in IFU mode for studying spatially resolved kinematics and ionization of the emission of galactic outflows and winds at different redshifts. This direct comparison of the same observables between local galaxies and their counterpart at higher redshifts sporting much higher SFR and lower metallicity (and possibly more pronounced infall) will provide input for our detailed understanding of feedback in galaxy formation and evolution. Additionally, I will explore synergies of JWST/NIRSPEC IFU with the E-ELT/HARMONI instrument.
Matteo Bonato — Tufts University	**Exploring galaxy/AGN co-evolution and dwarf galaxy properties with MIRI serendipitous spectroscopic surveys** Mon, 15:42 • P2-03	I will show predictions for spectroscopic observations with the MIRI Medium Resolution Spectrometer. Specifically, pointed observations of *Herschel* sources will require only a few minutes for detections of several star-forming and AGN lines, out to z=3 and beyond, allowing us to efficiently investigate early phases of the SFR history and of the galaxy/AGN (co-)evolution. But the same data will also include tens of serendipitous 0<z<4.5 galaxies per field with IR luminosities down to $\sim 10^6\,\mathrm{L}_\odot$. Therefore, for the first time and for free, we will be able to detect very low-luminosity galaxies ($L_{\rm IR} < 10^9\,\mathrm{L}_\odot$) at high redshifts, and with good statistics. This will allow us to study the properties of these extreme galaxies and to test galaxy evolution models. Moreover such serendipitous surveys will achieve unexplored levels of SFR and BHAR, with an impressive improvement over *Herschel* of about three orders of magnitude. These results hold for a wide range in the modelled low-L end of the IR luminosity function, and accounting for the PAH deficit in low-L, low-metallicity galaxies.
Gabriel Brammer — STScI	**Wide Field Slitless Spectroscopy, from Hubble to JWST** Mon, 15:43 • P2-04	I will review science results obtained with slitless spectroscopic observations with Hubble and will present analysis tools and simulations for WFSS observations with JWST instruments NIRISS and NIRCam.

Posters		
Thavisha Dharmawardena — ASIAA	**Dust production in M31 and M33** Mon, 15:44 • P2-05	Evolved stars, in particular Asymptotic Giant Branch (AGB) stars and Red Supergiants (RSG), play a crucial role in the life cycle of dust in galaxies, as the main contributors of dust to the interstellar medium (ISM). However, present-day dust production rates (DPRs) for AGB stars and RSGs, determined using mid-infrared thermal dust emission, are insufficient to build up the observed interstellar dust reservoir and compensate for destruction by supernova shocks and astration, as is established for both the Large Magellanic Cloud (LMC; e.g. Kemper 2015) and Small Magellanic Cloud (SMC; Srinivasan et al. 2016). These conclusions are supported by calculations of the theoretical dust yield of evolved stars (Schneider et al. 2014). Although the integrated DPR over the history of the LMC and SMC appears to coincide with the interstellar dust masses derived using Herschel maps (Gordon et al. 2014), and the situation gets worse when dust destruction (Temim et al. 2015) and dust consumption by star formation (Skibba et al. 2012) are taken into account. The DPRs for the LMC and SMC were determined from the SAGE and SAGE-SMC Spitzer imaging surveys, using all four IRAC bands and MIPS 24μm photometry of AGB stars and RSGs, complemented with near-infrared and optical data. Individual DPRs were determined by fitting these photometry with the GRAMS dust radiative transfer models (Srinivasan et al. 2011; Sargent et al. 2011), and integrated over the entire galaxy to produce the total DPR. At 50 and 60 kpc, the LMC and SMC are close enough to unambiguously resolve the evolved stellar population using Spitzer, down to the tip of the Red Giant Branch (RGB), and include the entire AGB/RSG population. However, Spitzer studies of the more distant M32 (Jones et al. 2015) and M33 (Javadi et al. 2013) are limited to the brightest AGB stars and RSGs in the infrared – which fortunately happen to be the most dusty objects – and suffer from confusion due to the large PSF of Spitzer. To determine the DPRs for M32 and M33, these teams were confined to the IRAC data, introducing great uncertainty on the DPR; mid-infrared photometry would mitigate this issue. JWST will facilitate studies of integrated DPRs for more distant galaxies. The high sensitivity of the JWST's MIRI and NIRCAM instruments will allow observations to reach the tip of the RGB and include the entire AGB and RSG sample throughout the Local Group. Furthermore, the smaller PSF reduces the confusion issues that hampered Spitzer studies of more distant Local Group galaxies, enabling mid-infrared photometric measurements. We propose a sampling imaging survey of galaxies M31 and M33, at 752 kpc (Riess et al. 2012) and 820 kpc (Conn et al. 2012) the nearest spiral galaxies, and Milky Way analogs, in our Local Group. We will use MIRI and NIRCAM to target a number of representative fields. Based on the population of evolved stars in the LMC, we estimate that there may be up to 400 AGB stars and RSGs in each MIRI pointing, with a range of DPRs. The GRAMS model grid will be applied to determine individual DPRs, and, with a set of well-chosen fields, we can extrapolate these values to determine the overall DPR for both galaxies using the stellar distributions. The global DPRs for M31 and M33 will be compared with the interstellar dust masses measured in the infrared, and parameters such as the star formation rate and dust destruction rate by shocks to evaluate the dust budget in these nearby Milky Way analogs. Moreover, this will extend the study of dust production to high-metallicity galaxies for the first time, revealing the importance of cosmic enrichment in dust production.
Marie-Lou Gendron-Marsolais — Université de Montréal	**AGN feedback in the Perseus cluster** Mon, 15:45 • P2-06	Deep Chandra images of the Perseus cluster of galaxies have revealed a succession of cavities created by the jets of the central supermassive black hole, pushing away the X-ray emitting gas and leaving bubbles filled with radio emission. Perseus is one of the rare examples showing buoyantly rising lobes from past radio outbursts, characterized by a steep spectral index and known as ghost cavities. All of these structures trace the complete history of mechanical AGN feedback over the past 500 Myrs. I will present results on new, ultra deep 230-470 MHz JVLA data. This low-frequency view of the Perseus cluster will probe the old radio-emitting electron population and will allow us to build the most detailed map of AGN feedback in a cluster thus far.
Diane Karakla — STScI	**Planning Micro Shutter Array observations of high redshift galaxies in the Hubble Ultra Deep Field** Mon, 15:46 • P2-07	The JWST's Near Infrared Spectrograph (NIRSpec) will enable multi-object spectroscopy through the Micro Shutter Array (MSA). The MSA is capable of observing up to a few hundred sources at once using ~250,000 individually configurable shutters. The Space Telescope Science Institute has developed an MSA Planning Tool (MPT) to facilitate the complex observation planning process for a variety of observing cases. The tool finds optimal positions on the sky where many (high-valued) sources can be observed through a series of user-constrained dithers. It also designs the associated MSA configurations for each position. The MPT is included in the Astronomer's Proposal Tool (APT), an integrated software package developed by STScI for the preparation of observing proposals.

