

TVS ROADMAP MEETING

24-25 March 2016

Argonne National Laboratory

REIMBURSEMENT

Keep receipts, return them to ANL

(Lauren Raino lraino@anl.gov)

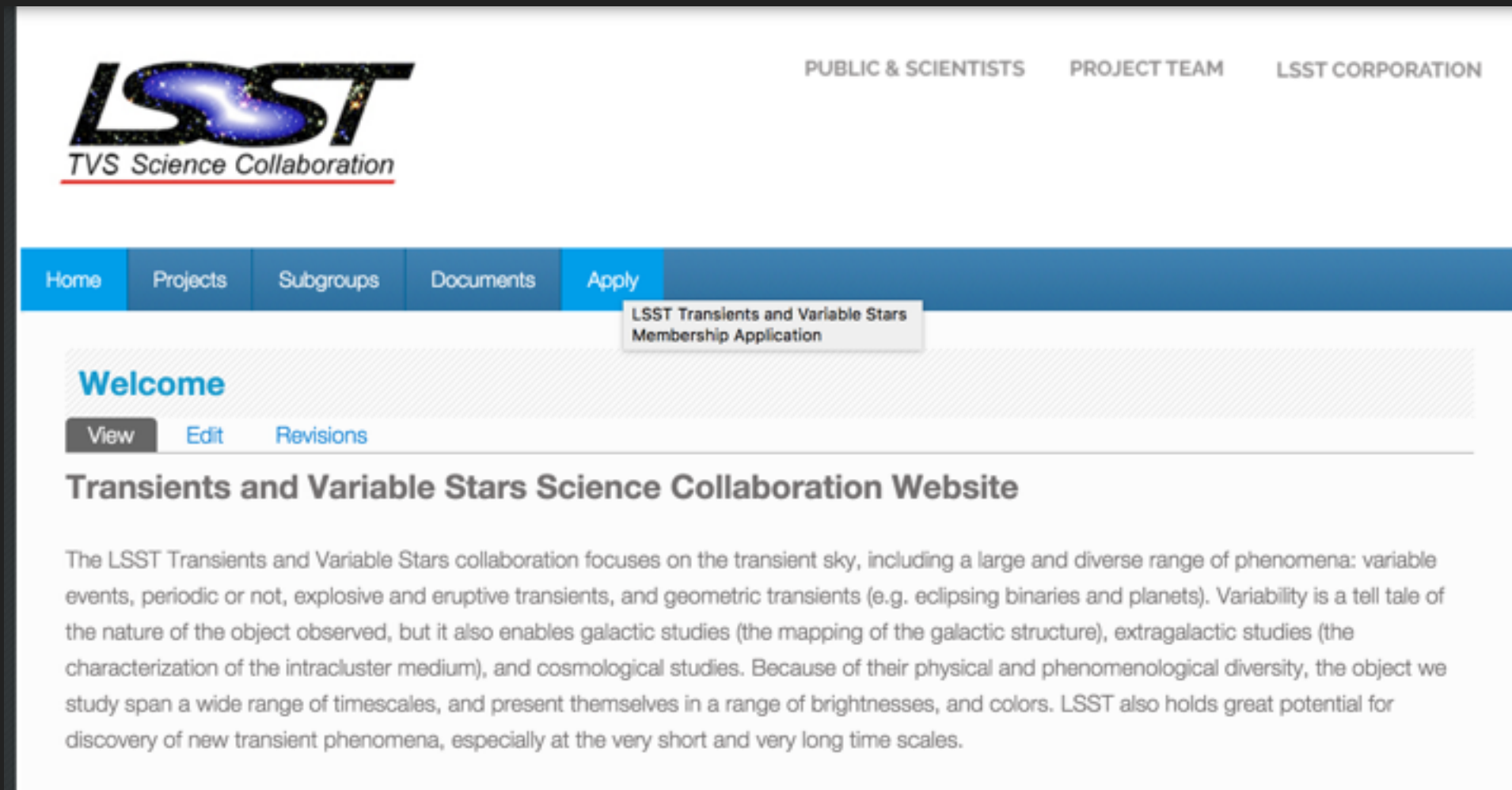
Keep your badge on at all times, remember your ID & Badge
(BOTH!) if you leave ANL

Lunch will be served here, dinner on your own

MAKE SURE

you applied and became a member of the TVS collaboration:

<https://tvs.science.lsst.org/home>



The screenshot shows the homepage of the LSST TVS Science Collaboration website. At the top left is the LSST logo with 'TVS Science Collaboration' underneath. To the right are links for 'PUBLIC & SCIENTISTS', 'PROJECT TEAM', and 'LSST CORPORATION'. Below these is a navigation bar with 'Home', 'Projects', 'Subgroups', 'Documents', and 'Apply'. The 'Apply' link is highlighted, and a tooltip above it reads 'LSST Transients and Variable Stars Membership Application'. Below the navigation bar is a 'Welcome' section with 'View', 'Edit', and 'Revisions' links. The main heading is 'Transients and Variable Stars Science Collaboration Website'. The text below describes the collaboration's focus on the transient sky, including variable events, explosive and eruptive transients, and geometric transients (e.g. eclipsing binaries and planets). It also mentions galactic, extragalactic, and cosmological studies, and the potential for discovering new transient phenomena.

