1 The Hector Galaxy Survey Science Case

The ATAC Chair has granted an extra two pages for this proposal to outline the big picture of the full Hector Galaxy Survey (Hector-GS) as well as the focus of the 2024B semester.

1.1 The Hector Galaxy Survey Overview

What is the physical basis for the diversity of galaxy properties in the local Universe? This is the overarching question driving the Hector-GS. The answer lies in connecting the internal properties of galaxies to the detailed role of their environment. For the Milky Way, accretion from and interactions with satellite galaxies have shaped our galaxy. In extragalactic studies, there has been a paradigm shift from local and global density-based environment properties to defining environments based on both large-scale structure (filaments, walls, nodes) and where galaxies sit in velocity space. The unique capabilities of the Hector instrument will enable us to tackle this question with data that cannot be obtained with any other survey. The large survey size and spectral resolution, which is a factor of two better than any comparable instrument, will allow us to explore galaxy properties across the stellar mass function with exquisite environmental characterisation. The Hector-GS plans to observe 15,000 galaxies over 6 years, providing a groundbreaking data set that maximises the science productivity of the remaining life of the AAT.

The legacy of the Hector-GS will lie not only with the vast and rich data set that the survey will produce, but also in unique science that cannot be accomplished with any other instrument in the world. SAMI [12, 7, 14] and MaNGA [10] have been the largest IFS surveys to date. However, they lack a combination of the higher spectral resolution that allows stellar kinematics to be measured in a larger fraction and broader diversity of galaxies; the broad range in halo masses required to test the influence of the environment, including mapping the large cluster halos out to higher cluster radii; larger IFUs to get resolved spectra of galaxies to a larger galaxy radius; and a larger sample that will allow the key drivers of galaxy evolution to be statistically determined by sub-dividing the sample in physical parameter space with sufficient statistical accuracy.

The Hector-GS has optimised the science synergies with other large Australian projects. For example, the ASKAP WALLABY [21] and DINGO (https://dingo-survey.org/) surveys will combine their HI data with the Hector-GS to link gas accretion mechanisms and total gas masses from the inner galaxy to the scales probed by HI observations. A group of simulators are already active in the Hector science team, focused on a range of fundamental questions that can be addressed with the Hector-GS regarding the impact of large-scale structure on galaxy evolution. In addition, the Hector-GS regions have been selected to be within the ESO 4MOST WAVES North and South sky areas, which will provide exquisite environmental metrics to confirm the place of our galaxies within local and large-scale structures as well as their kinematic flows (https://wavesurvey.org/).

The Australian community selected the Hector instrument as the next dark-time instrument for the AAT. Membership of the Hector science team is open to all astronomers working in Australia - in some cases with contributions that are not telescope nights. The data will deliver a vast array of science opportunities to the already $\sim$ 70-strong Hector team, drawn from across the country from 8 Universities and the CSIRO as well as KASI in Korea.

Here, we request 14 nights from the common pool. The Hector Galaxy Survey science goals are built on a complete statistical sample of 15,000 galaxies, a number carefully set by predictions from simulations and experience with the SAMI data. Further justification of the survey size is given in section 1.3 below. To complete the full Hector survey on the planned 6-year timeframe requires 100 nights per year. We aim for a minimum of 90 nights per year and a target of 100. Due to the 13 lost Hector nights in 2024A, we aim for 63 nights in the next semester to stay on-track. **However, we are aware that this is an unusual semester and the telescope needs to remain active with productive programs in the dark and grey nights while 2dF is not available. We can confirm that if there are excess telescope nights after other awarded programs (e.g. KOALA) then the Hector Survey has sufficient targets to observe for more than 63 nights - as many dark and grey nights as available from August to December** (January is less productive for Hector due to higher airmass of targets). We have reserved 49 nights for Hector from four institutions this semester, so we require 14 more to reach our target. We seek these additional nights from the common pool, noting that some Hector institutions (UNSW, Monash) have chosen not to reserve Hector nights and instead contribute through the pool, while ANU has put enough nights into the pool to apply for further Hector nights.