Posters		
Ciska Kemper — ASIAA	**Crystalline silicates in external galaxies** Mon, 15:47 • P2-08	Observational evidence has long supported that most of the interstellar silicates in galaxies are amorphous. While crystalline silicates may form around evolved stars at temperatures sufficiently high to allow for annealing, it is thought that the harsh interstellar environment quickly amorphitizes any crystalline silicates, most likely through bombardment by the heavy ions in cosmic rays (Demyk et al. 2001; Jöger et al. 2003; Brucato et al. 2004; Bringa et al. 2007; Szenes et al. 2010), and a firm upper limit of 2% on the crystalline fraction of silicates was derived based on the absence of substructure in the 9.7 μm feature (Kemper et al. 2004; Kemper et al. 2005). The first detection of crystalline silicates in external galaxies was reported by Spoon et al. (2006) in 12 out of a sample of 77 starbursting Ultraluminous Infrared Galaxies (ULIRGs), with later detections of further galaxies reported by Roussel et al. (2006), Willett et al. (2011), Stierwalt et al. (2014), and Aller et al. (2012). The only one of these studies quantifying the crystalline fraction is the work by Spoon et al. (2006), who report a crystalline fraction of 6-13% in the interstellar silicate reservoirs. A very simple model of the production of crystalline silicate dust by evolved stars, at a level of 10-20% of the total silicate dust production by these stars, is able to explain the observed crystallinities at about 30 Myr after the start of a starburst (Kemper et al. 2011). In general, the model can be used to estimate the transition time and interstellar conditions, such as cosmic ray fluence, based on observational constraints on the crystalline fraction. However, the small number of known interstellar crystalline silicate fractions in star-forming galaxies limits the usefulness of such a model. We have devised a method to measure the crystalline fraction of silicates in a large number of galaxies quickly and easily. For this purpose, we are performing radiative transfer models of starburst galaxies, with varying crystalline fractions of their interstellar silicates using the SKIRT radiative transfer code (Camps & Baes 2015), and identified a method to determine the crystallinity of silicates directly from any MIRI 5-28 μm spectrum obtained of external galaxies.
Ciska Kemper — ASIAA	**A database of computed infrared spectra of proto-silicate clusters and silicate aggregates** Mon, 15:48 • P2-09	Interstellar grain models (Desert et al. 1990; Li Draine, 2001) typically include a Very Small Grain (VSG) component, of which the optical properties cannot be described using bulk material measurements. VSGs (<20 nm) may be responsible for the UV bump in the interstellar extinction curve and a significant fraction of the mid-infrared emission. While traditionally Polycyclic Aromatic Hydrocarbons (PAHs) and other carbonaceous species are thought to be the main constituents of the VSG population, recent suggestions that silicate grains may form in the interstellar medium (Rouillé et al. 2013) imply that a corresponding proto-silicate population must be present as well. Bromley & Goumans (2012) have explored possible chemical pathways for the first steps toward silicate condensation, resulting in a number of plausible proto-silicate clusters, for which the molecular structures and energies have been determined.For the purpose of observational astronomy, especially in the context of JWST-MIRI spectroscopy, we are currently calculating infrared spectra for proto-silicate clusters ranging from just a handful of atoms to some 50 atoms. We are exploring stoichiometry (olivine, pyroxene, and non-stoichiometric compositions) and Fe-content, and present calculated spectra of the five to ten lowest energy clusters that we know of, for each composition. Furthermore, we are planning to expand this database with larger clusters for which the structures have been calculated by aggregating different proto-silicate clusters (Rimola et al. in prep.). Calculations of large clusters will also be used to quantify the amount of lattice displacements needed (by e.g. cosmic ray hits) for the infrared spectrum to appear amorphous.The database of calculated infrared spectroscopy of proto-silicate clusters and silicate aggregates will be made available to the astronomical community for comparison with observational data. We envision a data delivery similar to the PAH database (http://www.astrochem.org/pahdb; Boersma et al. 2014), which consists of the raw database, but also tools that allow the user to fit observed spectra with species in the database.

