What is an abstract?

- Blurb on the inside cover of a book but for a scientific paper – **Summary of findings** – what you did, spoil the ending,
- big picture motivation and context – invite you in.
- A hook – a highlight of a finding – **Advertisement** (talks!)
- Summary of proposed **usage of resources** (proposals).
- **Stand-alone application** for a competitive spot (e.g. conferences)

What is the goal of an abstract?

- To summarize an argument for a particular point of view.
- Summary of findings (journal) → to get people to read, arguing that the conclusion that you came to is correct. (referree/audience)
- Advertisements (talks) → get people to come – arguing why someone should come listen to you.
- Stand-alone application for a competitive spot (conferences) → give me a talk! Let me in!
- Preview of an argument/allocation of resources (proposal) → give me money, telescope time! Or both !

Why does an Abstract even matter?

- Summary of findings (journal) → lots of folks only read the abstract
- Advertisements (talks) →one opportunity to convince someone to come to your talk – if someone can't come to your talk they may still be interested in speaking with you.
- Stand-alone application for a competitive spot (conferences) → this is typically the only information the committee has.
- Preview of an argument/allocation of resources (proposal) → HST/JWST TAC members are routinely assigned 70+ proposals, give the reviewers the arguments to fund you. The specific language.

Searching Abstracts

- HST Program Info: https://www.stsci.edu/hst/observing/program-information
- HST MAST Archive: https://archive.stsci.edu/hst/abstract.html
- JWST Program Info: https://www.stsci.edu/jwst/science-execution/program-information

Grading Criteria Given to HST/JWST TAC

Grade	Impact within the sub-field	Out-of-field impact	Suitability
1	Potential for transformative results.	Transformative implications for one or more other sub-fields.	Science goals can only be achieved by observational or theoretical analysis of HST data.
2	Potential for major advancement.	Major implications for one or more other sub-fields.	Analysis of HST data offers major advantages over data from other facilities.
3	Potential for moderate advancement.	Some implications for one or more other sub-fields.	Analysis of HST data offers some advantages over data from other facilities.
4	Potential for minor advancement.	Minor impacts on other sub-fields.	Analysis of HST data offers minor advantages over data from other facilities.
5	Limited potential for advancing the field.	Little or no impact for other sub-fields.	Analysis of HST data offers little or no advantage over other facilities or the advantages of analysing HST data are unclear.

Abstract Outline

Facts	
Importance of Facts	Potential of Impact
Problem	This sets the narrative and the title
Goal – identify the "key component" and "target" that will solve the problem	We propose to…
Strategy – to utilize/generate the "key component", (Justify HST/JWST – usually based on "target")	Suitability
Importance of Solution	Impact within Sub Field
Broader Impact	Out-of-field Impact

Caught in the act of dispersing their disks? MIRI MRS can tell

Small GO

Transition disks are planet-forming disks with large dust gaps or cavities, from a few to tens of au. Based on spectrally resolved 12.8 micron [NeII] profiles, several of them have been also found to drive slow (~5 km/s) winds, compatible with star-driven photoevaporative flows. Regardless of whether the gaps/cavities are created by planets or photoevaporation, these systems might be in the unique stage of dispersing their disks. However, line profiles alone cannot exclude MHD winds which might drive evolution but not dispersal. Here, we propose MIRI MRS observations of two transition disks with a large dust cavity (>30 au in radius) and a small (=<4 au) inner disk plus evidence for a slow [NeII] wind. MIRI MRS is the only instrument that can spatially resolve [NeII] emission near or exterior to the cavity radius as expected in the photoevaporative wind scenario. Along with [NeII], we will map the emission from other forbidden and H recombination lines to constrain the ionization fraction of the flowing gas, hence wind mass loss rates. Our project will establish how much time is left for planet formation and migration in these two systems and provide a pathfinder for future observations aiming at clarifying how disks disperse.