1.2 Key Science Goals

(A) **How is the accretion of gas and angular momentum (spin) influenced by the local and global environment?** Cosmic structures over the mega-parsec scale, such as cosmic filaments and clusters where they intersect, strongly constrain the flows and thermodynamics of baryons in their vicinity. Simulations and theory predict that this impacts the accretion onto galaxies and, therefore, their spin, structure and, more generally, their dynamics. The world-leading Australian surveys WALLABY and WAVES (2024+) will map galaxies and their peculiar velocities in the local Universe with unprecedented detail. They will locate the Hector galaxies both in 3D space and dynamically within cosmic flows, permitting the most extensive analysis of correlations between large-scale structure morphology and Hector's galaxy-scale dynamics.

SAMI demonstrated the feasibility of such studies through the first detection of the alignment of galaxy spins with filaments [35], but the limited statistical power capped the significance of the results at $\approx 2\sigma$. It also precluded any analysis of cosmic walls, any multivariate analysis (field filaments, filaments in groups, filaments into clusters) and any detailed analysis of the corresponding kinematic disturbances in the outer parts of galaxies. [4] and [5] demonstrated the importance of spin filament alignments to understanding accretion of angular momentum in galaxies, and again found a larger sample over a wider mass range was required. With its increased sampling, wider field of view and wider coverage of clusters up to $2\,R_{\rm vir}$, the Hector-GS will allow for a deep analysis of how filament/wall, filament/group, and filament/cluster interactions impact galactic inflows, spin and structure. Such studies are very timely. Modern simulations predict, for instance, that cluster outskirts $(0.75 - 2\,R_{\rm vir})$ are regions of multiple transitions, strongly impacting the structure of galaxies. It is where satellite galaxies are expected to progressively align their orbit and spin to the central galactic plane, while aligned to the nearby cosmic filament at outer radii [34, 33]. While the orbit transition was detected in the SDSS [36], the spin counterpart requires the power of the Hector-GS.

(B) **Tracing the mass accretion and dynamical evolution of galaxies through utilising Hector's spectral resolution.** The SAMI Galaxy Survey was the first to clearly demonstrate the impact of the environment on the stellar-dynamical properties of galaxies. The largest dynamical changes are detected in the most massive galaxies ($\log(M_\star/M_\odot) > 11$) in the most extreme environments. Between $9.5 < \log(M_\star/M_\odot) < 11$, the dynamical transformation as a function of both mass and environment is significantly smaller [11, 13, 32]. In this regime, a factor of > 5 increase in sample size is paramount to understanding what physical processes determine a galaxy's morphology and dynamical structure. Nonetheless, the highest impact science is expected to come from the mass regimes currently out of reach of SAMI. Towards low stellar mass, there are hints that galaxies become more dispersion dominated [see also 15, 30, 2, 3], but this mass regime is currently below SAMI's spectral resolution. The higher spectral resolution of Hector will enable stellar kinematic measurements on a broader range of galaxies than any other survey. Similarly, for the most massive galaxies in extremely dense cluster environments, SAMI's current bundle size restricts measurements to the very core of these galaxies, while the vast majority of accreted material and transformation is predicted to take place at larger radii [$> 2R_\mathrm{e}$; 29, 6, 28]. In both low and high-mass regimes, the Hector-GS will make breakthroughs.

Hector will also revolutionise our ability to measure high-order kinematic signatures that offer a complementary yet unique insight into the orbital structure of galaxies. Measurements from SAMI have resulted in well-cited results for high stellar mass galaxies [31], but the Hector-GS will probe the stellar kinematics of the low-stellar mass population in large numbers for the first time. Detailed Schwarzschild's orbit-superposition models [27] have now demonstrated that high-order kinematic signatures detect unique orbital substructures, and cosmological hydrodynamical simulations show that high-order signatures are the best probes for determining the amount of ex-situ versus in-situ material in galaxies [26]. The Hector-GS will yield an unprecedented number of galaxies ($N \sim 4000$) where high-order kinematics can be measured, across stellar mass, morphology, and environment, enabling detailed comparisons to simulations [e.g. 23, 26] that relate galaxy formation models to the stellar kinematics, to unravel the formation paths of galaxies as drivers of their present-day physical properties.