First Light

Myriam Latulippe — Université de Montréal	**Deep VLA observations of the massive cluster MACS J1447.4+0827** Tue, 10:20 • P3-01	X-ray observations have shown that the distribution of gas in galaxy clusters is far from being uniform. Many clusters contain X-ray cavities, gigantic bubbles lacking Xray bright gas. Those bubbles are inflated by supersonic jets emitted by the active galactic nucleus(AGN) of the central galaxy. These jets heat the gas and offset the cooling of the intracluster medium (ICM). This process is known as AGN feedback. I will present new results obtained from the analysis of JVLA data for MACS J1447.4+0827, an extremely bright galaxy cluster at $z > 0.3$ which a central galaxy that is extremely luminous in the infrared and has a massive molecular gas reservoir. We have detected the jets responsible for the X-ray cavities and find the presence of a radio mini-halo, a particularly rare structure.
Annabelle Richard-Laferrière — Université de Montréal	**The relation between mini-halos and the feedback of supermassive black holes** Tue, 10:21 • P3-02	Radio mini-halos are diffuse radio sources found in galaxy clusters. The radio emission is however located too far from the relativistic source (the Active Galatic Nucleus - AGN), implying that the particles must be reacceleration in situ. Only a few mini-halos have been discovered so far. We report the discovery of a radio mini-halo in PKS 0745-19, a massive cluster of galaxies located at $z = 0.1028$. We also report on a review of scientific literature of all known mini-halos (28 in total). We have compared several properties of the radio mini-halos to those of the cluster and find evidence of new, previously unknown correlations between the radio mini-halo power and BCG radio power, as well as the physical size of the radio mini-halo and the BCG radio power.
Tim Rawle — ESA/STScI	**NIRSpec MOS observations of massive galaxy clusters** Tue, 10:22 • P3-03	Galaxy clusters are the largest gravitationally bound systems in the Universe, and hence offer a crucial laboratory to probe environmental effects on galaxy formation. At the same time, massive clusters act as powerful lenses, magnifying background objects and yielding a clearer view of otherwise faint galaxies at high redshift. JWST/NIRSpec will provide a unique configurable MOS in space, allowing up the selection and efficient observation of up to 100 targets chosen from both cluster field science cases. Furthermore, the $\sim$3×3 arcmin field-of-view is ideally matched to the on-sky extent of intermediate-redshift (z$\sim$0.4) massive clusters. Here we discuss the practicalities, efficiency and limitations of using the NIRSpec MOS to target massive galaxy clusters.
Peter Scicluna — ASIAA	**Fitting AGN mid-infrared spectra efficiently** Tue, 10:23 • P3-04	The volume of observational data is increasing at an ever-growing rate, and it is already proving difficult for analysis to keep up with the avalanche of data. For example, the Spitzer archives alone contain thousands of spectra suitable for detailed analysis (Lebouteiller et al., 2015) many of which have yet to be fully exploited, seven years after the end of cryogenic operations. JWST is expected to produce an even larger volume of high-quality spectra, and it will be necessary to adopt new, highly-automated but computationally intensive methods to fully exploit such a large database. With this problem in mind, we are developing a framework for robustly fitting infrared spectra, incorporating dust radiative transfer modelling and modern techniques that efficiently explore parameter space (e.g. the Pikaia algorithm, Charbonneau 1995, see Dijkstra 2007 and Baier et al., 2010 for an application to dust emission). This framework must be combined with automatic classification schemes to apply the correct class of models to each object. This removes the major part of the human interaction in the analysis process, making the availability of computing time the only bottleneck. Although the resulting framework is generally applicable, our primary goal is to explore the dust content and mineralogy of AGN tori. AGN disc winds are expected to harbour conditions favourable to dust formation, and may make a significant contribution to the dust budget in the early universe (Elvis et al., 2002). By including a complete treatment of radiative transfer, it is possible to constrain the mineralogy without resorting to simple assumptions such as pure absorption. This will probe the physical conditions in the dust-forming region of a large sample of AGN, and robustly constrain the contribution of AGN-formed dust to galactic dust budgets. So far, the dust mineralogy has been studied in detail for only a handful of quasars, manually (Markwick-Kemper et al. 2007; Köhler & Li 2010; Smith et al. 2010; Xie et al. 2014), while automated fitting techniques typically focus on other aspects of the spectra, and use a standard grain model, such as that of Draine & Li (2007), for the dust. Applying such a tool to a large sample of AGN across the range of luminosities to which JWST-MIRI will be sensitive, will enable a census of dust-forming conditions up to a redshift $\sim$1. Currently, some 2,500 spectra of active galaxies are available in the Spitzer archive (Lebouteiller et al. 2015), which raises expectations of a multiple of that number to be obtained with JWST. If this project is to be completed in less than a million CPU hours, then the time available to explore parameter space, and converge to a solution, is approximately 50 hours per source. In the case of AGN tori, the radiative transfer calculations are potentially very time-consuming (in case of an edge-on view of the torus). Optimization is therefore essential, and we will discuss strategies to reduce the CPU time needed.

Back to schedule ...	Posters	
Heath Shipley — Tufts University	**Through the Looking Mass: Comprehensive Photometric Catalogs of Multi-wavelength HST** Tue, 10:24 • P3-05	With greater sensitivity than any previous IR mission, the James Webb Space Telescope (JWST) will be a powerful tool in future high-redshift IR surveys and follow-up programs. We present Hubble multi-wavelength photometric catalogs, including (up to) 17 filters with the Advanced Camera for Surveys (ACS) and Wide Field Camera 3 (WFC3) from the ultra-violet (UV) to near-infrared (near-IR) for the Hubble Frontier Fields and associated parallels. We have constructed comprehensive photometric catalogs for four fields and their parallels (MACS 0416, MACS 0717, Abell 2744 and MACS 1149) and are continuing to work on the final two (Abell 1063 and Abell 370; as the data become available). To further expand these data catalogs we have added ultra-deep KS-band imaging at 2.2 m from the Very Large Telescope (VLT) HAWK-I and Keck-I MOSFIRE instruments. As well as post-cryogenic Spitzer imaging at 3.6 μm and 4.5 μ with the Infrared Array Camera (IRAC). We introduce the public release of the multi-wavelength (0.25 m) photometric catalogs, and we describe the unique steps applied for the construction of these catalogs. Particular emphasis is given to the source detection band and the contamination of light from brightest cluster galaxies and intra-cluster light, and their solution. In addition to the photometric catalogs, we provide catalogs of photometric redshifts and stellar population properties. Furthermore, the public release includes all the images used in the construction of the catalogs, including the combined models of the brightest cluster galaxies and intra-cluster light, the residual models, segmentation maps and more. These catalogs are a robust data set of the Hubble Frontier Fields and will be an important aide in designing future JWST surveys as well as planning follow-up programs to answer key questions remaining about first light, reionisation and the assembly of galaxies, most notably, by identifying high-redshift sources to target with JWST.
Henrik Spoon — Cornell University	**The Infrared Database of Extragalactic Observables from Spitzer** Tue, 10:25 • P3-06	We would like to advertise the Infrared Database of Extragalactic Observables from Spitzer. IDEOS provides the principle mid-infrared diagnostics for more than 3000 galaxies/galactic nuclei from spectroscopic measurements obtained by the InfraRed Spectrograph (IRS) on the Spitzer Space Telescope. The spectra have been drawn and vetted from the Cornell Atlas of Spitzer-IRS sources (CASSIS), a repository of 13500 homogeneously extracted, publication-quality, low-resolution spectra of all Spitzer-IRS observations performed in staring-mode (as opposed to mapping mode). Among the measured observables are PAH fluxes and their equivalent widths, the strength of the 9.7 μm silicate feature, emission line fluxes in the 5.5-13 μm range, rest frame continuum fluxes, and synthetic IRAC, MIPS, WISE, IRS-peakup, and JWST-MIRI photometry.
Sundar Srinivasan — ASIAA	**Dust in the wind: the mineralogy of newly formed dust in Active Galactic Nuclei** Tue, 10:26 • P3-07	The origin of large reservoirs of dust (Priddey et al. 2003; Beelen et al. 2006) in the early universe still remains a mystery. The traditional (stellar) dust sources are not sufficiently productive during the first Gyr to explain the reservoir observed (Morgan & Edmunds 2003; Rowlands et al. 2014), and, furthermore, the extinction curves at high redshift are markedly different from those observed in the local universe (Maiolino et al. 2004; Stratta et al. 2007). Therefore, additional dust sources have been invoked, such as interstellar grain formation and grain growth (Martini et al. 2013). Additionally, by comparison with the dust forming environments around evolved low mass stars, Elvis et al. (2002) argue that the conditions in winds launched from the accretion discs of Active Galactic Nuclei (AGN) accretion disks allow for the formation of significant quantities of dust. This dust source would not only help resolve the so-called dust budget crisis at high redshift, but also provides a natural explanation for the origin of the dusty AGN torus (Elitzur & Shlosman 2006). We have selected a sample of Palomar Green (PG) quasars with Herschel and AKARI photometry from the sample of Petric et al. (2015), and required their archival Spitzer spectra to show the 9.7 micron silicate feature in emission. The Herschel photometry will constrain the far-infrared continuum. We will chart the variety in mineralogy present in quasar winds, and compare the results with other work present in the literature (e.g. Kühler & Li 2010; Smith et al. 2010; Xie et al. 2014), studies which have all targeted single objects, or very small samples. From spectral fitting of the solid state features seen towards these objects in the 5-40 μm wavelength range, using the method described by Markwick-Kemper et al. (2007), we can identify the dust composition in the disk wind and torus, including amorphous and crystalline silicates, as well as more primitive condensates, such as alumina (Al_2O_3) and periclase (MgO). Thus, future studies using the MIRI mid-infrared spectroscopy mode, potentially provide a systematic probe for the conditions in the dust condensation zone in quasar winds.

