

HECTOR SCIENCE MEETING
TUESDAY 14 JUNE 2022, 3.00 – 4.00PM
Zoom – the meeting was recording for minute taking purposes only.

Attendees: Julia Bryant (Chair), Sree Oh, Matt Owers, Sam Vaughan, Luca Cortese, Jesse van de Sande, Scott Croom, Matthew Colless, Gabriella Quattropiani, Brent Groves, Mina Pak, Joon Hyeop Lee, Jiwon Chung, Hyunjin Jeong, Jong Chul Lee, Amelia Fraser-McKelvie, Richard McDermid, Madusha Gunawardhana, Di Wang, Emily Wisnioski, Tom Rutherford, Yifan Mai.

Apologies: Stefania Barsanti, Celine Boehm, Sarah Sweet, Angel Sanchez Lopez, Marie Partridge

Item	
1	<p>Action Items from the previous meeting (11 May 2022)</p> <p>Observer Numbers</p> <ul style="list-style-type: none"> Sree has the schedule and observers finalised for all the upcoming observing nights. Some people have volunteered for some data reduction tasks, but more are required. This will remain as an ongoing action item. <p>Cubing Methods</p> <ul style="list-style-type: none"> Brent will move the cubing details on to the build site and email Hector members regarding how to locate the information. He confirmed he will share the files in the next few weeks <p>The 4 Initial Observing Proposal Objectives</p> <ul style="list-style-type: none"> The action points have been addressed or will be further discussed during today's meeting. <p><u>Further discussion on this topic:</u></p> <ul style="list-style-type: none"> There are no papers currently listed on the Wiki, so nothing has been submitted since the last meeting. Key science cases, several are linked to specific people eg Cluster work - Matt and his team will put in paper proposals for that area. Please post paper submissions for the early science data before the Exec meeting on 27 July. Contact Stefania if there are any issues with posting information on the Wiki. The abstracts don not need to be extensive but need to be aligned with the Science cases (also on the Wiki). Proposals must be for a defined science goal and include key collaborators. People need to be able to work with the data immediately and publish mid to 2nd half of 2023. The number of galaxies and the target selection is outlined in detail in the proposals to aid people in submitting their proposals. Larger samples will be available in the future. It was raised that not everyone may have the same opportunity to submit a paper proposal as there may be some political issues with AAT membership etc. However, putting those aside, it was agreed, if people in teams want to do the science, please encourage them to submit a proposal and if there are overlaps these will be discussed collaboratively. The aim is to get progress before the September busy week. The proposal schedule for this semester may not happen due to the poor weather, however there are still 2 further runs this semester to obtain some data. The science cases aren't semester specific. Both low mass galaxies and milky way analogues should be available in the coming runs and are not semester dependent. Sree confirmed that the Wiki is working she submitted a proposal. WG members are encouraged to read the minutes if they are not able to attend the meetings An error message is appearing when people try to log into the Wiki, this needs to be investigated by Data Central, also the log out time is short and the load time is very slow. Uploading data to the Data Central cloud is clunky. Sree is planning to learn how to do this and will share this information with the group. These instructions need to be added to the observing instruction for each run to increase efficiency. <p>Action items</p> <ul style="list-style-type: none"> Julia to send an email requesting proposal submissions with a deadline to the entire Science Working Group. Sree will raise the issue of the error message and follow up the other issues raised with Simon O'Toole at Data Central this week.
2	<p>Instrument commissioning update</p> <ul style="list-style-type: none"> The last run had a total of 24 nights with only 1.5 nights of usable data and that was through cloud. There has however been a lot of work done on the instrument. The positioning is good and streamlining is happening. Julia is working on the labview software to improve these processes. The on-sky calibration of the P & Q values still needs to be completed. It is hoped that this can be achieved in 3 nights during the next run, rather than the original 5 nights allocated. The penalty of not achieving this is that the galaxies will not be as well centred, and the field of view will be reduced.

