

PHOTON

RANCH @ LC 

AAS Summer Meeting, 2023

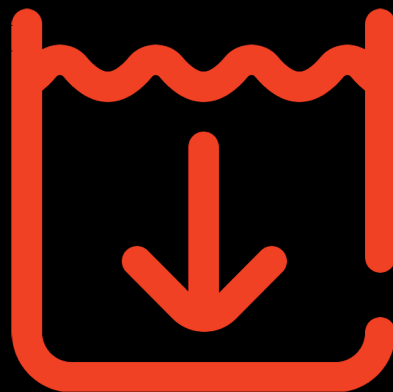
Wayne Rosing, Michael Fitzgerald, Katie Ciurleo, Darren Hunt,
Saeed Salimpour, Tim Beccue

Heterogenous Telescope Network



Low-Barrier
Self-Paced
Laboratory
Course

**Real Time
Observing**



**Scale for
Depth**

**Continued
Expansion**



Key Projects



Supernovae, exoplanets, solar system, Global Sky Partners

Photon Ranch and the self-paced course.

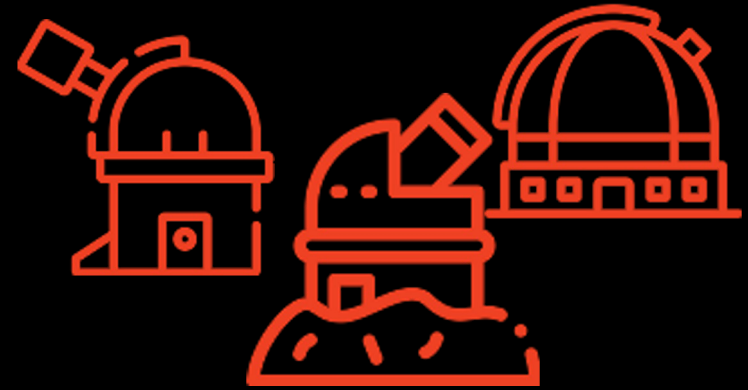
Both are also great for multiple niche projects.

