# LSST:UK Newsletter 3 (August 2020)

- Introduction
- 2020 Rubin Observatory Project and Community Workshop
- The impact of satellite constellations on the Legacy Survey of Space and Time
- Lasair
- Results of JA round
- Recent LSST:UK outputs

#### Introduction



With the summit still closed due to Covid restrictions, and, hence, construction still paused, the undoubted highlight of the past month within the Rubin community was the Project and Community Workshop (PCW), which attracted over 700 online participants; as detailed below, material is now available from the workshop sessions, including videos, as well as slide sets. A revised project schedule for the final stages of construction and for pre-operations remains to be announced, but it seems clear that Covid is likely to introduce a delay of something approaching a year to the start of survey operations.

One of the hot topics at the PCW was the potential impact on Rubin science of the constellations of low-Earth orbit (LEO) satellites due to be launched over the next few years by companies like SpaceX and OneWeb. This follows a workshop - SATCON1, the first in an intended series - at the end of June, organised by the AAS and NSF's NOIRLab and bringing together astronomers and technical staff from the space industry to discuss how to quantify and mitigate the likely impact on ground-based optical and near-infrared astronomy. We present a brief summary below, along with links to the workshop report and presentation materials, which will be of interest to everyone reading this Newsletter.

Despite the delay to the construction schedule, work towards agreement of the international contributions to operations continues apace. With support from STFC/UKRI, LSST:UK is seeking a more substantial involvement in the *Legacy Survey of Space and Time* than was originally envisaged. Our *Letter of Intent* was well received, and many people are now working on expanding that into a full proposal by the submission deadline of September 25th. Approval for its contents will be sought from the LSST:UK Consortium Board, which acts as a proxy for the UK community in such matters. The proposal will be reviewed in the US in the autumn, with further iteration on its detailed content to follow in the New Year, with new data rights agreements due to be signed by 31 May 2021.

LSST:UK members are also currently preparing a second Rubin proposal, to host a Community Broker, which would guarantee access to one of the full alert streams to be produced by the near-real-time difference imaging pipeline. The UK's prototype broker, Lasair, has been ingesting, and supporting analysis of, alerts from a Rubin precursor, the Zwicky Transient Facility (ZTF) for more than two years, and, in an item below, @ Andy Lawrence summarises some of the capabilities of Lasair and lessons learnt from running it on the ZTF alert stream.

Those with ideas for future newsletter items should contact the LSST:UK Project Managers ( @ George Beckett and @ Terry Sloan : lusc\_p m@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.



## 2020 Rubin Observatory Project and Community Workshop

The 2020 Project and Community Workshop (PCW) took place online on August 10-14, with approximately four hours of presentations per day, divided into three main sessions. The table below presents the workshop schedule, with links to relevant page on the PCW website, from which presentation materials - including YouTube recordings of the sessions - can be accessed.

Monday		Tuesday		Wednesday		Thursday		Friday	
Director's open Plenary 1: Construction QA		Plenary 2: Operations QA		Plenary 3: Science Collaborations Report		Plenary 4: Science Keynote: "From disruption, opportunity: the current and future impact of AI on astronomy" (Dr. Brian Nord)		Diversity, Equity, and Inclusion	
Intro to Rubin: Systems & Jargon	Algorithms Workshop Follow-up	Rubin Research Bytes (contributed flash talks)		Evaluating Survey Strategies	In-kind proposal workshop (repeat)	Community Alert Brokers	LSSTC - Fundraising	Stack Club: New Science Platform Tutorials	LSSTC - DEI in New Programs
Community Support for Science	External Synergies for Rubin Science	Commiss . & Validation	In-kind proposal workshop	Community Preparation for Early Science		Low Surface Brightness Science	EPO Interacting with Data in the Browser	Breakout Summaries	

There is a lot of interesting material there, but, obviously, the plenary sessions are a good place to start.

The Rubin staff and Science Collaboration leaders put a lot of thought into how to make a large conference work online. Through the provision of pre-recorded videos and other preparatory materials to study before the sessions, and with dedicated staff carefully monitoring session-specific Slack channels as well as the Zoom chat window, it proved possible to circumvent some of the limitations of the medium, and to get some level of interaction amongst the globally-distributed online participants, although, of course, there is no real online substitute for the chat in the coffee break or in the bar after dinner.

@ Bob Mann

#### The impact of satellite constellations on the Legacy Survey of Space and Time

Few astronomers can have missed images like that shown on the right of SpaceX Starlink satellites crossing the field of view of the Blanco telescope at CTIO soon after launch last November. Quantitative assessment of the impact of LEO satellite constellations has begun in earnest, with a particular focus on the Rubin Observatory, since the high etendue that make the Simonyi Survey Telescope so powerful for survey astronomy also makes it particularly vulnerable to the effects of LEO constellations, since, crudely, it covers too much of the sky too quickly to make it possible just to dodge the satellites.

First results from these studies were presented at the end of June at a workshop - SATCON1 - organised by the AAS and NSF's NOIRLab. A report from that workshop has now been published, along with technical appendices, while the workshop website also has copies of the presentations made by members of four working groups, covering observations, simulations, mitigations and metrics. More sophisticated simulations will be needed for detailed assessment of the impact on particular LSST science cases, but it is clear that constellations of LEO satellites will affect astronomy significantly - this initiative focuses on optical/NIR, but there are analogous issues in the radio - requiring coordinated action between the astronomical community and the satellite operators. There is a hierarchy of effects, some of which can be mitigated relatively easily, some of which are harder, and some, especially those relating to twilight observations, seem set to remain, whatever is done. SATCON1 is a good start, but this is, clearly, a topic that will require significant attention from the community in the coming years.