LSST
TVS Science Collaboration

PUBLIC & SCIENTISTS PROJECT TEAM LSST CORPORATION

Home Projects Subgroups Documents Apply

LSST Transients and Variable Stars Membership Application

Welcome

View Edit Revisions

Transients and Variable Stars Science Collaboration Website

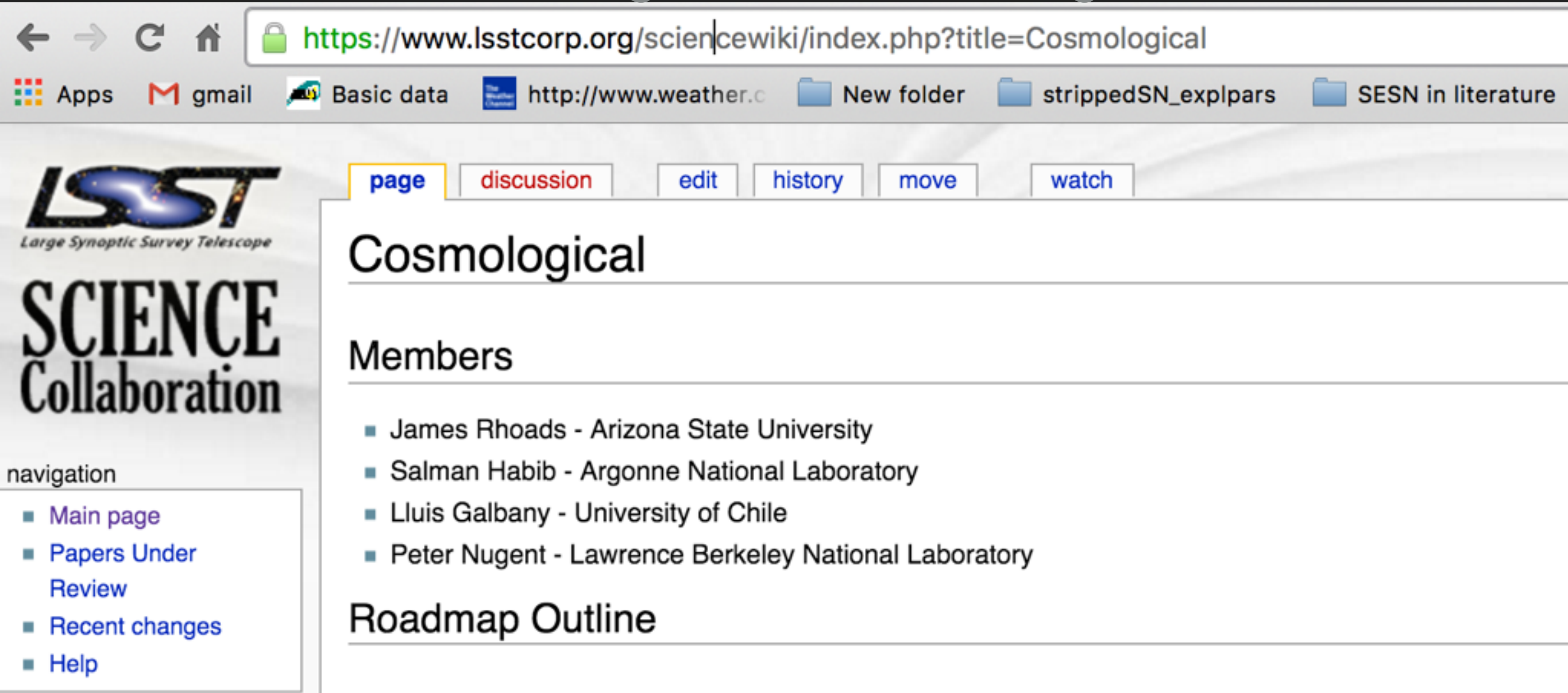
The LSST Transients and Variable Stars collaboration focuses on the transient sky, including a large and diverse range of phenomena: variable events, periodic or not, explosive and eruptive transients, and geometric transients (e.g. eclipsing binaries and planets). Variability is a tell tale of the nature of the object observed, but it also enables galactic studies (the mapping of the galactic structure), extragalactic studies (the characterization of the intracluster medium), and cosmological studies. Because of their physical and phenomenological diversity, the object we study span a wide range of timescales, and present themselves in a range of brightnesses, and colors. LSST also holds great potential for discovery of new transient phenomena, especially at the very short and very long time scales.