Facts | Importance of Facts | Problem | Goal – key? Target? | Strategy

Importance of Solution | Broader Impact

The Last Neutral Islands at the End of Reionization? Characterizing the Nature of the Longest Dark Gaps in IGM Transmission at z~5.3

Xiangyu Jin & Fan

Very Small 7436

James Webb Space Telescope

Cycle 4 GO Proposal

Understanding when and how reionization happened is crucial for studying early structure formation and the properties of first galaxies in the Universe. During cosmic reionization, ionized regions gradually grew and overlapped in the IGM. At z>6, complete Gunn-Peterson troughs observed in the Ly-a forest of quasar spectra indicate ongoing reionization. At z~5.5, the average Ly-a effective optical depth suggests that most of the IGM is already highly ionized. However, some quasar sightlines still exhibit long troughs with no detectable flux (so-called "dark gaps") in Ly-a forests even at z<5.5. These long dark gaps could be the last remaining neutral islands in the IGM at the end of a highly inhomogeneous reionization process. If confirmed, it will have profound impact on the physics of reionization. We propose for joint JWST and Keck observations to study galaxy properties around two lowest-redshift long dark gaps known detected quasar absorption spectra at z=5.3. NIRCam/WFSS will measure the H-a redshift of ~230 galaxies (~75 in dark gap regions) and joint Keck observations will probe Ly-a emission from detected galaxies.

If long dark gaps are indeed neutral islands, we expect a significant lower Ly-a visibility, and a large Ly-a/Ha velocity offset, among JWST-detected H-a emitters in the dark gap regions due to saturated IGM absorption. We will also characterize the galaxy density field around long dark gaps. This joint program will allow us to directly test the ultra-late reionization model and to place robust constraints on the topology of reionization and the nature of inhomogeneous reionization.

Facts | Importance of Facts | Problem | Goal – key? Target? | Strategy

Importance of Solution | Broader Impact

Dynamically Mapping the Satellite Galaxies in the Outer Halo of the Milky Way

Kallivayalil, Besla

HST 18068 Medium GO, Cycle 33

The satellite galaxies of the Milky Way (MW) constitute the benchmark for studies of faint galaxies, including the effects of cosmic reionization, and testing cold dark matter. We propose to use HST ACS/WFC and WFC3/UVIS for second-epoch imaging of 14 ultra-faint satellite galaxies of the MW that have existing first-epoch imaging from HST, in order to measure high-precision proper motions. We target the most distant satellites, d = 80 to 420 kpc, which uniquely probe 3D dynamics in the outer halo of the MW, and which have large uncertainties from Gaia. Through these precise proper motions, we will match each satellite's stellar mass, distance, and 3D velocity to statistical analogs from cosmological simulations to infer full orbital histories in a cosmological context. We will use these orbits to address diverse science cases, including testing models of patchy reionization, testing the origin and significance of the MW's plane of satellites, and robustly determining the total mass profile of the MW's dark-matter halo out to its virial radius. Ultimately, completing the dynamical catalog of MW satellites at these distances will enable a novel and robust modeling framework that will place the entirety of the MW satellite population in its cosmological context for the first time.

Facts | Importance of Facts | Problem | Goal – key? Target? | Strategy

Importance of Solution | Broader Impact

Dynamically Mapping the Satellite Galaxies in the Outer Halo of the Milky Way

Kallivayalil, Besla

Medium GO, Cycle 33

Qualifiers:

The satellite galaxies of the Milky Way (MW) constitute the benchmark for studies of faint galaxies, including the effects of cosmic reionization, and testing cold dark matter. We propose to use HST ACS/WFC and WFC3/UVIS for second-epoch imaging of 14 ultra-faint satellite galaxies of the MW that have existing first-epoch imaging from HST, in order to measure high-precision proper motions. We target the most distant satellites, d = 80 to 420 kpc, which uniquely probe 3D dynamics in the outer halo of the MW, and which have large uncertainties from Gaia. Through these precise proper motions, we will match each satellite's stellar mass, distance, and 3D velocity to statistical analogs from cosmological simulations to infer full orbital histories in a cosmological context. We will use these orbits to address diverse science cases, including testing models of patchy reionization, testing the origin and significance of the MW's plane of satellites, and robustly determining the total mass profile of the MW's dark-matter halo out to its virial radius. Ultimately, completing the dynamical catalog of MW satellites at these distances will enable a novel and robust modeling framework that will place the entirety of the MW satellite population in its cosmological context for the first time.