(C) **Directly identifying feeding and feedback in galaxies**. The Hector-GS will evaluate the balance of gas supply for star formation in all environments by imaging outflows from kinematic signatures and emission-line diagnostics of shocks and AGN. While a small number of galaxies in the SAMI survey had the right size and orientation to identify galactic winds and outflows [17, 18, 22], the larger IFU imaging fibre bundles, called 'hexabundles', and the Hector survey strategy will allow for the gas kinematics to be traced to higher effective radii within each galaxy. This, in turn, better captures the velocity structure, including the maximal rotational velocity, and the subtle signs of inflows, outflows and re-accretion at large radii for a much larger fraction of emission-line galaxies. Our modelling has shown that the higher spectral resolution in the blue will enable multi-component line fitting and distinguishing of AGN outflow signatures in the [OIII]500.7nm emission line, which is ambiguous with the lower resolution IFS surveys.

(D) **Testing the origin of gas and its influence on star formation in galaxies.** The kinematic misalignment of gas and stars is a key tracer of the origin of gas and the impact of gas accretion and mergers on star formation and the build-up of mass. It has been shown with SAMI [8] that the larger IFU size in Hector is needed to map the merger signatures and in-coming accretion from larger radii that is necessary to constrain galaxy formation models.

The broad interests of the Hector Science team met by this survey also include i) spatially resolving star formation rates, metallicities and stellar ages; ii) tracing galaxy star formation histories from stellar populations; iii) separating the formation histories and mechanisms for the disk and bulge components of galaxies and much more.

1.3 Survey Design and Target Selection

Sample Size Justification: The need for 15,000 galaxies has been carefully set by simulations of the highest impact Hector Science goal and based on experience with the SAMI data. A unique high-priority science goal for Hector is the correlation of the angular momentum of galaxies with their formation position within the large-scale structure. While the SAMI survey detected the first signature of galaxy spin alignments with cosmic filaments [35], the significance of the detection was limited to $\approx 2\sigma$ and precluded more detailed analysis. Based on predictions from simulations, it was remarkable that the faint spin-alignment signal at $z < 0.1$ was recovered above the 95% confidence interval, especially considering the relatively low number of galaxies (N=1418) in the sample [35]. However, as outlined in key science goal (A), the limited number of galaxies in SAMI makes it impossible to detect spin-alignment trends within galaxy sub-populations, nor does it allow for a detailed analysis of galaxies near cosmic walls, any multivariate analysis (field filaments, filaments in groups, filaments in clusters), or any detailed analysis of the corresponding kinematic disturbances in the outer parts of galaxies [4, 5].

We have determined that 15,000 galaxies observed over a wider area, such as the WAVES regions, will be essential to recovering the 3D alignments of galactic spins in all cosmic structures, particularly near filaments and walls. While SAMI and MaNGA combined already observed 13,000 galaxies, the environmental statistics are insufficient to carry out the proposed science goal (A) as the SDSS regions lack the required redshift completeness.

Furthermore, understanding the broader science goals in section 1.2, relies on sub-dividing the galaxy sample by stellar mass (4 bins from $10^{7.5}$ to 10^{12} $\mathrm{M}_\odot$), morphology/colour (kinematic morphology - fast/slow rotators - and shape - elliptical, spiral, S0), local and global environment (position within local densities e.g. isolated galaxies, group members and radius of a galaxy within a cluster, and position within large-scale flows e.g. distance to filaments). The Hector Galaxy Survey aims for 180 galaxies per bin when subdividing into these 4 x 5 x 4 bins (requiring 15,000 galaxies) in stellar mass x environment x morphology/colour which will differentiate at the $\sim$ 15% level between environmental influences on gas accretion and the resulting star formation and angular momentum build up in galaxies.