MAKE SURE

you obtained access to the TVS wiki

<https://www.lsstcorp.org/sciencewiki/>

(contact Iain Goodnow igoodenow@lsst.org)



The screenshot shows a web browser window displaying the LSST Science Collaboration wiki page for 'Cosmological'. The browser's address bar shows the URL <https://www.lsstcorp.org/sciencewiki/index.php?title=Cosmological>. The browser's toolbar includes icons for Apps, gmail, Basic data, and several folders: http://www.weather.c, New folder, strippedSN_explpars, and SESN in literature. The LSST logo is visible on the left, with the text 'Large Synoptic Survey Telescope' and 'SCIENCE Collaboration'. The page title is 'Cosmological'. Below the title, there are tabs for 'page', 'discussion', 'edit', 'history', 'move', and 'watch'. The 'Members' section lists four members: James Rhoads - Arizona State University, Salman Habib - Argonne National Laboratory, Lluís Galbany - University of Chile, and Peter Nugent - Lawrence Berkeley National Laboratory. The 'Roadmap Outline' section is also visible.

← → ↻ 🏠 <https://www.lsstcorp.org/sciencewiki/index.php?title=Cosmological>

Apps gmail Basic data <http://www.weather.c> New folder strippedSN_explpars SESN in literature

LSST
Large Synoptic Survey Telescope

SCIENCE
Collaboration

navigation

- [Main page](#)
- [Papers Under Review](#)
- [Recent changes](#)
- [Help](#)

Cosmological

[page](#) [discussion](#) [edit](#) [history](#) [move](#) [watch](#)

Members

- James Rhoads - Arizona State University
- Salman Habib - Argonne National Laboratory
- Lluís Galbany - University of Chile
- Peter Nugent - Lawrence Berkeley National Laboratory

Roadmap Outline

TIME TABLE

thursday

9:00-
9:30

Announcements (this talk)

9:30-
12:30

Subgroup Status
presentations

13:30-
15:00

Synergy discussion: envision
interaction between subgroups

15:00-
16:00

MAF presentation (Lynne)

16:15-
17:00

First writing session: draft the
wiki document

TIME TABLE

friday

9:00-
9:30

Cadences description (Lynne)

9:30

working session within/across
subgroups

15:00

15:00-

Subgroup Roadmap

16:00

presentations (7 min each)

16:00-

additional writing session

17:00

DESIGN THE ROADMAP FOR EACH SUBGROUP

LSST Science Collaborations

There are currently ten LSST Science Collaborations. Additional information about their work and membership can be found at the links below or by contacting the individual chairs, or the [LSSTC Science Collaborations Coordinator](#) (LSSTCSCC), Lucianne Walkowicz.

Galaxies

[Michael Cooper](#) (UC Irvine); [Brant Robertson](#) (University of California, Santa Cruz);

Stars, Milky Way, and Local Volume

[John Bochanski](#) (Rider University); [John Gizis](#) (University of Delaware); [Nitya Jacob Kallivayalil](#) (University of Virginia);

Solar System

[Lynne Jones](#) (University of Washington); [David Trilling](#) (Northern Arizona University);

Dark Energy

[Rachel Bean](#) (Cornell University); [Jeffrey Newman](#) (University of Pittsburgh);

Active Galactic Nuclei

[Niel Brandt](#) (Pennsylvania State University);

Transients/variable stars

[Federica Bianco](#) (New York University); [Ashish Mahabal](#) (Caltech);

Large-scale structure/baryon oscillations

[Eric Gawiser](#) (Rutgers The State University of New Jersey); [Shirley Ho](#) (Carnegie Mellon University);

Strong Lensing

[Phil Marshall](#) (KIPAC);

Informatics and Statistics

[Tom Lored](#) (Cornell University); [Chad Schafer](#) (Carnegie Mellon University);

DESIGN THE ROADMAP FOR EACH SUBGROUP

[Home](#)[Projects](#)[Subgroups](#)[Documents](#)[Apply](#)[Home](#) » [Subgroups](#)

Subgroups

[View](#)[Edit](#)

- [Cosmological](#)
- [Classification/Characterization](#)
- [Distance Scale](#)
- [Fast Transients](#)
- [Galactic](#)
- [Gravitational Waves](#)
- [Interacting Binaries](#)
- [Magnetically Active Stars](#)
- [Microlensing Subgroup](#)
- [Multiwavelength Characterization/Counterparts](#)
- [Non-degenerate Eruptive Variables](#)
- [Pulsating Variables](#)
- [Supernovae Subgroup](#)
- [Tidal Disruption Events](#)
- [Transiting Planets](#)

https://www.lsstcorp.org/sciencewiki/index.php?title=Transiting_Planets

DESIGN THE ROADMAP FOR EACH SUBGROUP

Identify subgroups science drivers.

