

## LSST:UK Newsletter 5 (October 2020)

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### Introduction

The impact of Covid-19 continues to be felt in Rubin construction as in all other areas of life, but a recent Rubin news item describes progress since a very welcome, if limited, restart to construction activities at the end of September. Initially, this saw only about 15% as many people on the summit as was typical just prior to lockdown, but the intention is to increase that fraction over time, with initial priorities including work on catering and IT facilities to support that increasing summit activity. It is hoped that the dome contractors will return (from Italy) soon, with the Spanish contractors responsible for the Telescope Mount Assembly expected back on site in 2021. Continuing uncertainty over the likely duration of Covid-19 restrictions means that the Observatory has not released an updated Project Schedule, but the current expectation is that the survey will start in October 2023, a year later than originally planned.

Those with ideas for future newsletter items should contact the LSST:UK Project Managers (@ George Beckett and @ Terry Sloan : lusc\_pm@mlist.is.ed.ac.uk), while everyone is encouraged to subscribe to the Rubin Observatory Digest for more general news from the US observatory team.

@ Bob Mann

### 2021 Affiliate PI and Junior Associate selection round (October 14 - November 9)

The 2021 LSST:UK Affiliate PI and Junior Associate selection round is open and closes at **16.00 GMT on Monday, November 9th 2020**. For those of you who are relatively new to LSST:UK, this is your chance to secure LSST data rights, allowing you to participate in the International Science Collaborations and to have greater input into shaping the strategy for Rubin Observatory operations.

Existing data-rights holders whose term is coming to an end, either this year or next, should have received a reminder about the call. However, even if you have not, it is worth checking your status – for example, by consulting the current list – to ensure you do not miss out.

Further details and application forms are available here.

*Note: This selection round is unaffected by the changes to the LSST operations funding model. The UK Memorandum of Agreement with the LSST Corporation will remain in effect until at least June 2021. So, for example, Affiliate PI or Junior Associate status will continue to be required for membership of a Science Collaboration until that time (or until the MoA is superseded by a new agreement). LSST:UK will continue to run regular selection rounds to keep our AP and JA lists updated until a new arrangement takes effect.*

@ George Beckett

### The low-surface-brightness Universe: unlocking LSST's extragalactic discovery space

The low-surface-brightness (LSB) Universe, defined as the domain that is undetectable in past wide-area surveys, represents the entirety of the extra-galactic discovery space in LSST's deep-wide images. LSB galaxies (which include all dwarf galaxies at cosmological distances and massive diffuse disks) dominate the galaxy number density. In addition, LSB structures such as intra-cluster light and merger-induced tidal features, offer strong constraints on our theoretical paradigm, particularly the build up of stellar mass with cosmic time. However, while LSST's unique combination of area and depth is capable of opening up the LSB Universe, its ability to do so depends on the preservation of LSB flux by the data processing pipeline. Developing precise sky subtraction algorithms that preserve LSB flux is key to the delivery of LSST's extragalactic discovery space and is the purpose of this project (WP 3.7).

To date, we have developed metrics to quantify the data management (DM) pipeline's impact on LSB flux: specifically, the over-subtraction of astrophysical LSB objects in terms of both their total magnitudes and radial surface brightness profiles. Using flat model injections, we have established a baseline for this impact and demonstrated a serious short-coming in the DM pipeline: over-subtraction occurs consistently for objects with surface brightnesses fainter than 26 magnitudes/arcsec<sup>2</sup> in all wavebands, far short of LSST's theoretical ability to reach limits of 30--31 magnitudes/arcsec<sup>2</sup>. This compromises vast swathes of extra-galactic science and prevents LSST from achieving its full discovery space. The results were presented at the Rubin Project and Community Workshop in August 2020.

Our flat models have only provided a baseline, however, hence more testing is needed to uncover the specific nature of the problem. In the future, we will do this by injecting more realistic galaxies, spanning a wider range of profile shapes (including very extended objects such as

intra-cluster light), as well as stamps from cosmological simulations containing LSB tidal features. Using these models to measure our metrics will enable us to explore specific aspects of the DM pipeline that might be revised to preserve LSB flux. Once known, we can then develop sky-subtraction algorithms that preserve LSB flux down to LSST's theoretical surface brightness limits. Given the conflicting needs of the extra-galactic and weak-lensing communities, however, this could require a bifurcation of the pipeline, which we will work towards delivering over the duration of this project.

@ aaron.watkins

@ Sugata Kaviraj

## The First Rubin Operations Bootcamp

The Observatory held its first Operations Bootcamp on 13-15 October 2020. As the name suggests, this was primarily aimed at staff starting work in the Rubin operations team - most of whom are starting to transition from the Construction project, as that draws to a close - but an invitation to participate was extended to some collaborators in the UK and France, and the materials from the Bootcamp are now available on a public wiki page. The topics covered over the three days ranged widely, as did the level of detail, but several are likely to be of interest to many readers of this newsletter, as they providing high-level updates. In particular, I recommend *Part 1* of Day 1, which presents an overview of the project structure in operations and the *Moving towards operations* session that took up most of Day 3; the latter contains an update on Commissioning plans (although still not a revised schedule, as the "rebaselining" of the final stages of the construction project schedule due Covid delays is still being discussed with the US agencies), plus a discussion of possibilities for Early Science (i.e. that which can appear before Data Release 1) and of plans for the work of the Community Engagement Team.