PHOTON

RANCH @ LCO



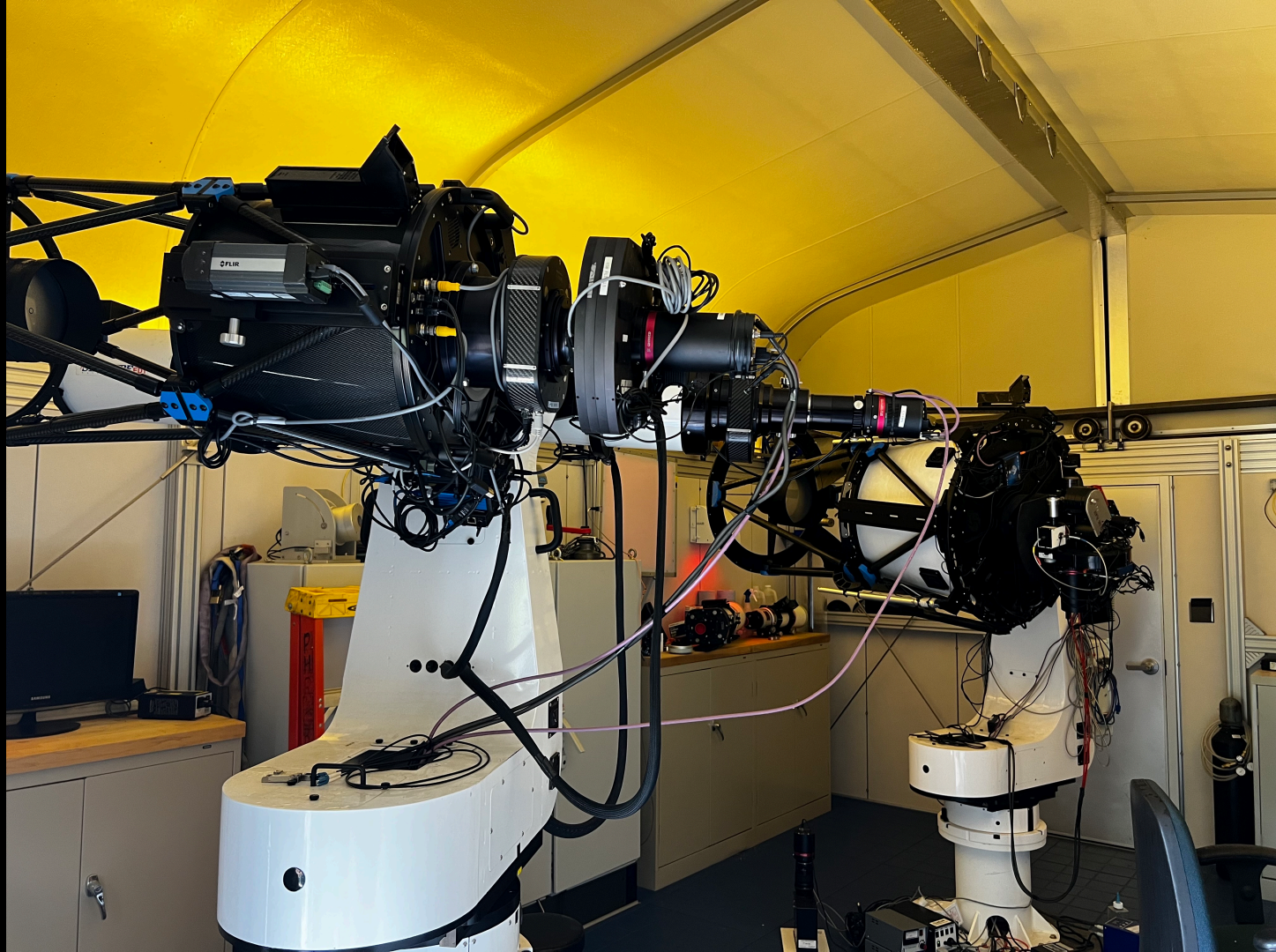
Standard Observatories