Survey Design: The Hector-GS field sample will probe a significant range in environmental densities, from the lowest density voids all the way to the centres of low mass clusters. However, the Hector-GS field sample volume does not contain rare massive

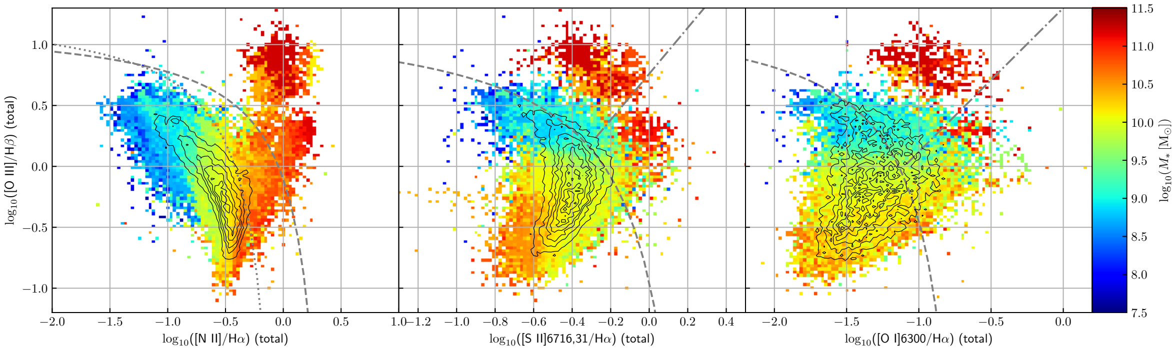

Figure 1: Optical diagnostic diagrams of individual spaxels from Hector galaxies, created using the spaxelsleuth python package. The colour of each cell represents the median host galaxy stellar mass of the spaxels in each cell, and the log-scaled contours represent the number density. The dashed, dotted and dash-dotted lines are the diagnostic lines from [19] and [20] which separate emission ratios indicative of star forming ionisation to the left of these lines and non-star-forming emission to the upper right of the lines. These show the effectiveness of Hector in measuring the ionisation and metallicity across galaxies, for a broad range in stellar mass and in a significant sample of low-mass galaxies, as indicated by the blue "wing" extending towards the left in each panel.

clusters ($M_{200} > 10^{14.5} M_{\odot}$). To sample the full range in environment density, the Hector-GS will observe an additional 11 galaxy clusters with $M_{200} > 10^{14.5} M_{\odot}$, which have existing high-quality optical *griz*-band imaging from the Dark Energy Survey [DES; 1]. Hector and SAMI are the only large IFS surveys to target rich cluster fields. Furthermore, the Hector-GS will go beyond the cluster science possible with SAMI by covering the cluster outskirts out to twice the virial radius. This will bridge the density regimes of field and cluster galaxies. These intermediate density regions are a crucial environment for the morphological transformation of galaxies. Thus, the Hector-GS will be the first IFS survey that truly covers the full range of environmental densities, to give the most comprehensive investigation of environment-driven galaxy transformation to date.

The field sample will be in two regions: one in the north galactic cap at $\delta \simeq 0°$ (with known redshifts from SDSS, 2dFGRS and GAMA); and a second at $\delta \approx -30°$ in the south galactic cap (with known redshifts from 2dFGRS). These are the "WAVES North" and "WAVES South" fields that will be observed with (unresolved) single-fibre spectroscopy using 4MOST as part of the upcoming WAVES survey from 2024. The alignment of the Hector Survey to these WAVES fields enables the environmental and large-scale structure information from WAVES, which is essential to the key science cases for the Hector Survey. Photometry for the target selection is based on deep optical KiDS imaging.

Target Selection: Target selection for the Hector-GS will follow a similar philosophy to that of the SAMI galaxy survey, using a selection function described by a series of steps in the redshift – stellar mass plane (see [7] for details). To avoid an overabundance of L_*-mass galaxies, we will sparsely select in the mass range $\sim 10^{10} - 10^{11}\,\mathrm{M}_{\odot}$. The final target selection selects 15,000 galaxies at $z \leq 0.1$.

The 2024B semester Hector observations will focus on two 60 sq. degree sub-regions in the WAVES South fields (H01 and H03) and the GAMA G23 field and 10 of the Hector-GS clusters. Enabled by the 2dF Hector Galaxy Redshift Survey, the clusters now also have sufficient redshift coverage for the selection of Hector targets in semester 2024B.

1.4 Hector performance so far

The Hector survey began in 2023. The first internal team data release in April 2024 with the fully-operational data reduction pipeline consisted of 3714 cubes (red and blue spectral ranges), featuring 1495 unique galaxies. There are further data that are awaiting reduction.