Sofia Wallström — ASIAA	**Massive stars and the crystallinity of interstellar silicates** Tue, 10:27 • P3-08	Crystalline silicates are observed in the ISM of other galaxies (Spoon et al., 2006); in particular, starburst galaxies with crystallinities up to 95% have been observed (Aller et al., 2012). As the timescale for amorphisation by cosmic rays is relatively short (e.g. Bringa et al., 2007), the formation of crystalline material must be associated with massive stars or the starburst itself. We identify three possible sources of silicates injected into the ISM by massive stars: First, the condensation of silicates in the gradual winds of pre-Supernova phases, in particular Red Supergiants; second, the relative fast direct condensation of silicates in Supernova, and finally, the ejection of silicates entrained in jets coming from massive YSOs. The formation and processing of large quantities of crystalline dust is difficult to explain: most massive stellar sources of dust have relatively low crystallinities (e.g. up to a few percent in Red Supergiants (Harwit et al., 2001), and similar in Luminous Blue Variables (Guha Niyogi et al., 2014) and B[e] stars (Kastner et al. 2010), although very few sources have detections) and crystalline silicates have not been detected in any supernova remnants to date. Only a small number of supernova remnants have been targeted for mineralogy studies (Bouchet et al. 2006, Rho et al. 2009, Arendt et al. 2014), while the reported detection of crystalline forsterite in SNR G292.0+1.8 by Ghavamian et al. (2009) appears to be foreground emission. A possible environment where crystalline silicates may form is stable, long-lived discs, where material can be processed at high temperatures and ejected in a disc wind. Such discs might be found around massive interacting binaries or massive YSOs. In particular, massive YSOs provide a means to process existing dust through high-temperature or shock annealing (Harker & Desch, 2002), and recent work has suggested that accretion efficiency of massive stars may be as low as 10% (Haemmerlé et al., 2016), implying that 90% of the natal cloud material will be re-injected into the ISM. This provides a means to recycle existing interstellar dust and enrich its crystalline fraction without altering the chemistry of the dust.We will conduct a mid-infrared spectroscopic survey of evolved massive stars, supernova remnants and massive star-forming regions throughout the Local Group, with a particular focus on the high-metallicity environments of M31 and M33, but not limiting ourselves to these environments. Mid-infrared spectroscopy has been shown to be extremely useful in disentangling crystalline and amorphous silicates (Molster & Kemper, 2005). The observations will be interpreted using a robust radiative-transfer model-fitting framework to constrain the mineralogy of the dust produced in each of the environments in question. By comparing these constraints to identical analyses of existing observations of Galactic and Magellanic sources, we will have a homogeneous sample of crystalline silicate producers which can be used to identify the most likely culprits in distant starbursts.