A New View of Dust at Low Metallicity: The First Maps of SMC Extinction Curves

Sandstrom HST GO 13659

Qualifiers:

In order to constrain basic dust physics and anchor the interpretation of both UV/optical extinction and IR emission at low and high redshifts, we propose seven-filter photometry of a key region in the Small Magellanic Cloud (SMC). Via a cutting-edge technique demonstrated to work in M31 we will use these data to construct the first ever maps of the extinction curve shape (Rv), 2175 Angstrom bump strength, and dust column (Av) across a low metallicity environment. These maps will allow us to (1) measure the true distribution of extinction curves in the SMC, which is frequently used as a template for low metallicity extinction; (2) rigorously test whether PAHs are the carriers of the 2175 Angstrom extinction feature; and (3) place the estimation of dust masses from IR emission in low metallicity systems on a firm empirical and observational footing. Dust regulates the structure and evolution of interstellar medium (ISM) and shapes the optical and ultraviolet emission of galaxies. Its emission at infrared and mm wavelengths represents a powerful tool to probe the ISM out to the highest redshifts. Understanding the physics and interpretation of dust absorption and emission as a function of metallicity is critical to a vast range of science and mapping key dust properties is a new application, uniquely possible with UV through NIR imaging from HST. As such, we expect this program to have wide ranging scientific impact.

Werk GO 14140: Using UV-bright Milky Way Halo Stars to Probe Star-Formation Driven Winds as a Function of Disk Scale Height

Galactic-scale winds driven by star formation are a common feature of galaxy formation models, and are observed ubiquitously from the local Universe to z~6. However, empirical constraints on the radial density profile and total spatial extent of these winds have been very challenging to obtain. We have devised a simple experiment using blue horizontal branch (BHB) stars in the halo of the Milky Way that will directly map the extent and density of diffuse, ionized outflows from the Galactic disk to the halo. We propose to take COS FUV spectra of 7 BHB stars that evenly sample the range of scale heights from 3 - 13 kpc, lying perpendicular to the disk of the Milky Way, extending from the position of the sun. This study will allow us to unambiguously track inflowing and outflowing material from the Milky Way via absorption component blueshifts and redshifts, respectively. This program will yield the first direct observational determination of the scale height to which star-formation-driven winds propagate in the halo. We will additionally probe the change in the gas density as it extends into the halo, and approximate a mass of metals as they leave the disk and become integrated into the halo. Our proposed experiment will yield the most detailed constraints on the physical state and energetics of gas in a large-scale galactic wind to date. Such constraints are fundamental to understanding the impact of feedback processes on galaxies and in fueling the buildup of their gaseous environments.

Importance of Facts ???

Facts

Problem

Goal – key component and target

Strategy

Importance of Solution - products

Broader Impact

Paper Version

The Astrophysical Journal, Volume 882, Issue 2

September 2019

10.3847/1538-4357/ab3414

arXiv:1907.09459

Galactic Gas Flows from Halo to Disk: Tomography and Kinematics at the Milky Way's Disk-Halo Interface

Show affiliations

Bish, Hannah V. ; Werk, Jessica K. ; Prochaska, J. Xavier ; Rubin, Kate H. R. ; Zheng, Yong ; O'Meara, John M. ; Deason, Alis J.

We present a novel absorption-line survey using 54 blue horizontal branch stars in the Milky Way halo as background sources for detecting gas flows at the disk-halo interface. Distance measurements to high-latitude ($b >$ 60°) background stars at 3.1-13.4 kpc, combined with unprecedented spatial sampling and spectral resolution, allow us to examine the 3D spatial distribution and kinematics of gas flows near the disk. We detect absorption signatures of extraplanar Ca II and Na I in Keck HIRES spectra and find that their column densities exhibit no trend with distance to the background sources, indicating that these clouds lie within 3.1 kpc of the disk. We calculate covering fractions of $f_{\mathrm{Ca\,II}} = 63\%$, $f_{\mathrm{Na\,I}} = 26\%$, and $f_{\mathrm{H\,I}} = 52\%$, consistent with a picture of the circumgalactic medium (CGM) that includes multiphase clouds containing small clumps of cool gas within hotter, more diffuse gas. Our measurements constrain the scale of any substructure within these cool clouds to <0.5 kpc. Ca II and Na I absorption features exhibit an intermediate-velocity (IV) component inflowing at velocities of -75 km s^{-1} $< v <$ -25 km s^{-1} relative to the local standard of rest, consistent with previously studied H I structures in this region. We report the new detection of an inflow velocity gradient $\Delta v_z \sim$ 6-9 km s^{-1} kpc^{-1} across the Galactic plane. These findings place constraints on the physical and kinematic properties of CGM gas flows through the disk-halo interface and support a galactic fountain model in which cold gas rains back onto the disk.