In previous proposals we featured data illustrating the science gains we are achieving due to the higher resolution, and the science-quality products now available which are contributing to the initial science cases below. We also showed early results for the highly unique science case of stellar kinematics in low-mass galaxies (see Section 1.2(B) above) plus we showed first results on the Hector cluster ram pressure stripping (early science program 3 - see Section 1.5(3) below).

Here we highlight two new results. Fig. 1 shows the quality of the Hector data for measuring ionisation of galaxies right down to the lowest stellar masses. These results rely on the effectiveness of the new multi-component emission line fitting code in which separation of line components is only now possible due to the high spectral resolution of Hector. Then the data products from SpaxelSleuth, are being used for classifying the ionisation in individual spaxels (e.g. star formation, AGN, plus gas metallicity).

Fig. 2 is a result from our early science program #3 (aligned to Section 1.2 A and C above) in which quenching of a galaxy due to the cluster environment is characterised in detail with Hector data.

1.5 Plan for Semester 2024B

The Hector instrument [9] has 19 hexabundles on galaxies in each field and two that image secondary standard stars for calibration. This semester, the Hector-GS aims to target 1580 galaxies in 63 dark/grey Hector nights (49 reserved nights on Hector, 14 shared-time nights requested here), with 2 fields per night and 19 galaxies per field (with weather overhead). Targets this semester are available from Aug-Jan (but Jan is not as useful due to higher airmasses of targets). To reach 15,000 galaxies, a future request of 100 nights per year over 5 years is required.

Targets for 2024B will be chosen from the main Hector survey input catalogue, but be specifically chosen to continue our key early science programs. They will particularly contribute to papers on the following 3 science cases:

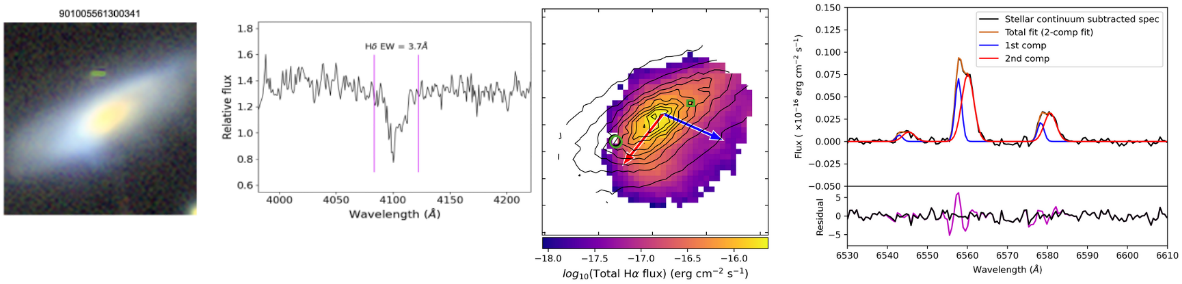

Figure 2: An example of a ram pressure affected galaxy in Abell 3667. **Left:** Optical image of the galaxy showing visual indications of a tail towards the bottom right. **Mid left:** Combined spectrum from 13 spaxels selected from a region just outside where H$_\alpha$ is detected (inside the green circle mid right plot), revealing strong H$_\delta$ absorption, indicating recent quenching. **Mid right:** The distribution of ionised gas traced by the H$_\alpha$ flux with stellar continuum in black contours. Note the asymmetric distribution of gas which extends beyond the stellar disk contours towards the bottom right of the image. The red arrow indicates the direction to cluster centre while the blue arrow indicates the tail direction. **Right:** Emission line fitting using multiple Gaussian components: a two component fit from the spaxel in the green square (mid left panel), which identifies two gas components with a velocity difference between them of 110 km s^{-1}. The normalised residual of the 2-component fit (black) is greatly reduced around the emission lines than the 1-component fit residual (mauve).