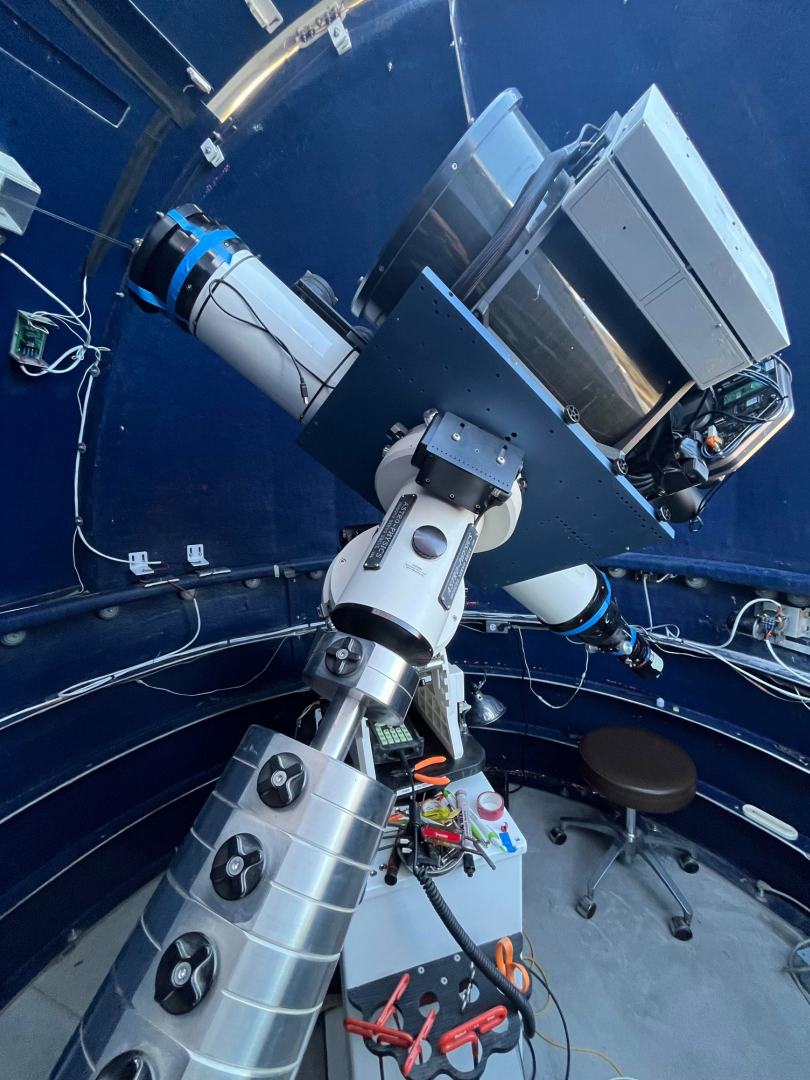


Independent Observatories





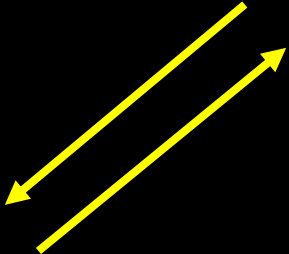