Solar System

Tracy M. Becker — Southwest Research Institute	**Mid-IR Spectral Search for Salt Signatures on Solar System Bodies** Tue, 15:40 • P4-01	Chlorinated salts (chloride, chlorate and perchlorate) are expected to exist on planetary bodies throughout the Solar System, likely forming through the interaction of rocky, chondritic material and liquid water at some point in the objects' history. The presence of these salts establishes a wider range of temperatures for which liquid water is stable. Chlorinated salts have been hypothesized to be present on the trailing hemisphere of the surface of Jupiter's moon Europa, causing that hemisphere to be distinctively dark at near-IR wavelengths. The presence of these salts on the surface of Europa would indicate interaction between the surface and sub-surface liquid ocean, and would constrain the temperature of the liquid reservoir and the thickness of Europa's ice shell. Recent laboratory studies have revealed diagnostic spectral features of chlorinated salts at mid-IR wavelengths. However, few observations of Europa or any of the Gallilean satellites have been made at these wavelengths with sufficient resolving power to identify such features. We present a spectral comparison of laboratory data with mid-IR observations of Europa and Callisto obtained by the NASA IRTF/TEXES instrument between 10-11 microns with R$\sim$2,500, which leads us to a discussion of the opportunities to expand such studies using the MIRI instrument on the JWST with a similar R$\sim$3000. The improved $\sim$0.28$''$ spatial resolution provided by MIRI/MRS mode 1B would cover up to 16 pixels across Europa's disk, enabling comparisons of hemispherical regions. Future JWST observations could be used to study a variety of solar system objects to detect chlorinated salts and to garner details about the past or current presence of a liquid reservoir on small bodies throughout the solar system.
Philip Judge — High Altitude Observatory	**Bio-signatures from Enceladus' Geysers using transits from 2023** Tue, 15:41 • P4-02	Europa and Enceladus are two objects in the solar system harbouring subsurface liquid water. Enceladus is a prolific emitter of fountains of matter from the subsurface, Europa has one confirmed emission event. The purpose of this paper is to argue for the search for spectral biosignatures using transits of Enceladus across the disk of Saturn. From the Earth's neighbourhood, transits will begin again in 2023. The technique is analogous to the transits of planets and their atmospheres across the Sun and stars, except one uses reflected and thermal light emitted by the planetary disk as the source. JWST is ideally suited to such measurements, having the capability to observe from visible to infrared wavelengths without detrimental effects of seeing. It high angular resolution is also necessary. Differential spectroscopy of the transiting satellite can achieve enormous signal-to-noise ratios permitting us to look for biogenic signatures in the absorption spectra of the emitted plumes. Some transits of Europa across Jupiter's disk would also seem worthwhile before 2023.
Stefanie Milam — NASA Goddard Space Flight Center	**JWST operations and capabilities for observations in the Solar System** Tue, 15:42 • P4-03	The James Webb Space Telescope (JWST) is optimized for observations in the near and mid infrared and will provide essential observations for targets, including those in the Solar System, that cannot be conducted from the ground or other missions during its lifetime. The state-of-the-art science instruments, along with the telescope's moving target tracking, will enable the infrared study, with unprecedented detail, for nearly every object (Mars and beyond) in the solar system. All instruments have implemented special modes or resolution that enables observations of bright targets. Key science goals for various targets, observing capabilities for JWST, and highlights for the complementary nature with other missions/observatories are described in this paper.
Micaela Bagley — University of Minnesota	**Studying the environment around Lyman-alpha emitters during reionization with JWST** Tue, 15:43 • P4-04	With the HST WFC3 Infrared Spectroscopic Parallel (WISP) Survey, we have discovered two of the brightest Lyman-alpha emitters (LAEs) at z$\sim$6.5. We show that the WISP LAES likely reside in large ionized bubbles in the intergalactic medium (IGM). Although very bright, they are not capable of ionizing the IGM out to the distance required to allow Lyman-alpha photons to escape. A population of fainter ionizing sources is necessary. The supreme sensitivities of JWST-NIRCam and NIRSpec will allow for the detection and investigation of the fainter galaxies surrounding these and similar bright LAEs towards the end of reionization. JWST provides the opportunity to study the clustering of these sources and their contribution to reionization in the context of environment.
Thomas Kemp — The University of Edinburgh — IFA/UKATC	**Simulation of High-Redshift Star Forming Galaxy Observations using MIRI.** Tue, 15:44 • P4-05	JWST, with improved sensitivity, is the only observatory that has realistic capabilities of delving further back than the epoch of re-ionisatoin. Specifically, when looking at a key tracer of star formation (Hα), the Mid Infra-Red Instrument (MIRI) MIRI becomes an increasingly important instrument at these higher redshifts ($z = 6.7$). I assess the capabilities of the Medium Resolution Spectrometer (MRS) and present results of on-board simulated observations of star forming galaxies at $z > 7$.