Goal – key component and target
We propose → We present

Strategy/Methods

Findings/Results

Broader Impact/Importance – this tells the reader how the paper should be cited.

What's the difference?

Setting the stage in a paper abstract

A Galactic Transformation—Understanding the SMC's Structural and Kinematic Disequilibrium

HIMANSH RATHORE,[1] GURTINA BESLA,[1] ROELAND P. VAN DER MAREL,[2,3] AND NITYA KALLIVAYALIL[4]

Facts/Context

Problem

Goal – key component and target
We propose →
We show

Strategy/Methods

Findings/Results

Broader Impact

The SMC is in disequilibrium. Gas line-of-sight (LoS) velocity maps show a gradient of 60 – 100 km s^{-1}, generally interpreted as a rotating gas disk consistent with the Tully-Fisher relation. Yet, the stars don't show rotation. Despite a small on-sky extent ($\sim$ 4 kpc), the SMC exhibits a large ($\sim$ 10 kpc) LoS depth, and the stellar photometric center is offset from the HI kinematic center by $\sim$1 kpc. With N-body hydrodynamical simulations, we show that a recent ($\sim$100 Myr ago) SMC-LMC collision (impact parameter $\sim$ 2 kpc) explains the observed SMC's internal structure and kinematics. The simulated SMC is initialized with rotating stellar and gaseous disks. Post-collision, the SMC's tidal tail accounts for the large LoS depth. The SMC's stellar kinematics become dispersion dominated ($v/\sigma \approx 0.2$), with radially outward motions at $R > 2$ kpc, and a small (< 10 km s^{-1}) remnant rotation at $R < 2$ kpc, consistent with observations. Post-collision gas kinematics are also dominated by radially outward motions, without remnant rotation. Hence, the observed SMC's gas LoS velocity gradient is due to radial motions as opposed to disk rotation. Ram pressure from the LMC's gas disk during the collision imparts $\approx$ 30 km s^{-1} kick to the SMC's gas, sufficient to destroy gas rotation and offset the SMC's stellar and gas centers. Our work highlights the critical role of group processing through galaxy collisions in driving dIrr to dE/dSph transformation, including the removal of gas. Consequently, frameworks that treat the SMC as a galaxy in transformation are required to effectively use its observational data to constrain interstellar medium and dark matter physics.

Providing facts/context to understand the need for the study / worthiness of publication --> Argument for a referee!
Set the stage and start by telling the ready WHY you did the study rather than starting with what you did

So what is the difference between a paper abstract and a proposal?

- Knowledge gaps
- 2 different arguments – different audiences
- Material itself is different (one is solved problem, other is a proposed solution)

Proposal vs Papers

- Both are about the “Story”
- Both Require awareness & management of “readers expectations”
- DIFFERENCE: tone, goal, structure

Paper

1) the reader is already sold. They read the abstract and chose to keep going

2) The reader would like to be convinced of your results

Proposals

1) the reader has no choice but to read it. They are probably sick of reading by the time they get to yours

2) The reader is looking for reasons not to be swayed.

Paper Writing vs Proposal Writing : How to start

- For **proposals**, start with the **ABSTRACT** – you need to be concise with your language and the abstract is the outline for the entire proposal.
- For **Papers**, start with the **FIGURES** – these are the results and once you have a story board/ordering of your figures, you can determine the narrative. Figure captions with punchlines will help you determine the abstract and conclusions. (more later).