	<ul style="list-style-type: none"> The benefits of everything running smoothly prior to starting the survey were agreed and the potential of doing an additional commissioning run to achieve this was mentioned. However, some science data which may not be considered as part of the survey will be available for DR purposes and this can help identify any issues Training has been working well for both running the robot and plate plugging, Julia commended on how enthusiastic the observers had been to learn the processes. Up to 12 people will be trained by the end of this semester. The site staff are also being trained for the instrument changes. This has also progressed well, and the staff have been very proactive in wanting to ensure that everything runs smoothly. Julia recognised that they are a great team to work with.
3	<p>Data Reduction (DR) Update – Sree & Madusha DR wiki page: https://hector.survey.org.au/wiki/working-groups/data-reduction-wg DR document: https://cloud.datacentral.org.au/apps/onlyoffice/43517818?filePath=%2FHector%2FDR%2FDocuments%2FHector_DR_document.dOCX</p> <ul style="list-style-type: none"> Sree provided a summary of the DR meeting on 9 June, the full details of which are located here: https://cloud.datacentral.org.au/s/kHTKXK4QYhD0pUj The DR WG are working hard and meeting every 2 weeks. From the May data some issues were found with the ccd4 data but they are working through this There is a slight decrease in the dark frames due to a light leakage with the dark slide. Madusha has tested the dark frames while making the dome lights on and off. The left 2 plots are ccd3 and the right plots are ccd4. The red line is the dark currents when the dome light is on and the blue lines when the dome light is off. The dark slide is now confirmed as working properly and dark frames can be taken during the day. The dome flat system was not showing the spectrally flat features. The left figure with the yellow line show the spectral features are not flat (March) The figure on the right is the using the new dome flat system in June and the peak has been significantly reduced. SSO staff are working to get some more lights in the blue end. Sam is working on the 2d modelling approach to get wavelength solutions which is time consuming. Sree and Madusha are working on the DR pipeline and are working through the SAMI pipeline to introduce the Hector data. <p>2D modelling update (Sam)</p> <ul style="list-style-type: none"> PSF profile across 2df in ccd has not been done. Currently Sam confirmed that 2dfdr fits the arc lines and give an x and a y position and that gives the wavelength of the line which is fitted in 2d. It would be useful if a snapshot of an arc frame could be taken and model the psf (similar to HERMES). This probably won't occur soon. With Spector, due to the Hermes experience, there were constraints to the elongation of the psf at different places along the detector so that there would not be the highly elongated psf's that Hermes sees to the side/corners of the detector. It is difficult to measure the 2d psfs. In the last run the sparse frames were measured which gives the psf in one direction and sparse frames with arcs were also done which gives a grid of arc points rather than just flat fields. More work is to be done in this area. Jesse will look into this as soon as all the reduced arc frame are available for all ccDs from a spectral point of view, checking the gaussianity of each line. Matt was also considering the spatial psf in the blue end for AAOmega where the scattered light means that it is difficult to understand that fully. Julia confirmed that this was the reason for taking the sparse frames. Scott commented that the scattered light in the new spectrograph looks very clean compared to AAOmega – possible a factor of 10 better (although this hasn't been quantified). Julia confirmed that there was a requirement to ensure that any ghosting on the spectrograph was either very diffuse or so concentrated that it only landed on a small number of pixels. Ghosts can be seen is a small number of pixels in the sparse frames, but these are unlikely to hit anything important. <p>Action Items:</p> <ul style="list-style-type: none"> The DR tasks are still being developed. Please join the DR group and sign up to any tasks or email Sree with questions.
4	<p>Update on the selection of initial target galaxies for the upcoming runs in terms of edge-on emission line galaxies and the cluster strategy - Sam, Matt, Brent</p> <ul style="list-style-type: none"> The previous and future observing runs focus on the WAVES North field (an extension of the SAMI G15 region) for the first half of the night and the 2nd half of the night will focus on the clusters. The main goals are: <ul style="list-style-type: none"> Catalogue galaxies which fill in the top 1° of the G15 field and meet all Hector target criteria. Reobserve some SAMI galaxies to compare the data for Spector. Observe some sample galaxies for some early science papers – low mass galaxies, edge on gas rich galaxies and some milky way analogues. Sam received a list of 28 galaxies which meet the selection cut of being gas rich and edge on and fit in the 1° strip of at the top of G15. They are axis ratio of <0.5 and G minus I of <0.6 and are brighter than 70 magnitude in the R band. One gas rich tile has 11 gas rich galaxies within one Hector field. The milky way analogues – there are a set of 4 tiles which repeat 2 low mass galaxies, 2 gas rich galaxies and a milky way analogue and the rest of the hexabundles get filled in with other more interesting SAMI galaxies. The aim is to end up with 50 – 60 galaxies Sam has worked with Jesse to identify 6 areas of sky in SAMI with a number of milky way analogues where the discs can be seen in SAMI but the AAOmega spectral resolution means that the kinematics don't allow for H3 and H4 to be measured accurately. These will be put onto the Spector hexabundles and the aim is to get 3 repeats and measure the improvement in signal to noise ratio.