What can be accomplished in different phases of LSST: commissioning, 1-, 3-, 10-years?

What goals can be achieved with the regular cadence surveys,

what goals require deep-drilling strategy, ToO, special strategies?

Key requirement for each science goals to be achieved

(e.g. surface brightness limits, cadence regularity, filters...)

What support is needed from the LSST organization, including the TVS Chairs,

to clarify the RoadMap and achieve the goals?

Synergy and Friction between subgroups.

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MEETING GOALS

KEEP IN MIND

WHITE PAPER

http://www.slac.stanford.edu/~digel/ObservingStrategy/whitepaper/LSST_Observing_Strategy_White_Paper.pdf

<https://github.com/LSSTScienceCollaborations/ObservingStrategy>

OIR STUDY

<http://www.noao.edu/meetings/lstt-oir-study/>

KEEP IN MIND

http://www.slac.stanford.edu/~digel/ObservingStrategy/whitepaper/LSST_Observing_Strategy_White_Paper.pdf

**Science-Driven Optimization
of the LSST Observing Strategy**

MEETING GOALS

KEEP IN MIND

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http://www.slac.stanford.edu/~digel/ObservingStrategy/whitepaper/LSST_Observing_Strategy_White_Paper.pdf

<https://github.com/LSSTScienceCollaborations/ObservingStrategy>

<https://github.com/LSSTScienceCollaborations/ObservingStrategy/blob/master/whitepaper/transients.tex>

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KEEP IN MIND

Guidelines for Authors

Phil Marshall

Since this is a community white paper, contributions are welcome from everyone. Read on for how to make a contribution, and how you should structure that contribution.

0.0.1 How to Get Involved

The first thing you should do is read and absorb the current version of the white paper, which you should be able to [view on GitHub](#). (You can also [download the “raw” PDF](#), which is hyper-linked for easier navigation.) You will then be able to provide good feedback, which you should do via the [GitHub issues](#). Browse the existing issues first: there might be a conversation you can join. New issues are most welcome: we’d like to make this white paper as comprehensive as possible.

To edit the white paper, you’ll need to [“fork” its repository](#). You will then be able to edit the paper in your own fork, and when you are ready, submit a [“pull request”](#) explaining what you are doing and the new version that you would like to be accepted. It’s a good idea to submit this pull request sooner rather than later, because associated with it will be a discussion thread that the writing community can use to discuss your ideas with you. For help getting started with `git` and GitHub, please see this [handy guide](#).

MEETING GOALS

KEEP IN MIND

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[https://github.com/LSSTScienceCollaborations/](https://github.com/LSSTScienceCollaborations/ObservingStrategy)
[ObservingStrategy](https://github.com/LSSTScienceCollaborations/ObservingStrategy)

OIR STUDY

<http://www.noao.edu/meetings/lsst-oir-study/>

KEEP IN MIND



Maximizing Science
in the Era of LSST:
A Community-based Study of
Needed US OIR Capabilities

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what goals require deep-drilling strategy, ToO, special strategies?

Key requirement for each science goals to be achieved

(e.g. surface brightness limits, cadence regularity, filters...)

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Synergy and Friction between subgroups.