(1) **The unexpected dynamics of low-mass dwarf galaxies.** Recent results indicate that both low-mass ($\log(M_\star/M_\odot) < 9.5$) spirals and spheroidals have unusual low ratios of V/σ as compared to more massive galaxies [15, 30], and break away from fundamental galaxy scaling relations [e.g. Faber-Jackson, $M_\star - S0.5$; 2, 3]. Determining the physical cause for low-mass galaxies to be outliers is currently restricted by 1) a bias towards spheroidal galaxies and those with early-type morphology residing in over-dense cluster environments, and 2) limited spectral resolution in the largest IFS surveys (e.g., ATLAS^{3D}, CALIFA, SAMI, and MaNGA). Due to its higher spectral resolution, the Hector-GS will be the first IFS survey to properly measure the stellar dynamics of low-mass galaxies. We will test whether the offset from current dynamical scaling relations is real or whether the limited spectral resolution of previous surveys caused this. This semester alone will net 250 $\log(M_\star/M_\odot) < 9.5$ galaxies.

(2) **Inflows and outflows at large radius.** Using SAMI, we found that at least $\sim 40\%$ of edge-on star-forming galaxies show evidence for outflows [18]. A more recent analysis using SAMI shows that almost all galaxies have increased velocity dispersion in extra-planar gas, suggesting that winds are much more widespread. Hector can make fundamental steps forward in this area for two reasons. First, the higher spectra resolution in the blue part of the spectrum will allow us to decompose all the spectral lines (e.g. Hβ, [OIII]5007) into multiple components to provide much clearer ionisation diagnostics. Second, the spatial extent of these outflows was limited by the small fibre bundle sizes of SAMI. With the larger fibre bundles of Hector, we will probe much further out, tracing the radial decline of the outflows and their ionisation structure. This semester we will intentionally target the next set of $\sim$ 40 galaxies with effective radii larger than the SAMI hexabundles and that are preferentially edge-on galaxies where outflows will be more easily detected in ionised gas to the edge of the Hector hexabundles. This number will substantially build on the outflows results from SAMI. The sample from last semester is under analysis to refine our selection criteria in order to increase our outflow detection rate.

(3) **The future fate of ram-pressure affected cluster galaxies:** SAMI targeted galaxies in the central parts of 8 clusters, finding a substantial fraction of recently accreted star-forming galaxies were undergoing outside-in quenching due to the effects of ram-pressure stripping [25]. However, many of these galaxies are only partially quenched, exhibiting ongoing central star-formation. The outstanding question is whether these galaxies are completely quenched at the first cluster core passage, as predicted by [24], or whether the central star formation continues for long periods following pericentric passage. The Hector-GS will address this question by measuring the spatial distribution of star formation in galaxies located in the 1-2R_{200} regions. This region is dominated by two distinct galaxy populations: higher velocity galaxies on their first in-fall into the cluster, and lower velocity "backsplash" galaxies that are close to the turn-around radius after a recent cluster core passage [16]. Comparing the resolved star-forming properties of these two populations and galaxies in the central virialised regions will provide a strong empirical constraint on quenching timescales following the accretion of a galaxy onto a cluster. This semester will continue to focus on galaxies located at 1-2R_{200}, thereby allowing a complete view of the outskirts of clusters (See new result in Fig. 2 above).

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2 Technical Justification

Hector Commissioning Status: The commissioning of Hector has been successful, with "first light" achieved during the first commissioning run: a detection of bright Hα emission lines of 19 galaxies simultaneously in *all* hexabundles. While exceptionally poor weather delayed commissioning during 2022, the Hector Galaxy Survey began in 2023. The data taken to-date has been successfully reduced and the cubing pipeline has produced data cubes for all galaxies, which are now being used by the Hector Science team members. The results show that Hector is meeting its requirements for high throughput and spectral resolution in the new spectrograph. All subsystems (positioner, guider, sky fibre system, magnetic field system and hexabundles) have all been demonstrated successfully and are operational. Intensive training of a team of observers has resulted in 23 fully or partially trained observers in the Hector Science team.

Instrument setup and exposure times: Hector uses two spectrographs simultaneously - AAOmega and Spector (the new Hector spectrograph). In both spectrographs the wavelength range is selected to include [OII]λ3727Å to the [SII] doublet at λ7424Å for our maximum survey redshift of 0.1. Important lines in between are [NII], [OI], [OIII], Mgb, D4000, Fe lines, Hα and the rest of the Balmer series. AAOmega will cover a wavelength range of $3700 - 5700$Å with the 580V grating giving a resolution of $R \sim 1700$ in the blue arm. The 1000R grating on the red arm will cover $6300 - 7400$Å at $R \sim 4500$. Spector has a fixed instrumental resolution of 1.3Å from $3727 - 7761$Å delivering $R \sim 3460$ at 4500Å and $R \sim 5000$ at 6500Å.

