HECTOR SCIENCE MEETING

WEDNESDAY 9 JUNE 2021, 12.00 - 1.00PM

<u>Zoom</u> – the meeting was recording for minute taking purposes only.

Attendees: Julia Bryant (Chair), Sree Oh, Marie Partridge, , Matt Owers, Charlotte Welker, Stefania Barsanti,, Jesse van de Sande, Nic Scott, Scott Croom, Joss Bland-Hawthorn, Celine Boehm, Di Wang, Nabomita Roy Mukty, Jong Chul Lee, Jiwon Chung, Joon Hyeop Lee, Hyunijin Jeong, Angel Lopez-Sanchez, Simon O'Toole

Apologies:, Lisa Kewley, Matthew Colless, Sam Vaughan, Luca Cortese, Sarah Sweet, Emily Wisnioski

Item	
1	**Welcome and Overview** Julia welcomed everyone and provided an overview of the meeting agenda.
2	**Action Items from the previous meeting (9 June)** • Scott will contact Joon Lee about his student who is working on a paper on spin flows with SAMI **Instrument Update** • Julia confirmed that the instrument was turned back when in transit to site due to COVID restrictions and is now back in the lab awaiting installation. • Instrument team to provide a name for the robot – Ideas have been suggested, but nothing which has been universally accepted. Some suggestions were made by Jesse – RHEX, HEXA or RHHEXA **Target Selection** • Sam had addressed the action items to check the colour cuts of PANSTARRS with sdss and received the catalogue for A2399 from Matt. • Science team members to send any favourite galaxy in A2399 or G15 send the details to Sam to include for commissioning **Other Business** • Celine will discuss her group's potential contribution with Joss and Julia. • Joss presented some N body simulations as an agenda item.
3	**Hector Website Overview** • The Hector website will be available for everyone to use soon. • Simon O'Toole provided an overview of the site and the support which Data Central can offer. • The site is hosted on the WordPress platform members of the working group will provide content for the relevant pages, at present holding text is visible. It was suggested that training videos might be useful. • Website log in is through your individual Data Central account. Permissions for site access are being finalised. Current administrators are Simon, Julia, Sree, Sam and Marie. • There will be outward facing (public) pages and an inward facing (private or password protected pages) site. • WordPress has 2 modes: ○ Pages – these form the main site tabs. New pages may be created in a workflow which can be published as a draft for the site administrators to approve. Media can be added as videos or images. ○ Posts – this is a blog post and not a webpage. Blog posts are shown as a news feed at the bottom of the page and can be used to share interesting current news. • WordPress allows the use of plug ins. • The log in to Data Central's cloud (Cloudstor) allows access to data sets. Each survey has a public folder and a team folder. It also gives users the ability to share data with other Data Central account holders, public links can also be created which have a password and an expiry date. Email Lists and Communication: • Data Central uses Zulip which is similar to Slack log in at hector.messages.org.au • This allows both public and private channels/streams. An advantage over Slack is that topics can be created within a stream to allow easier filtering of information. Input Catalogues • Data Central will be hosting the WAVES catalogue and is working with ADACS to become an optical data node along with Curtain and Swinburne. • The AAL is calling for a research champion from each survey team to check outcomes are in line with agreed deliverables and there will also be a call for optical data issues and challenges. • Data Central are also building a small thumbnail view for target contamination. Discussion points:

	• Simon confirmed that it was simple to upload files. • The structure of the site and administrator recommendations should dictate where information is added to the site. • Sree will edit observer related pages, including dates and observers. <mark>Action Items:</mark> • Simon will investigate the best option for the inward facing pages (Private or password protected). • Please advise Simon if you are aware of any useful plug ins to include in the site, or if there are additional tools or input catalogues as Data Central can host them. • KASI team members can register for Data Central accounts via the [Data Central registration link](#) •
4	**N Body Simulations –** Joss – Refer to supporting slides via the MS Teams link https://unisyd.sharepoint.com/:p:/r/teams/HectorScienceWorkingGroup829/Shared%20Documents/General/Hector-TTG-models.pptx?d=w5148a5b7df03474d9eb3feaf3bee10a0&csf=1&web=1&e=7kex7m • Joss introduced Nabomita Roy Mukty (Nabo) who has just started her PhD with his team. Nabo is a prize-winning MQ quantum Masters student. Nabo's research will focus on simulations for Hector. • Thorsten Tepper Garcia (Thor) is a postdoc who is working in the simulations area and has produced many of the plots shared here. This work has a big impact on integral field spectroscopy. • To date models of galaxies in N body simulations have not been that accurate. **Slide 1** – An historical model. A 10^7 particle simulation of the milky way shows that the disc seems to misalign and waves appear to propagate through it. The best N body simulations today have fewer particles per galaxy than in this simulation. Long term problem of how equilibrium models can be generated with long term stability. This is solved by the use of distribution functions, including work by Larry Widrow (Canada) and more successfully by Vasiliev with AGAMA. Thor's work focuses on this and also feeds into RAMESES. **Slide 2** – Different models can be specified – eg stellar + arms, stellar + bar etc Molecular clouds do important things to galaxies in terms of migration and heating. From a recently published paper (JBH & TTG) the top right graph shows the density vs radius and the rotation curve Green = the bulge, Orange = dark matter halo, Red = the disc Solid line show the start of the simulation and the dotted lines are the properties which are seen after 4 billion years, their properties are retained. The bottom left plot shows that there is evolution, but there no vertical heating and only a small amount of radial heating. This type of simulation very useful for GALAH Gaia, Hector and MUSE . **Slide 3** –Demonstration at 10^8 particles for 1 billion years. The disc doesn't heat and stays aligned. **Slide 4** – These models have been used for impacts and produce spiral modes these show the spiral pattern winding up from 2oo million upto 1 billion years. **Slide 5 -** More interesting when you drive these spiral arms you also get underlying bending modes. Orange = moving away, purple = moving towards. Half speed of density waves which is shown as a black line. Simulations agree closely with the theory papers. **Slide 6** – The properties of the milky ways which haven been formed in the simulations agree closely with the input parameters. If the mass of the H1 disc is included, you can form a bar. It can be seen on the left-hand side that spiral arms form and after 1 billion years the bar forms. On the right-hand side of the plot the bar heats the inner disc, however it is no longer exponential. Interestingly the bar was confirmed to be the correct mass and size as expected for the milky way, also the bar is slowing down as it is losing momentum to the disc itself (about 2% per giga year) **Slide 7 –** The top right plot shows Green = the bulge, Red = exponential disc, Orange = dark matter halo These curves sum to give a fit to the rotation curve seen today. The bar causes the red solid curve to move to the dotted curve. The matter evolves and mass is pulled in. **Slide 8** - It is possible to measure the surface to density profile of the bars and project the dispersions etc The dispersion curves evolve due to the presence of the bar. **Slide 9** – The pattern speed of the bar can be tracked and this has shown that the bar does not slow down in a linear fashion it slows exponentially. **Slide 10 -** Nabo will be focusing on these simulations for Hector from different orientations. She will look at the absorption lines and also the gas which give the emission lines. **Slide 11 -** Thor's latest research is to get gas into the AGAMA Code consistently. The slide shows Stars = Top simulation and Gas = Bottom simulation. The gas drives density waves into the stellar disc and multiple arms form. Neither the disc or the gas heats, but the gas forms the local substructure, and this can be controlled due to the local Q value. **Slide 12 -** This can also be done with molecular clouds. **Discussion points:** • It was noted that the spiral arms at the end of the simulation with the gas looked blocky, this is due to instabilities. The simulations use self-gravity and it is the self-gravity of these arms which are interacting with one another. • The aim is to produce maps at different parsec resolutions and different orientations. Jesse's work has divided up the different SAMI discs which showed that towards the centre a butterfly pattern was seen which had different kinematics compared to a disc.
	The next Hector Science meeting is scheduled for Wed 11 August 2021, 3 - 4pm **Meetings will continue alternately on the 2ⁿᵈ Tue and Wed of each month at 3-4pm AEST (1 – 2pm AWST).**