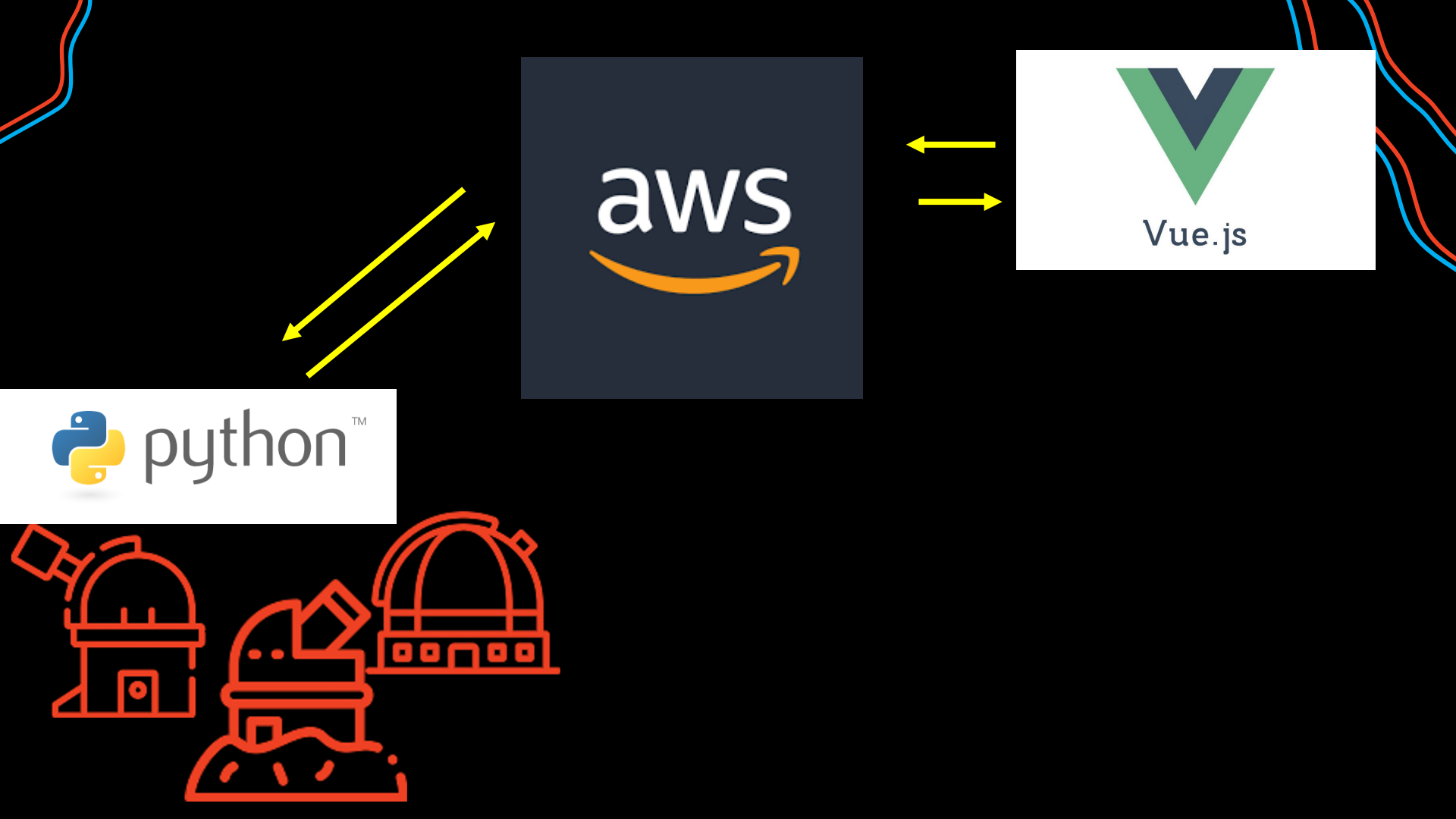


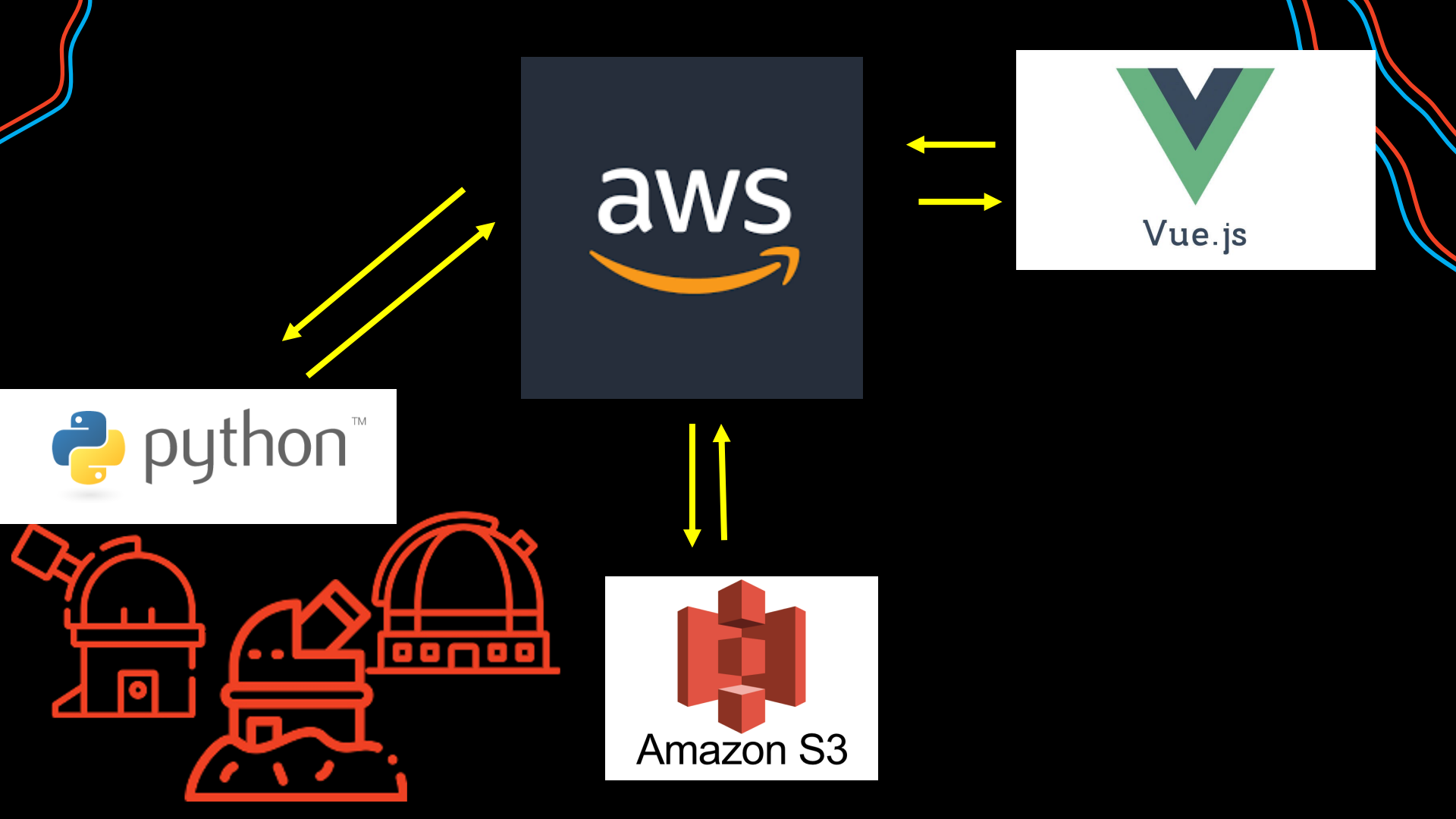


**'TOP
SECRET'**