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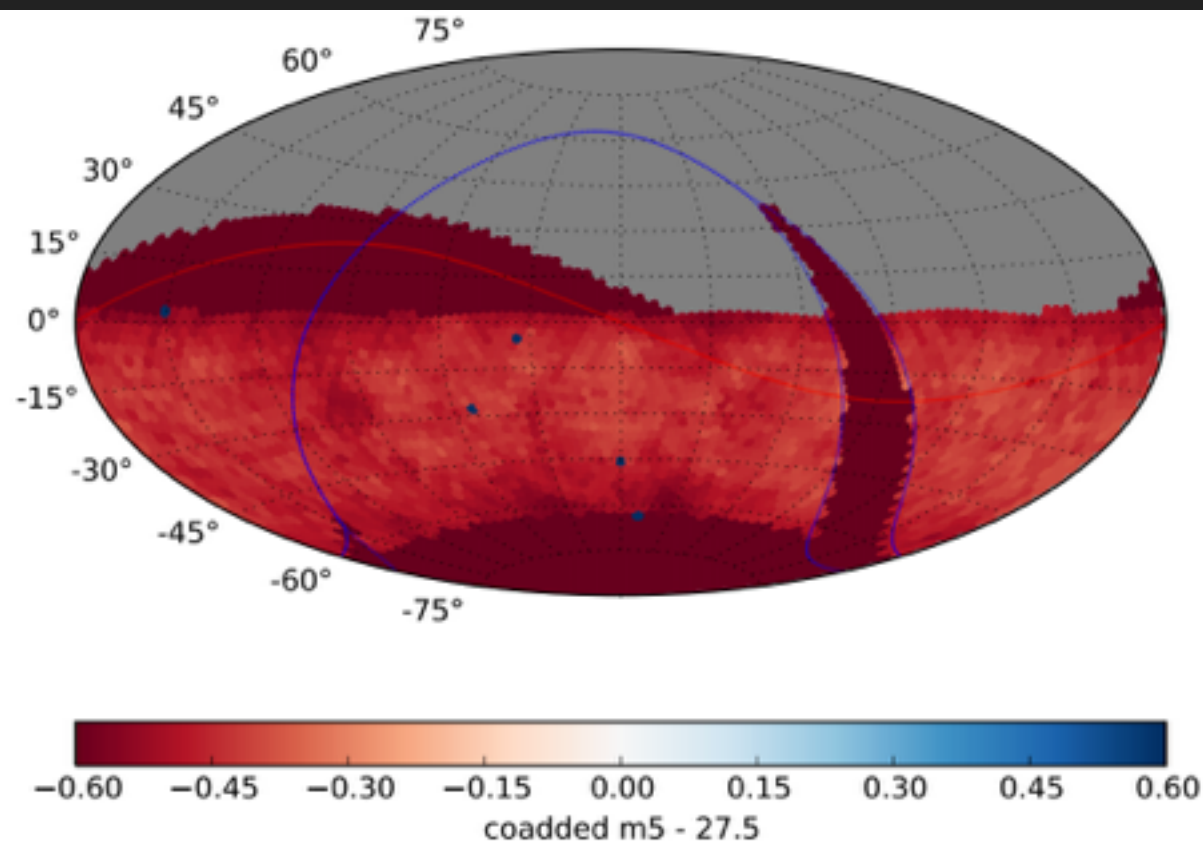
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DESIGN THE ROADMAP FOR EACH SUBGROUP