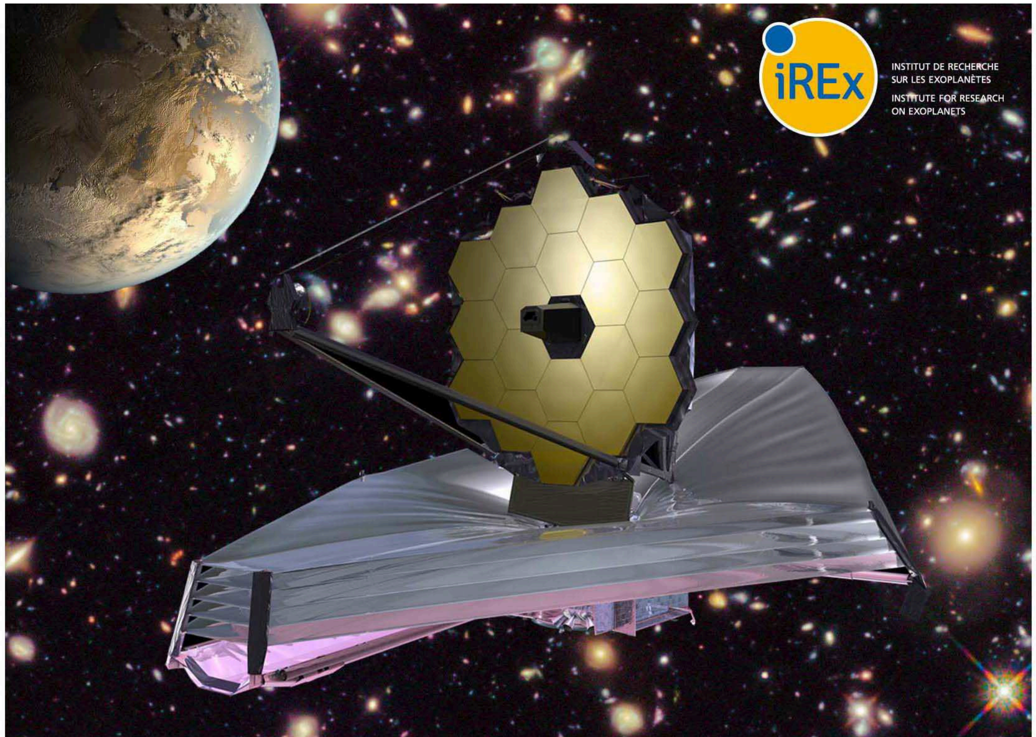
Ralph Kraft — SAO	**James Webb Space Telescope and Chandra X-ray Observatory observations of the Frontier Fields clusters: star formation and black hole growth at high redshift** Tue, 15:45 • P4-06	We discuss the potential scientific return of deep JWST and CXO observations of the Frontier Fields clusters. The lensing magnification of these massive clusters allows for a sensitive probe of the high redshift Universe to a depth that would not be achievable in direct imaging observations of blank fields. JW will detect a large number of galaxies over a wide range of evolutionary states out to z=10 and beyond. The sub-arsecond imaging capability of Chandra offers an efficient method to detect luminous AGN and star forming galaxies at $z > 1$. Deep Chandra observations therefore offer the opportunity to glimpse the star formation history and black hole growth of some of these galaxies. In this poster, we describe the scientific potential of deep ($> 1\,M_\odot$ each) Chandra observations of Frontier Fields clusters and potential synergies with JWST NIRCam surveys. The sensitivity and spectroscopic capability of JWST and Chandra will allow detailed study of the link between AGN feedback, black hole growth, and galaxy evolution in the high redshift Universe.
Brian O'Shea — Michigan State University	**Leaving the dark ages: exploring the first galaxies with large-scale cosmological simulations.** Tue, 15:46 • P4-07	In this talk I present a series of predictions from the Renaissance Simulations, a set of high-resolution and physics-rich calculations of high redshift galaxy formation. These simulations, which include radiation transport and sophisticated treatment of both Population III and metal-enriched stellar populations, resolve virtually every halo that may possibly form stars. I will present predictions about the nature of the global transition from primordial to metal-enriched star formation, the bulk properties of high-redshift galaxies (including gas, star formation rate, and the escape fraction of ionizing galaxies), and the high-redshift galaxy luminosity function.
Nina Bonaventura — McGill University	**Red but not dead** Tue, 15:48 • P4-09	We present the results of a comprehensive Spitzer/Herschel infrared analysis of the largest (716) and highest-redshift sample of Brightest Cluster Galaxies (BCGs) from massive (10^{14} solar masses) galaxy clusters in the Spitzer Adaptation of the Red-Sequence Cluster Survey (SpARCS), which reveals their unexpected star-forming nature through the identification of their dominant source of infrared energy output (Bonaventura et al. 2016, submitted). We compare the stacked, infrared, broadband spectral energy distributions (SEDs) of the BCGs to a variety of model templates in the literature, in multiple redshift bins between $z = 0$ and $z = 1.8$, from which we derive various physical parameters to serve as star-formation diagnostics. What we uncover is a star-forming, as opposed to a red and dead BCG population at $z < 2$, vigorously producing hundreds of solar masses per year with high efficiency at $z > 1$, and up to tens of solar masses per year at lower redshifts; follow-up optical spectroscopy of a subset of the BCG sample confirms these findings. This discovery conflicts with the 'dissipationless merger' hypothesis commonly invoked to explain BCG stellar-mass growth over the last 10 Gyr, but is in agreement with the improved semi-analytic model of hierarchical structure formation of Tonini et al. (2012), which predicts star-forming BCGs throughout the epoch considered in our study. We preliminarily attribute the star formation inferred from our SEDs to both major and minor 'wet' mergers, based on a lack of key signatures (to date) of cooling-flow-induced star formation, as well as a number of observational and simulation-based studies which support this scenario. Furthermore, we consider the lack of a discernible contribution from an Active Galactic Nucleus to the mid-infrared SEDs of the Spitzer 24 μm-bright BCGs, comprising 24.4% of the full sample, to reveal a fundamental difference between the BCGs selected from optical/infrared versus X-ray cluster surveys.

Exoplanets

Geneviève Arboit — Université de Montréal and iREx	**Simulation of phase-resolved spectroscopic observations of hot Jupiters with NIRISS** Wed, 10:20 • P5-01	We present a simulation of infrared spectroscopic observations of the phase curve of transiting exoplanets with NIRISS SOSS, in order to determine which systems are amenable to positive detection of phase modulation and which planet parameters can and cannot be constrained by the observations. We combine emission spectra, based on the BT-Settl models, modulated by the phase of a planet around its host star, as well as reflection spectra. Given our knowledge of NIRISS, photon and read noises are added to the resulting signal, as well as a priori unknown systematic variations of the overall instrument response with time. We assume that the planet is a tidally locked hot Jupiter with two temperatures, each characterizing one of its hemispheres. These modelled observations are then fitted to theoretical models to constrain the planet temperature. We present a simulation for WASP-43b and show that the temperatures of its hemispheres can be constrained to within 50 K.
Étienne Artigau — Université de Montréal/iREx	**Probing the cloud properties of a benchmark variable T dwarf** Wed, 10:21 • P5-02	SIMP0136 is one of the nearest isolated brown dwarfs to the Sun; this early-T dwarf lies in the temperature range where dust-bearing clouds, more typical of L dwarfs, sink below the photosphere. The inhomogeneous cloud coverage on its surface leads to rotation-induced variability at the 2-7% level over its 2.4 h rotation. Furthermore, the evolution of the cloud patterns leads to a modulation of the lightcurve over timescales of a few days. We propose GTO observations to obtain time-resolved SOSS spectroscopy of this benchmark variable brown dwarf over different rotations periods. These observations will detect variability at the 20-70ESC level for all resolution elements within a 10-min time bin. By probing different heights in the atmosphere, variability of different chemical species will trace the vertical extent of dust-clouds. Detection of out-of-equilibrium species, such as Cs, will provide insight into upwelling mechanisms in ultracool atmospheres. This work will have a strong bearing on the study of hot exoplanets; at a temperature of $\sim$1200 K, SIMP0136 is similar to numerous hot Jupiters. Proper description of dust behaviour is key in understanding transit spectroscopy data as dust clouds can readily mask the lower layers of an otherwise clear atmosphere.
Étienne Artigau — Université de Montréal/iREx	**Near-infrared m/s velocimetry: preparing the JWST era in exoplanet characterization** Wed, 10:22 • P5-03	Optical velocimetry has been around for more than two decades and largely dedicated to RV monitoring of G, K and early-Ms. As optical velocimetry does not probe the bulk of the SED of later-type stars, it has long been recognized that near-infrared (nIR) velocimetry is key towards the characterization of M dwarf planetary system. SPIRou and NIRPS are two nIR velocimeters developed by overlapping science teams. SPIRou is a spectro-polarimeter covering the 0.98-2.38 μm domain. It is currently ongoing construction for first light at the CFHT in 2017. NIRPS is in its final design stages and will be used simultaneously with HARPS at the ESO 3.6-m telescope. The HARPS+NIRPS setup will provide 0.38-0.69 μm and 0.98-1.8 μm coverage at a resolving power of 100 000. These instruments will be used to perform RV follow-up of transiting planets uncovered around M dwarfs by K2, TESS and ground-based transit searches. RV follow-ups will guide the efforts to obtain detailed atmospheric characterization of super-Earths and terrestrial planets with JWST. M dwarf planets are the most amenable to transit spectroscopy thanks to their favorable star-to-planet radius ratio.
Nicolas Crouzet — Dunlap Institute, University of Toronto	**Finding the best low-mass exoplanet targets for JWST using TESS and SPIRou** Wed, 10:23 • P5-04	A limitation to the success of JWST for exoplanet science is the low number of currently known Super-Earth and Earth-size planets suitable to atmospheric characterization. Most of the targets for JWST are expected to come from the NASA TESS mission that will be launched one year only prior to JWST. With such a tight schedule, efficient follow-up and mass determination of the TESS exoplanet candidates will be crucial to identify the best targets for JWST. SPIRou at CFHT is an instrument unique in its kind that will enable radial velocity measurements at high precision (< 1 m/s) and high resolving power ($> 70,000$) in the near infrared (0.98-2.35 μm) in one shot, and will be ideally suited to the follow-up and detection of low-mass exoplanets around low-mass stars. I will present possible strategies for the follow-up of TESS exoplanet candidates with SPIRou, the resulting yield of targets suitable to atmospheric characterization with JWST, and estimates of the required observing time with SPIRou and JWST. This work will help in delivering the best exoplanet targets for JWST.