	<ul style="list-style-type: none"> • There are 3 cluster in the previous and upcoming run. Sam has made tiles for the double cluster systems Abel 3716 and 3667. These have high velocity dispersions and the cluster mass characteristics can be studied in addition to the galaxy science. • The tiling algorithm has been run to completion and 5 tiles have been selected which trace the substructure. • Cluster A2399 is rising in the next run and also the July run. The central regions have been covered with SAMI, so the outer regions can be filed by with Hector. • The WAVES South field starts to rise during the next 2 runs. The survey could be started with this region, selecting some gas rich galaxies, however there is no SAMI data for this region so overlaps can't be compared as they have been for the G15 region. • Matt has been working on some dynamic and membership analyses of the clusters to give some initial data for these double clusters. A3667 is a post core passage major merger so had a lot of dynamical activity. A3716 is also a bi modal cluster but is observed before the core passage phase of the merger. This shows two relatively relaxed systems shown before they merge however there are multiple structures in these clusters which complicate the understanding of the characteristics of the clusters and their substructures. • He has been using a more detailed approach using gas in mixture models to try and allocate membership to the different substructures. The spatial distribution of galaxies in a cluster are not gaussian. The process incorporates an nfw profile for spatial distribution and also uses a spherical dark matter halo to model the velocity distribution as a function of radius to use for mixture modelling. • Matt was able to share some results from the A3716 which seem to be more effective than a multi component gaussian mixture model. <ul style="list-style-type: none"> ○ Plot 1 - Projected Phase Space distribution. Y axis – velocity, X axis - the projected cluster centric distance – it is quite asymmetric due to the 2 systems in the double cluster, so it is difficult to use this for mass measurements. ○ Plot 2 – Projected distribution. The contours show galaxy surface density. The colour coding is the members coded by relative velocity. The inner circle shows R200 and the outer 2R200. The aim is to do mixture modelling to separate out the components. ○ Plot 3 – colours show the probabilistic membership allocated to the 3 main structures - Purple main system, green is the norther cluster and yellow NE cluster. It returns a mass for the main structure of about 5×10^{14} <p>Discussion</p> <ul style="list-style-type: none"> • The nominal sampling radius is around 2R200 it may be better alter the tiling strategy for Hector to target some groups that fall into the clusters at slightly larger than 2R200. However there is also the need to sample the lowly in fallers and the backplash galaxies. • Matt confirmed that with the 50:50 cases he chose the maximum probability. To run this MC was used to fit the fraction allocated to each cluster, the scale radius of the distribution of galaxies, the M200 of the dark matter profile and the positions of the substructures. • The galaxy colour selection prioritisation for Hector should be finalised after the initial 2 runs. This can be discussed further.
5	<p>Other Business</p> <ul style="list-style-type: none"> • Ancillary data for fast tracking to support the initial science goals requires further discussion at the next meeting eg star masses and formation rates. Hopefully ancillary data requirements can be developed at a Busy Week however a lot duplicates the work which was done for SAMI. • It would be useful to set up a page of ancillary data on the Wiki. • As yet the Schedule for Semester 2 has not been released but is likely due this week. The dates for the busy week cannot be finalised until this is available. • Please contact Julia to assist with the Busy Week organisation. • Jesse, Matt and Sam all intend to submit proposals for papers this week on the Wiki. Brent will contact his team to confirm if another person is able to lead an early science paper. <p>Action Items</p> <ul style="list-style-type: none"> • Julia will email relevant people about assisting with organising the Busy Week.
	<p>The next Hector Science meeting is scheduled for Wed 13 July 2022, 3 - 4pm AEST</p> <p>Meetings will continue alternately on the 2nd Tue and Wed of each month at 3 - 4pm AEST (12 – 1pm AWST).</p>