TRANSIENTS \Leftrightarrow CADENCE

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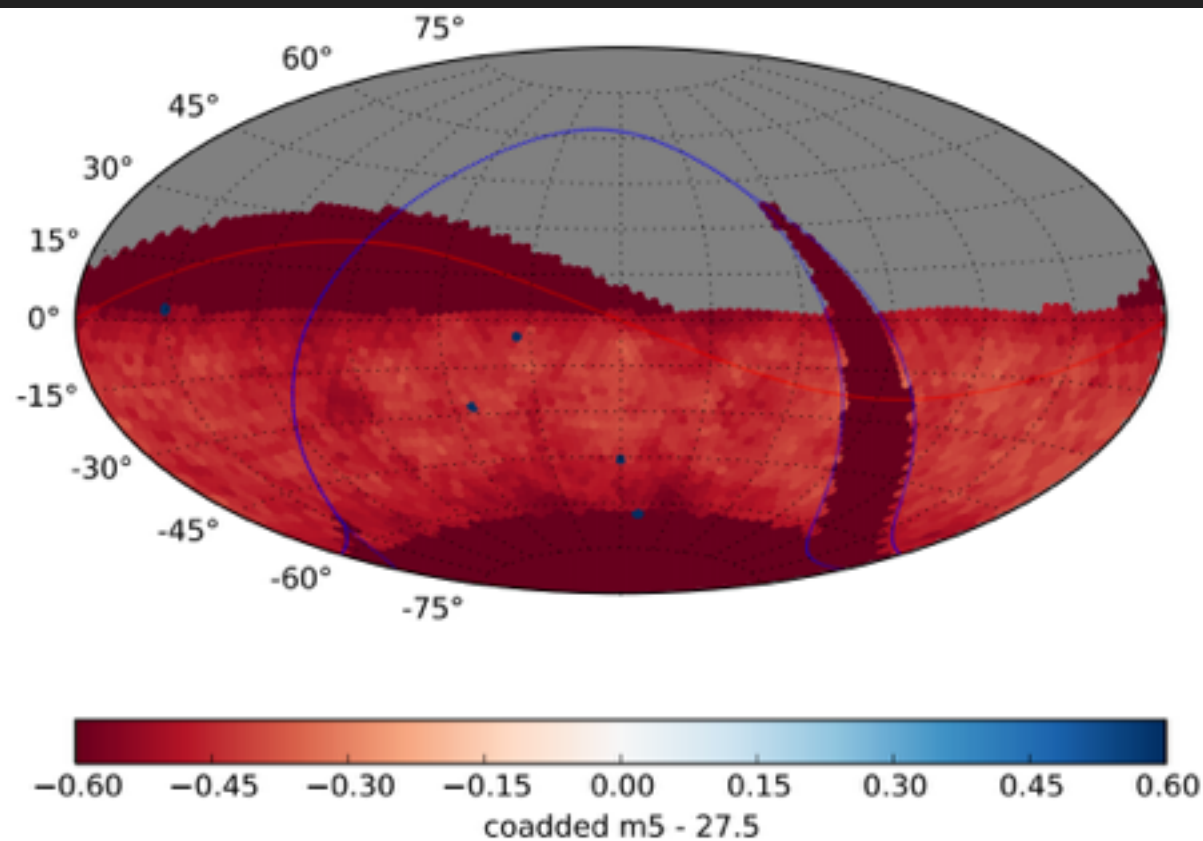
TRANSIENTS \Leftrightarrow CADENCE