Back to schedule ...	Posters	
Lisa Dang — McGill University - IREx	**Rounding Up the Misfit: Full-Orbit Phase Curve of CoRoT-2b** Wed, 10:24 • P5-05	The James Webb Space Telescope (JWST) will provide unprecedented observations of exoplanet transits, eclipses, and phase curves. The data reduction and analysis of data from the Spitzer Space Telescope can guide future efforts with JWST. In particular, we report continuous full-orbit monitoring of the CoRoT-2b system with Spitzer/IRAC at 4.5 micron. The dayside emission spectrum of this transiting hot Jupiter exhibits by far the strongest broadband spectral feature of all short-period planets, and is poorly fit by both radiative transfer and spectral retrieval models. Furthermore, the abnormally deep eclipse depth at 4.5 μm could not fit any atmospheric models, even in the absence of CO absorption. Our full-orbit observations of CoRoT-2b allows us to (1) determine its Bond albedo, (2) quantify day-night heat transport, (3) further constrain its atmospheric opacity via transit spectroscopy, and (4) discriminate between astrophysical and atmospheric scenarios for its inscrutable eclipse spectra. Misfits often provide the most leverage for understanding phenomena.
Yan Betremieux — JPL/Caltech	**Effects of sharp transmission boundaries on the effective radius of a transiting exoplanet.** • P5-06	Most exoplanet transmission spectroscopy radiative transfer codes either use or are validated against the formalism presented by Lecavelier des Etangs et al. (2008), who showed that the effective radius of an exoplanet with a clear isothermal atmosphere occurs where the slant optical depth through the atmosphere is about 0.56. Although this formalism is extremely useful to understand what shapes transmission spectra, it does not include the effects of sharp transmission boundaries. However, with recent advances on the effects of refraction in exoplanet transmission spectra, it turns out that all exoplanets have a sharp transmission boundary in the form of either a surface, optically thick clouds, or a refractive boundary. We have derived a first-order analytical solution, against which radiative transfer codes can be tested, for the effective radius of an exoplanets accounting for sharp transmission boundaries and discuss their effects on exoplanetary transmission spectra.
Anthony Moffat — Univ. de Montreal	**Wolf-Rayet Stars and Dust Formation in the Early Universe** Wed, 10:25 • P5-07	Population-I Wolf-Rayet (WR) stars emerge at the latest evolutionary stages of massive ($M_i >\sim 25\ M_\odot$) stars. Among various WR subgroups, some of the carbon-rich WC stars exhibit strong IR excesses linked to the formation of copious amounts, up to 10-6 $M_\odot$/year, of carbonaceous dust. In the early Universe, over the first billion years, such prodigious WC dust-making stars should appear and may generate up to $\sim$20% of the primordial dust necessary to form planets and lead to life. We show that, once formed, a significant fraction of the WC dust survives the harsh WR environment. Even more surprisingly, we find some traces of polycyclic aromatic hydrocarbons in the WC dust ejecta. This raises the possibility of a very early accumulation of complex pre-organic ingredients. JWST would be a powerful tool to probe such dust machines in the local Universe and beyond.
Joel C. Schwartz — McGill University	**Exploring the Impact of JWST Measurements on Characterizing Planetary Atmospheres** Wed, 10:26 • P5-08	Energy balance in planetary atmospheres describes the global absorption and transport of heat, key components for the climate and habitability of terrestrial worlds. With Spitzer and Hubble Space Telescope measurements, it is possible to constrain the day (T_d) and night temperatures (T_n) of a Hot Jupiter to within $\sim$2% and $\sim$10%, respectively. These translate to $\sim$ 10% uncertainties on Bond albedo (AB) and heat transport efficiency (ϵ). However, the best constraints require observations, including several phase curves, in $\sim$10 distinct infrared wavebands, only available for select bright targets (e.g. HD 189733b). The James Webb Space Telescope (JWST) presents an opportunity to characterize at least an order of magnitude more short-period giantsand even some terrestrial planets. We explore what the precision of JWST spectroscopy and photometry can mean for describing atmospheres of transiting planets. For those with $T_d > 500$ K, NIRSpec will allow one to model the peak of the planet's thermal SED more finely than with Hubble or Spitzer. Coverage by MIRI on the Rayleigh Jeans tail will also help one distinguish reflected light from thermal emission in the near-infrared. We show that precision of order 10^{-4} in just these measurements constrain Td and Tn of Hot Jupiters to within $\sim$1%, giving better estimates of AB and than the best cases today. We further demonstrate that 103 transiting planets with $R_p < 2R_\oplus$ are warm enough to radiate in the JWST bands. For these and other worlds, we investigate the optimal instrument modes on JWST to observe different features in full-orbit light curves. In essence, energy balance on Hot Jupiters today is the prelude for discoveries on temperate terrestrial planets tomorrow.
Ariane Trudeau — Université de Montréal	**Polarization of A/B stars in the Young cluster NGC 6611** Wed, 10:27 • P5-09	Most stars form in groups in molecular cloud complexes. NGC 6611 is a particularly large open cluster which formed about 1 Myr ago. With polarimetry we want to probe the presence of circumstellar disks or envelopes through dust scattering and also the presence of magnetic fields within the cluster and in the foreground material through dichroic extinction by aligned grains. We present linear polarization measurements for 82 A/B stars with a limiting magnitude of $V = 14$ in red filters. While most of the observed stars show a red polarization of $2-4$%, mostly interstellar in origin, W80, W151 and the remarkable W188 display high polarizations partially due to the intracluster dust in the north-western part of NGC 6611. Eight of the 18 stars tested for polarimetric variability, including W188 and W231, show evidences of intrinsic polarization and 4 others may have an intrinsic polarization component. Relation between the frequency of circumstellar disks and the proximity of O stars is not clear and will need further investigation.