Of particular interest in the Community Engagement Team (CET) section is the discussion of planning for Data Preview 0 (DP0). DP0 will be the first opportunity for some test users to access LSST-like data (TBC, but probably Hyper Suprime-Cam PDR2 and DESC DR2 simulations) through the Rubin Science Platform, which will be the system through which access to data releases will be provided. The CET is planning to have ~300 test users - to be called *DP0 Delegates* - who will have that access in return for some sort of contribution of benefit to the Observatory. This is still being discussed, but it could involve reporting back on running some test science case, or completing a feedback service, or helping to disseminate information about the Rubin Science Platform by running some satellite training event.

I am sure that a number of LSST:UK Consortium members would be interested in being DP0 Delegates, and we will keep you posted as we hear more about how this will work.

@ Bob Mann

## Merlin Fisher-Levine

*Merlin Fisher-Levine is a long-serving member of the LSST team, now returned to his native UK. We invited him to introduce himself and say a little about what he does.*

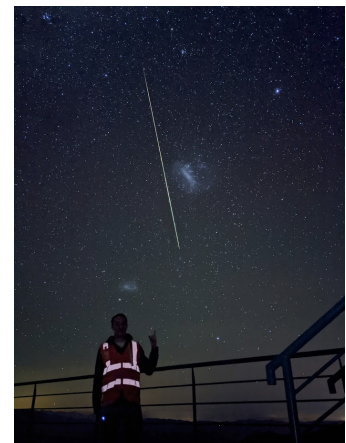
Hello LSST:UK! My name's Merlin, and here's a little bit about me:

Once upon a time, I did a PhD in particle physics hardware R&D in Bristol, then took a postdoc at Brookhaven National Laboratory on Long Island, NY (one of the two main US Dept. of Energy national labs involved in making LSST's camera), where I split my time between doing weird things to CERN chips to make them into time-of-flight pixel imaging mass spectrometers (</random backstory>), and learning about and characterising the LSST CCDs.

I then moved to Princeton, working with the (in)famous Robert Lupton as part of the LSST Data Release Production (DRP) team, where I stayed physically for 2 years, after which I moved back to London (my home town) where I'm now located permanently, with my current role as a staff scientist working directly for LSST/AURA, though still very much functionally a part of the DRP team in spirit.

The move to being a core LSST staff member has seen me get my finger in an increasingly large number of pies. Those pies include, but are not limited to:

- Being a part of the DRP team, the Commissioning Team, and now the early Operations Team too
- Trying to sort out/improve instrument signature removal (ISR) in LSST processing
- Calibration product production (the steps before ISR where we calculate the necessary data products in order to apply ISR so that it actually works)
- General photometric considerations for the survey, which in turn include:
- Improvements to flat fielding using the Collimated Beam Projector (CBP), aka. Giles the hedgehog
- Precision calibration of the 8.4m with respect to quantum efficiency, filter/pupil transmission etc also using the CBP



I was on the summit in Cerro Pachón in March this year for the AuxTel commissioning, making it back to the UK with about 2 days to spare before I would have had to spend the entire lockdown in Chile. Here is a pic I took on my phone (the Pixel 4's astrophotography mode is really incredible!) of me out of the back of the summit facility, trying to

- Using the CBP for precision crosstalk measurements and ghosting corrections (maybe?)
- Development of the Auxiliary Telescope spectroscopic reduction pipeline
- Commissioning the Auxiliary Telescope itself

Very much looking forward to working with you all and getting more involved in the LSST:UK community - if any of the above makes you think I might be able to help you with anything, please don't hesitate to get in touch ([merlin.fisherlevine@gmail.com](mailto:merlin.fisherlevine@gmail.com))!

point at the LMC and instead pointing more at a massive satellite streak. Was it a Starlink satellite? Exact location and time of the photograph are available on request to anyone who wants to try to work out which it was :)

@ Merlin Fisher-Levine

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## Survey cadence optimization workshop (8 & 9 December 2020)

A "save the date" note has been posted on [community.lsst.org](http://community.lsst.org) site to announce the first joint workshop between the Science Collaborations and the Survey Cadence Optimisation Committee, which, as explained in Stephen Smartt's item in the July Newsletter, is the body charged with advising the Rubin Observatory Operations Director on survey cadence. This committee will remain in existence until the end of survey operations, but its first task is to settle on an initial survey cadence that will strike an appropriate balance between the cadence requirements of different science areas.

Cadence optimization has been a hot topic within the Rubin community for a number of years, of course, with recent summaries presented in a session at the 2020 Project and Community Workshop and a more recent strategy report from Project members who have developed the survey simulations and analysis tools that support assessment by the community of the various cadence options. That assessment will proceed via production by the Science Collaborations of a set of *Cadence Notes*, each of which will summarise the implications for science within the domain of each Science Collaboration of the various survey strategies modelled in the most recent set of survey simulations.

This workshop is intended to discuss the expected content of these Cadence Notes, which are due in March 2021, but will also provide the community with a more general update on the survey cadence optimization process. It is described as being "*designed for stakeholders with a keen interest in helping design and analyze survey strategy options for the LSST, and it is open to the entire LSST user community*", with early career researchers particularly encouraged to attend. Further details will, no doubt, be circulated via the Community site in the coming weeks.

@ Bob Mann

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