python™

aws

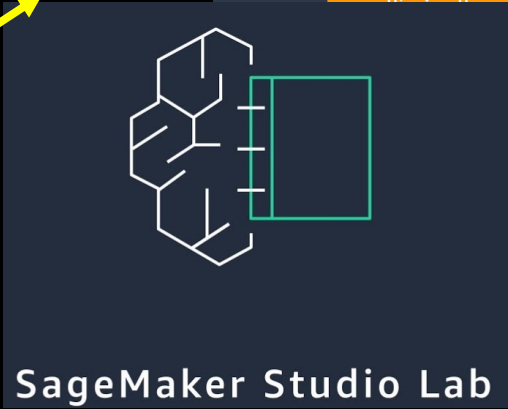
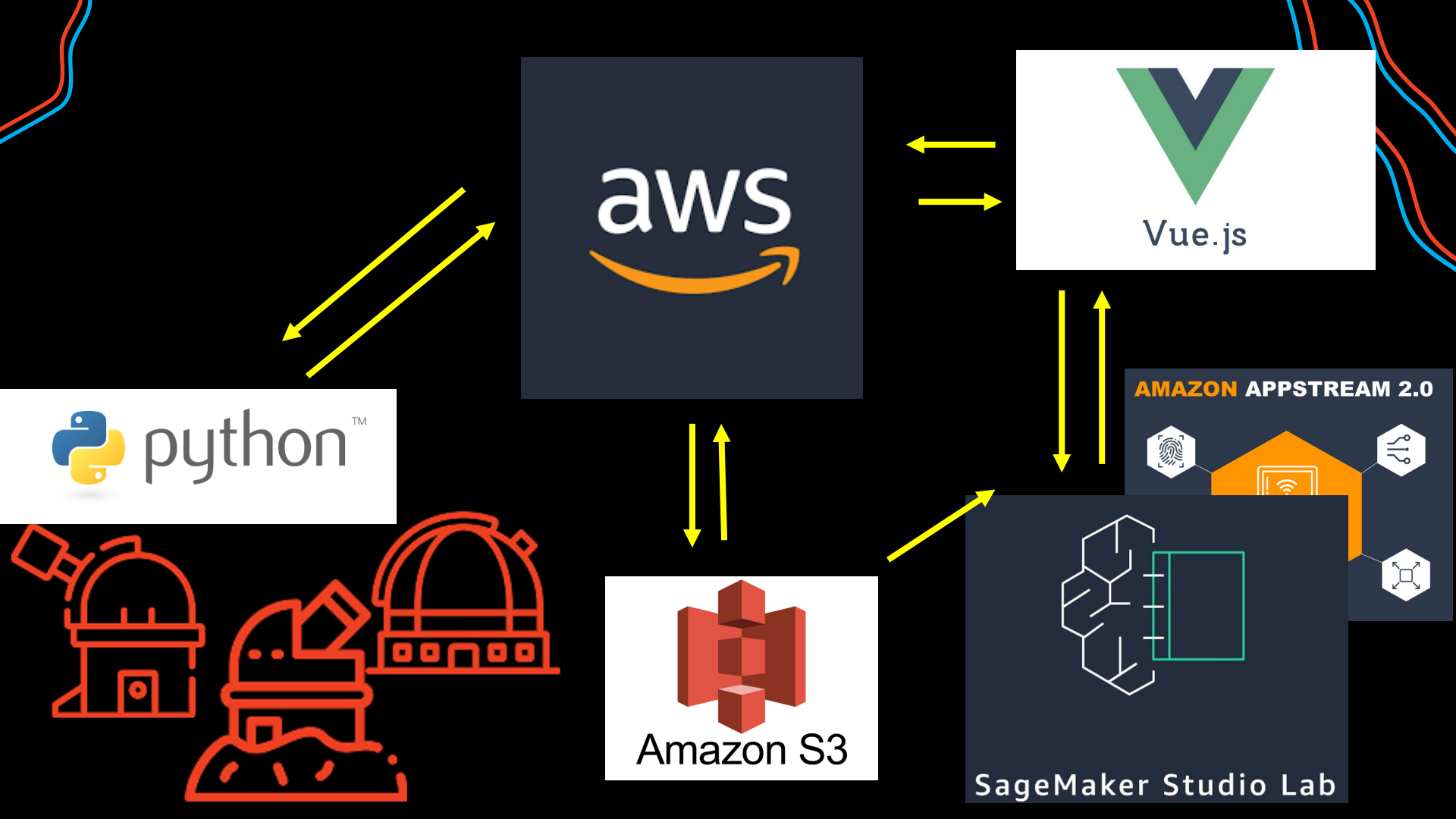