LSST simulates Observing Strategies

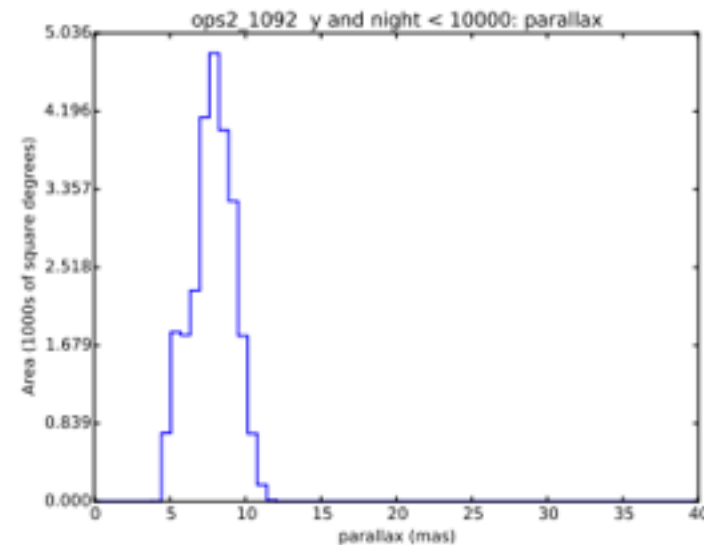
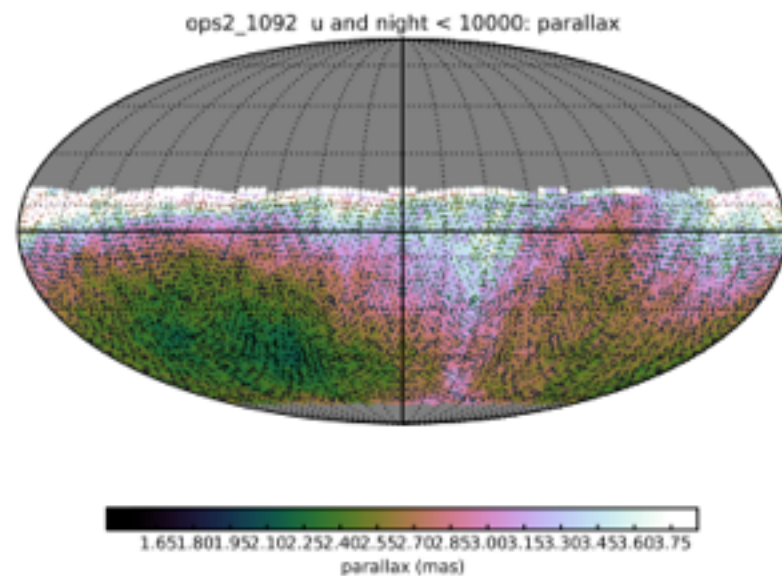
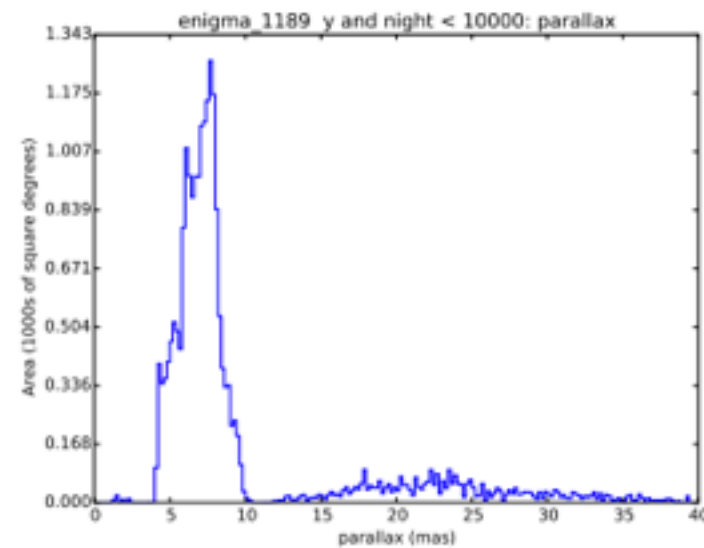
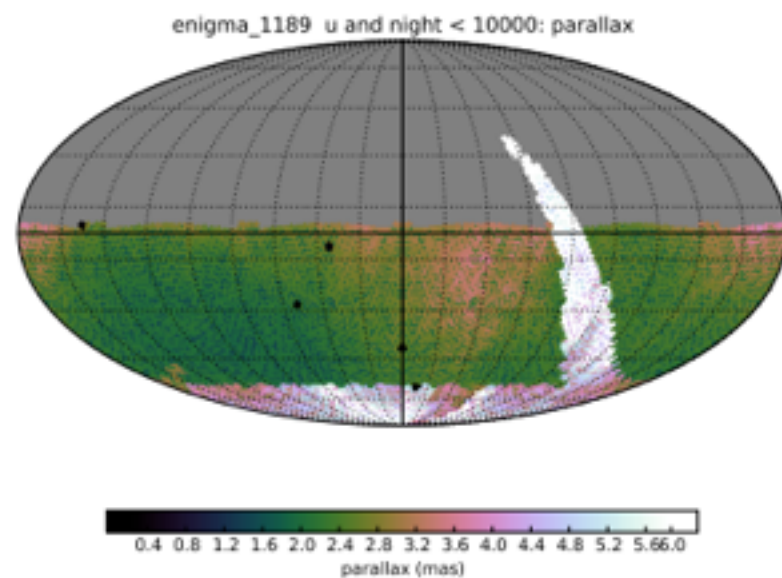
DESIGN THE ROADMAP FOR EACH SUBGROUP