Starlink satellites imaged on 18 Nov 2019 from the Victor M. Blanco 4m Telescope at CTIO. Image Credit: CTIO/NOIRLab/NSF /AURA/DELVE

#### Lasair

Lasair-ZTF is now a mature working service, and development of Lasair-LSST is well underway! In this item we will take a quick look at what you can do now, and where we are headed. We have already benefited from considerable user input, but more is always welcome.

The Rubin Observatory is expected to produce (on average) 10 million alerts every night. Getting these to users is a real challenge; the project approach is to feed the stream to third party services known as community brokers. A review process is underway to select a small number of these; the LSST:UK offering is the Lasair broker, being developed by a team in Belfast and Edinburgh. Lasair means "flame" or "flash" in both Irish and Scots Gaelic, which seems appropriate for this Celtic Collaboration. We showcased our efforts so far at a dedicated brokers session at the recent Rubin Observatory "Project and Community Workshop", recently held on line (see the item by Bob Mann in this newsletter).

To prototype Lasair, we built a system to process nightly alerts from the Zwicky Transient Facility (ZTF). However, this has gone well beyond a simple technical prototype - it is a working service being used by astronomers across the world to do science. In April we released Lasair 2.0 (see https://lasair.roe.ac.uk). This is now considered a mature and stable service, which will keep working while in the background we develop and test the next-generation Lasair, for the alerts which will come from the Legacy Survey for Space and Time (LSST) conducted at the Rubin Observatory. For short, we generally refer to the current working service as Lasair-ZTF, and the next generation version as Lasair-LSST.

As the ZTF-alerts stream into Lasair, we add multi-wavelength context, IDs, classification and other added value using our Sherlock software. You can query the accumulating database in various different ways, or produce a filtered stream which is sent on to you. You can also make a "watchlist" of your favourite objects and get alerted when one of them flares up. As well as the web interface, we have a Jupyter interface, which means you can write Python scripts to do all sorts of cunning things. Thanks to the UK IRIS service, there is some pretty high-powered computing facility behind all this. To learn more about what you can do, go the Lasair website (https://lasair.roe.ac.uk), or take a look at the Lasair cookbook (https://lsst-uk.atlassian.net/wiki/spaces/DOC/pages/881360908/Lasair+Cookbook). )

Meanwhile, we have been developing and testing a new and improved version for Rubin/LSST. For Cycles 1 and 2 of our planning process we have been concentrating on technical questions - system architecture, backend database technology, direct Kafka stream handling, and so on. All this was based on the detailed Phase B science requirements. However, as we move into Cycles 3 and 4, our focus will increasingly be on improving the functionality and the user experience. We kicked off this process in June with a kind of focus-group with the core of interested consortium scientists, which was extremely successful and informative. We are also having direct conversations with key projects

and collaborations, such as the Zooniverse people, and the TiDES project. However, we are also happy (and indeed keen!) to hear the desires, experiences, and suggestions of any interested users. One of the things we are reviewing right now is how to construct a good helpdesk system - but for now, send your suggestions to lasair-help@lists.roe.ac.uk.

We have a feeling that this process will be about users evolving as well as the project learning - as people get used to the idea of working with streams, as opposed to querying static databases, new ideas will emerge. So we are especially interested in hearing your thoughts on that issue.

② Andy Lawrence

## Results of JA round

At the end of June, LSST:UK issued a call for applications from potential new Junior Associates. Following a review by the LSST:UK Selection Committee, chaired by Nial Tanvir (Leicester), we are pleased to confirm that 22 new Junior Associates have been approved, plus four existing Junior Associates had their term extended (indicated by \*), as follows:

Qasim Afghan (UCL)	Steven Gough-Kelly (Central Lancashire)		
Alba Vega Alonso Tetilla (Southampton)	Noushin Karim (Surrey)		
Marika Asgari (Edinburgh)	Hin Leung (St. Andrews)		
Oliver Bartlett (Hull)	Matt Ratcliffe (Newcastle)		
Matteo Biancoi * (Birmingham)	Agata Roek (Edinburgh)		
Asa Bluck (Cambridge)	Jaime Ruiz Zapatero (Oxford)		
Umar Burhanudin (Sheffield)	Shubham Srivastav (QUB)		
Matteo Cataneo (Edinburgh)	Paula Stella Teixeira (St. Andrews)		
Cressida Cleland (Birmingham)	Edward Upsdell (sussex)		
Azadeh Fattahi (Durham)	Roy Williams * (Edinburgh)		
Hao Fu * (Southampton)	Tom Wilson (Exeter)		
Carlos Garcia (Oxford)	Bill Wright (QMU)		
Benjamin Giblin * (Edinburgh)	Yirui Zheng (St Andrews)		

The next call, which will be for both Affiliate PIs and Junior Associates will open in October 2020, for appointments from 1st January 2021. The call will be advertised on Confluence (on the https://lsst-uk.atlassian.net/wiki/spaces/HOME) plus advised to the LUSC Announce mailing list (see LSST:UK Announcements Email List for information on how to subscribe).

@ George Beckett

### Recent LSST:UK outputs

LSST:UK has recently produced the following technical reports.

Title	Author	Description
D2.5.1 Training resources for LSST:UK DAC users	Bob Mann, Stelios Voutsinas, Roy Williams	This document describes an initial release of documentation for users of current and future services accessed via the UK's LSST Data Access Centre (DAC). This documentation release is necessarily limited in scope given that the UK DAC is still being developed. It comprises existing documentation for the Lasair alert broker and a very preliminary set of documentation for the LSST Science Platform (LSP). The LSP is the set of data services to be provided by the Rubin Observatory to support analysis of LSST data products.

@ Terry Sloan