Back to schedule ...	Posters	
Jason Rowe — UdeM, iREx	**Tools for Slitless Spectroscopy of Extrasolar Planets with NIRISS aboard JWST** Wed, 10:28 • P5-10	We present an overview of exoplanetary science and tools being developed for the community that support the Single Object Slitless Spectroscopy (SOSS) mode of the Near-Infrared Imager and Slitless Spectrograph (NIRISS) aboard JWST. Publicly available code will enable the community to generate synthetic data, generate spectral traces, produce difference images and extract spectra..
Loïc Albert — UdeM, iREx	**Testing Brown Dwarf Models - Secondary Eclipse Observation of LHS 6343** Wed, 10:29 • P5-11	As the number of field Brown Dwarfs counts in the thousands, interpreting their physical parameters (mass, temperature, radius, luminosity, age, metallicity) relies as heavily as ever on atmosphere and evolutionary models. Fortunately, models are largely successful in explaining observations (colors, spectral types, luminosity), so they appear well calibrated in a relative sense. However, an absolute model-independent calibration is still lacking. Eclipsing BDs systems are a unique laboratory in this respect but until recently only one such system was known, 2M0535-05 – a very young ($\leq$ 3 Myr) binary Brown Dwarfs showing a peculiar temperature reversal (Stassun et al. 2006). Due to its young age, 2M0535-05 is an ill-suited test for Gyr-old field Brown Dwarfs whose population is by far the most common in the solar neighborhood. A few years ago, a second system – an evolved BD ($\geq$ 1 Gyr) – was identified (62.1$\pm$1.2 M_Jup, 0.783$\pm$0.011 R_Jup) transiting LHS6343 with a 12.7-day period. We propose to use NIRISS for 5.5 hours to determine the spectral type (a proxy for temperature) as well as the near-infrared luminosity of this brown dwarf. We conducted simulations that predict a signal-to-noise ratio ranging between 10 and 30 per 5-pixel resolution element in the peaks of the spectrum. These measurements, coupled with existing luminosity measurements with Spitzer at 3.6 and 4.5 μm, will allow us to trace the spectral energy distribution of the Brown Dwarf and directly calculate its blackbody temperature. It will be the first field Brown Dwarfs with simultaneous measurements of its radius, mass, luminosity and temperature all measured independently of models.
Anand Sivaramakrishnan — STScI	**Disambiguating structure in LkCa 15 with aperture masking interferometry** Wed, 10:30 • P5-12	L kCa15 is a transitional disk with potentially planet-forming bodies detected inside its disk gap. K and L band ground-based observations resolve multiple components, with contrast ratios 100-1000, within 100 mas of the host star. This search space is within NIRISS AMI's reach, but inaccessible to the NIRCam coronagraph at comparable wavelengths. Precise photometry at 2.77 and 3.8 μm will support the LBT detections and place stricter limits on accretion disk models for component b, and could provide evidence for accretion onto component c. Photometry at 4.3 um will provide an additional photometric point for better model constraints. Reaching a contrast of 2000 takes about an hour exposure in each of F380M,F430M, and F480M filters, and less in F277W.



Exploring The Universe With JWST - II

24-28 October 2016

Montréal, Canada

JWST is a joint mission between NASA, ESA and CSA

The James Webb Space Telescope (JWST), scheduled for launch in October 2018, will be one of the great observatories of the next decade. Its suite of four instruments will provide imaging, spectroscopic and coronagraphic capabilities over the 0.6 to 28.5 micron wavelength range and will offer an unprecedented combination of sensitivity and spatial resolution to study targets ranging from our Solar System to the most distant galaxies. With JWST's launch date approaching rapidly and a first call for proposals scheduled for the end of 2017, it is important to give the astronomical community opportunities to present, highlight and discuss scientific programs that will be made possible by JWST.

Scientific Organizing Committee

René Doyon (U. de Montréal/iREx; co-chair)
Chris Willott (NRC-Herzberg; co-chair)
Michael Balogh (U. of Waterloo)
Beth Biller (U. of Edinburgh/ROE)
Peter Behroozi (UC Berkeley)
Isobel Hook (U. of Lancaster)
JJ Kavelaars (NRC-Herzberg)
Robert Kennicutt (Cambridge, IoA)
Charles Lada (CfA)
Laura Pentericci (INAF)
Marshall Perrin (STScI)
Allison Sills (McMaster)
Tommaso Treu (UCLA)

http://craq-astro.ca/jwst2016/