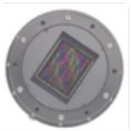
Vue.js



Amazon S3







QHY411 150 Megapixel Scientific Camera - Color

Brand: [QHY](#)

SKU : QH-QHY411U3G20C

☆☆☆☆☆ () - [Read](#)

[Add to Wishlist](#)

[Contact Us for Availability](#) 1-800-483-6287 ext.1

\$50,000

[Price Match Guarantee](#)

— 1 +

[Add to Cart](#)

[Request stock alerts](#) and we'll let you know when the item is back in stock

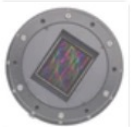
Got questions? [Click for live chat](#)

As low as **\$1613.13 / MONTH ***

✓ **World's Largest Resolution**
- 150 Megapixels - Medium Format.

✓ Ultra Low Read Noise - 1e to 3e.

✓ Back-Illuminated - Electric



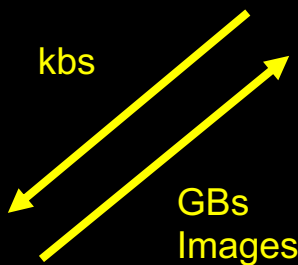
QHY411 150 Megapixel Scientific Camera - Color

Network transport problem –
Current QHY600Pro cameras are
already a problem for both LCO
and PTR.