TRANSIENTS \Leftrightarrow CADENCE



We measure how well we can achieve our science goals with that cadence

DESIGN THE ROADMAP FOR EACH SUBGROUP

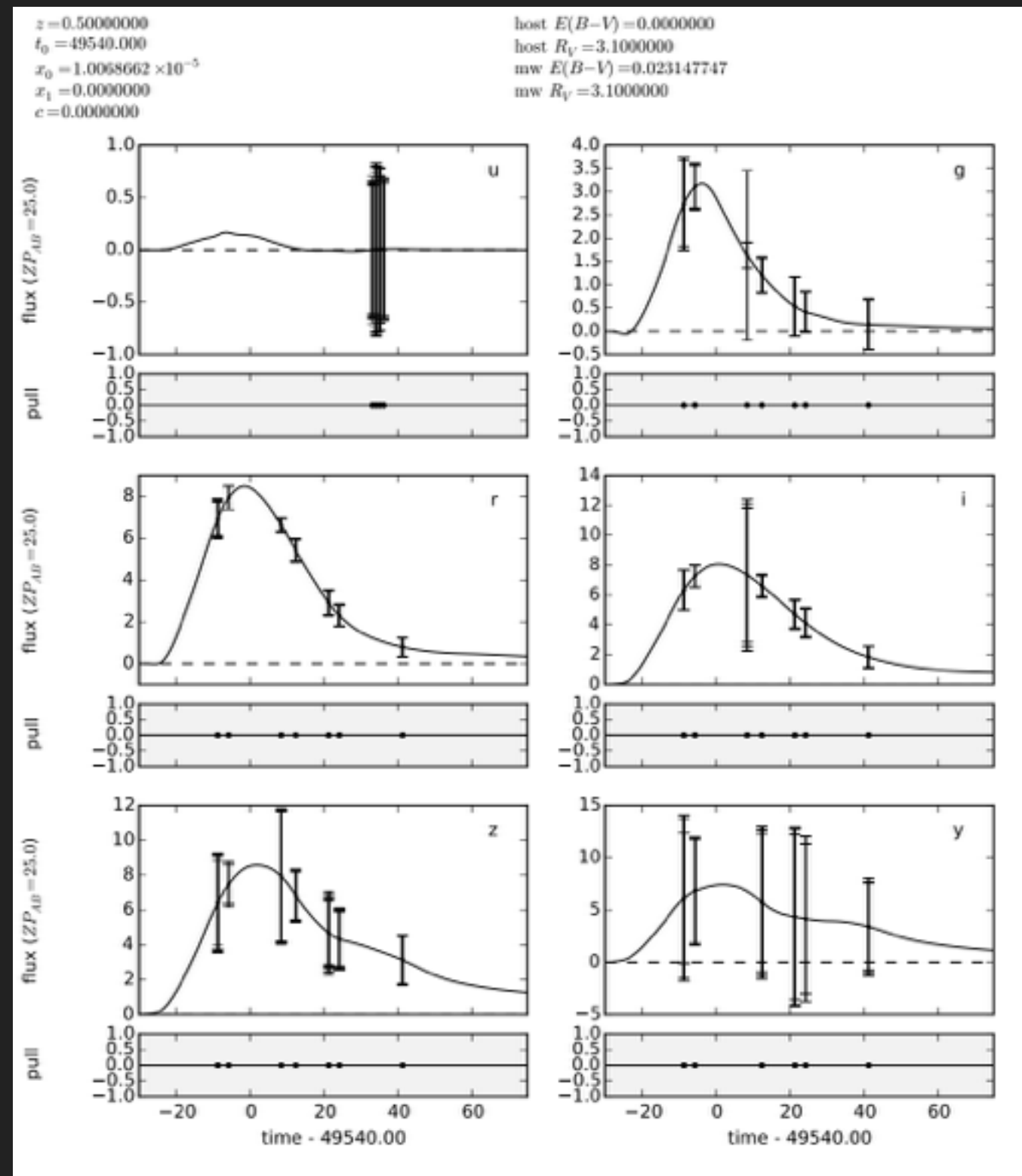


Parallax error for a star at apparent magnitude $m = 21.0$, assessed over the full survey. Crowding errors are ignored. Top and Third row: OpSim run enigma_1189. Second and bottom row: OpSim run ops2 1092 (PanSTARRS-like cadence).

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lightcurve MAF

http://www.slac.stanford.edu/~digel/ObservingStrategy/whitepaper/LSST_Observing_Strategy_White_Paper.pdf SN cosmo chapter



DESIGN THE ROADMAP FOR EACH SUBGROUP

TRANSIENTS \Leftrightarrow CADENCE

LSST measures the merits of a cadence via MAF (Lynne will talk about MAF)

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Even who does not run MAF needs to think of simple metrics to measure cadence:

minimum fraction or number of targets with N measurements in M bands at S SNR within T days

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LSST measures the merits of a cadence via MAF (Lynne will talk about MAF)

In each subgroups at least 1 member should be able to run MAF.

Even who does not run MAF needs to think of simple metrics to measure cadence:

Some cadences weaken a science case, but some can kill a science case! The two cases should be distinguished.

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TRANSIENTS \Leftrightarrow CADENCE

OpSim \Rightarrow MAF \Rightarrow FoM

With this program in mind, it makes sense to define *one “Figure of Merit” (FoM) per science project*, that captures the value of the observing strategy under consideration to that science team. This FoM will probably be a function of several “metrics” that quantify lower-level features of the observing sequence. For Figures of Merit to be directly comparable between disparate science projects, they need to be dimensional, and have the same units. One natural choice could be the information gained by the science team, in bits. This is a well-defined statistical quantity, albeit not yet one in common use. A given observing schedule’s value would then depend on both this information gain, but also *how much that information is worth to the whole community*. It is at this point that the debate could become heated: probably the best we can do in Cadence Diplomacy is to quantify all the information gains implied by each proposed change to the baseline observing strategy, combine them to see whether it makes everyone happy, and iterate. In this way we might hope to minimize the debates about the less quantifiable worth of each piece of information.

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TRANSIENTS \Leftrightarrow CADENCE

THEN you earn the right to suggest new
OpSim experiments

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TOGETHER WE ARE STRONG!

Some phenomenologies are similar, although the science goals differ.

Some transient science can inform other science collaboration (obvious connection: TVS SN and DE SN)

If more of us advocate for similar cadences we have a stronger case.

Where there is friction, do consider how much your science case suffers compared to how much other science cases gain.

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THANK YOU TO OUR ORGANIZERS AND GRACIOUS HOSTS!

The Chairs that planned this meeting: Ashish and Lucianne

Lauren Raino, Salman Habib, ANL!

LSST for the support for the meeting.