Both spectrographs will use the same exposure times because they observe galaxies simultaneously. The exposures are set to achieve S/N sufficient to measure stellar velocity dispersions out to 1 effective radius, and $H\alpha$ emission lines out to 2 effective radii. The Hector-GS pipeline allocates galaxies to the different sized hexabundles and different resolution spectrographs based on a formula that has been extensively modelled to optimise the fraction of each hexabundle that will contain useful data for stellar kinematics and/or emission line physics. The median surface brightness of the Hector-GS galaxies is r=22 mag arcsec^{-2} at $1R_e$ and the 90^{th} percentile is at r=23.65 mag arcsec^{-2}. Both Spector and AAOmega will achieve that median at a S/N=20/Å unbinned and the 90^{th} percentile at a S/N=5/Å unbinned (higher with binning) in a 4-hour exposure (see plots from the exposure time calculator as presented in the Hector Science document Fig.10] https://hector.datacentral.org.au/uploads/hec-spc-001-science-case-document-v-1-0-signed.pdf). The Spector spectrograph was built to optimise for throughput, and has a much higher throughput than the AAOmega cable+spectrograph across the full wavelength range, but particularly in the blue.

Observing strategy: One of the Hector hexabundles on each of Spector and AAOmega spectrographs will be used to measure a secondary standard star for both flux and PSF calibration. The remaining 19 hexabundles will be on galaxies. Each field of 19 galaxies will be observed in a 7-point dither pattern (previously optimised for SAMI) using 30 minute exposures plus calibration overheads for arcs and flat exposures. We will observe an average of 2 fields per clear night (slightly more in winter and less in summer). The complete Hector-GS aims to target 15,000 galaxies in 100 nights per year for 6 years (38 galaxies per night, then accounting for weather overheads).

In 2024B our targets are available from all semester, but January is less useful due to target positions.

A full observing preparation pipeline exists for Hector, which tiles the fields using a modified Greedy algorithm to maximise tiling for sky coverage, then calculates positions on the field plate, accounting for distortions in the optics and thermal changes. Next, the configuration code sets the 3D rotation of the hexabundles for placement while the collision code optimises positioner magnet placement order and then delivers the observing tile files and plots [9]. We use the Hector data reduction pipeline to process all observations. It has been modified from the SAMI pipeline to handle data from the Spector spectrograph. By using a well-established pipeline, we are able to produce publication-quality data cubes immediately after observations take place, allowing rapid turn-around of the data.

A highly qualified team: The Hector Science team has a wealth of experience with observing on the AAT, data reduction of integral field data, and with the instrumentation. This comes from a strong overlap with the SAMI science team members and senior team members who have used many instruments on the AAT. The observing process for Hector is similar to SAMI. 23 observers have been fully or partially trained so far for Hector, ensuring the team can provide two observers per Hector observing run.

Availability of data: The data is available immediately to team members (any astronomers at Australian institutions can join the team) and will be publicly released over time. We anticipate the first public data release once the first 5,000 galaxies are observed and quality controlled and data products are available (2026). The second data release will be at 10,000 galaxies and the final release at the end of the 15,000 galaxy survey. The data releases will be through Data Central and work is already underway with Data Central to establish the database and platform that will host the Hector data, building on that established for SAMI.

Publication plan: The Hector Galaxy Survey team submit abstracts for papers they plan to publish to the Hector wiki. These are checked by the Hector Science Review team to ensure there is not overlap and that there is a focus on the high profile science. This process allows papers to be "locked in" for students (e.g. 3 papers set at the start of a PhD). Supporting publications from the Hector postdocs and students is a priority (as is training in observing) to set them up for their next career step. The main Hector Survey papers defining the Survey, Target Selection, Data Reduction and Cluster selection are team papers that will be submitted in 2024 and will include all team members who have contributed to establishing Hector.