Two unpalatable “other” solutions

1. Only 30' x 30' centre of the image.
2. Don't send that image at all.





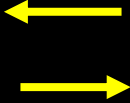
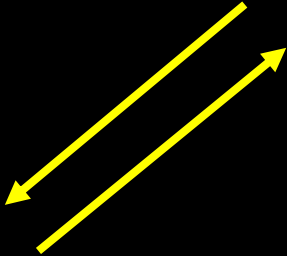
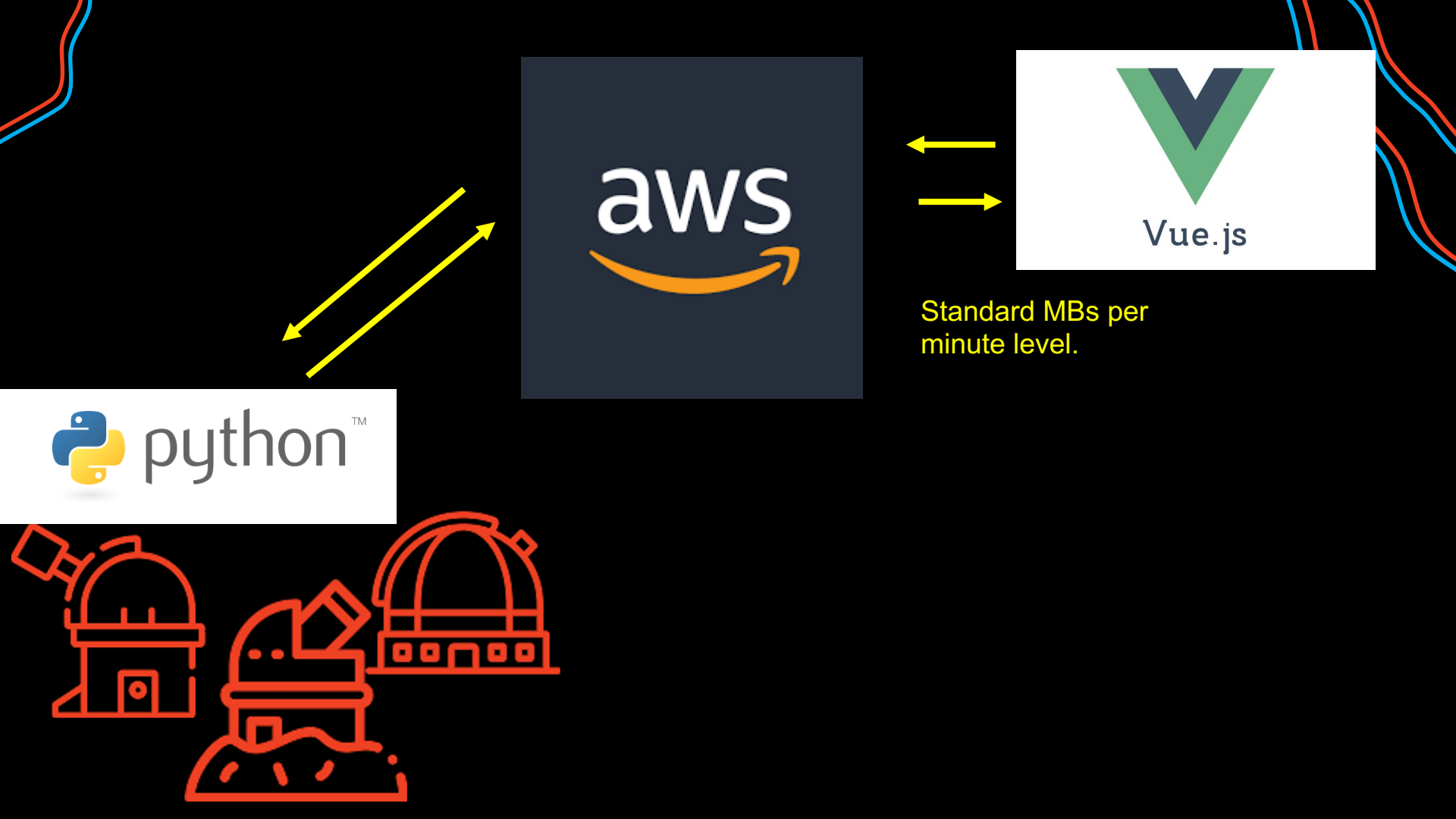
GBs
Images
Photometry
Jpegs
analysis



Site does most reductions. Has multiple upload “pipes”

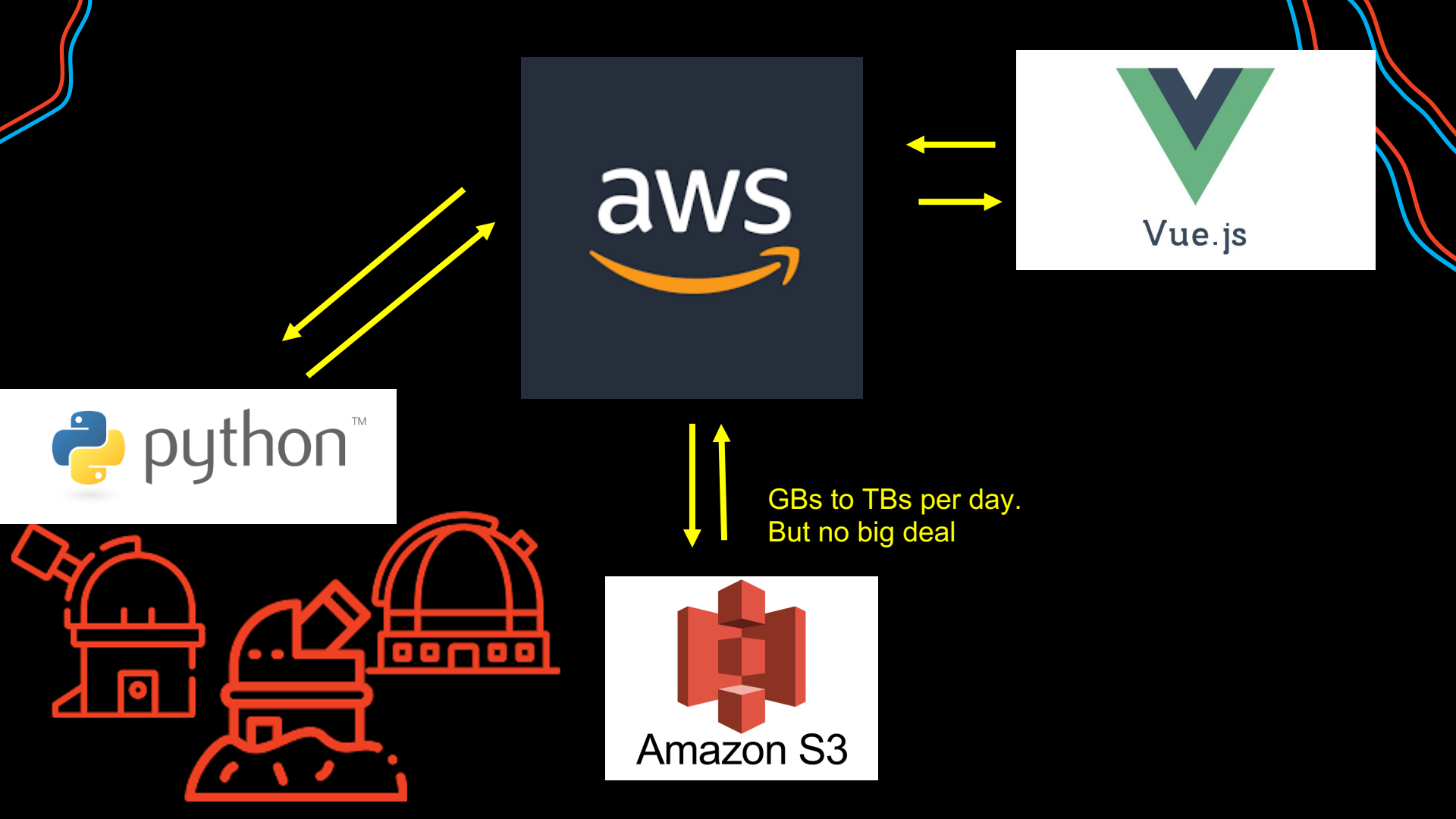
- Upload:
- Reduced image
- Jpeg
- Multiple Analysis products
- Multiple Photometry Products





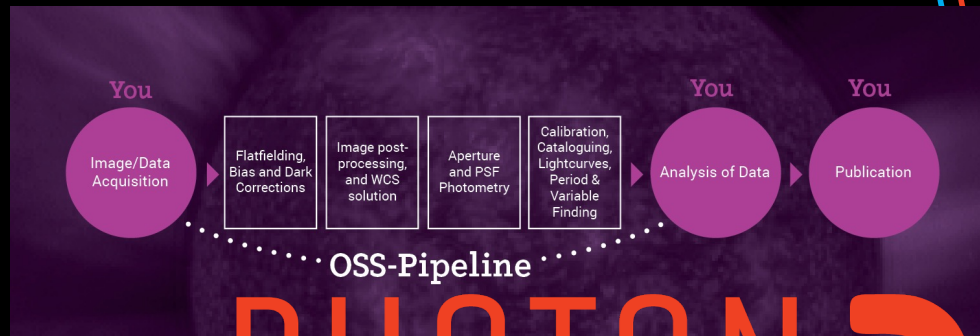
Standard MBs per
minute level.







Amazon S3



Science Archive

This Django application manages archival and retrieval of an observatory's data products. It features a REST API for retrieving metadata and download links for data products, and also for submitting metadata for data products that have been uploaded to a cloud or local datastore. For the complete list of filterable FITS header values, check out the [API specification](#).

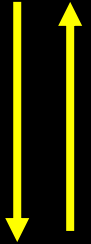
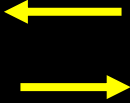
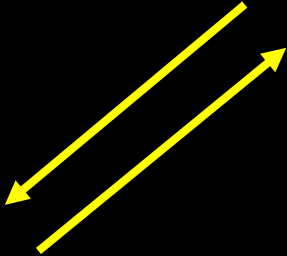
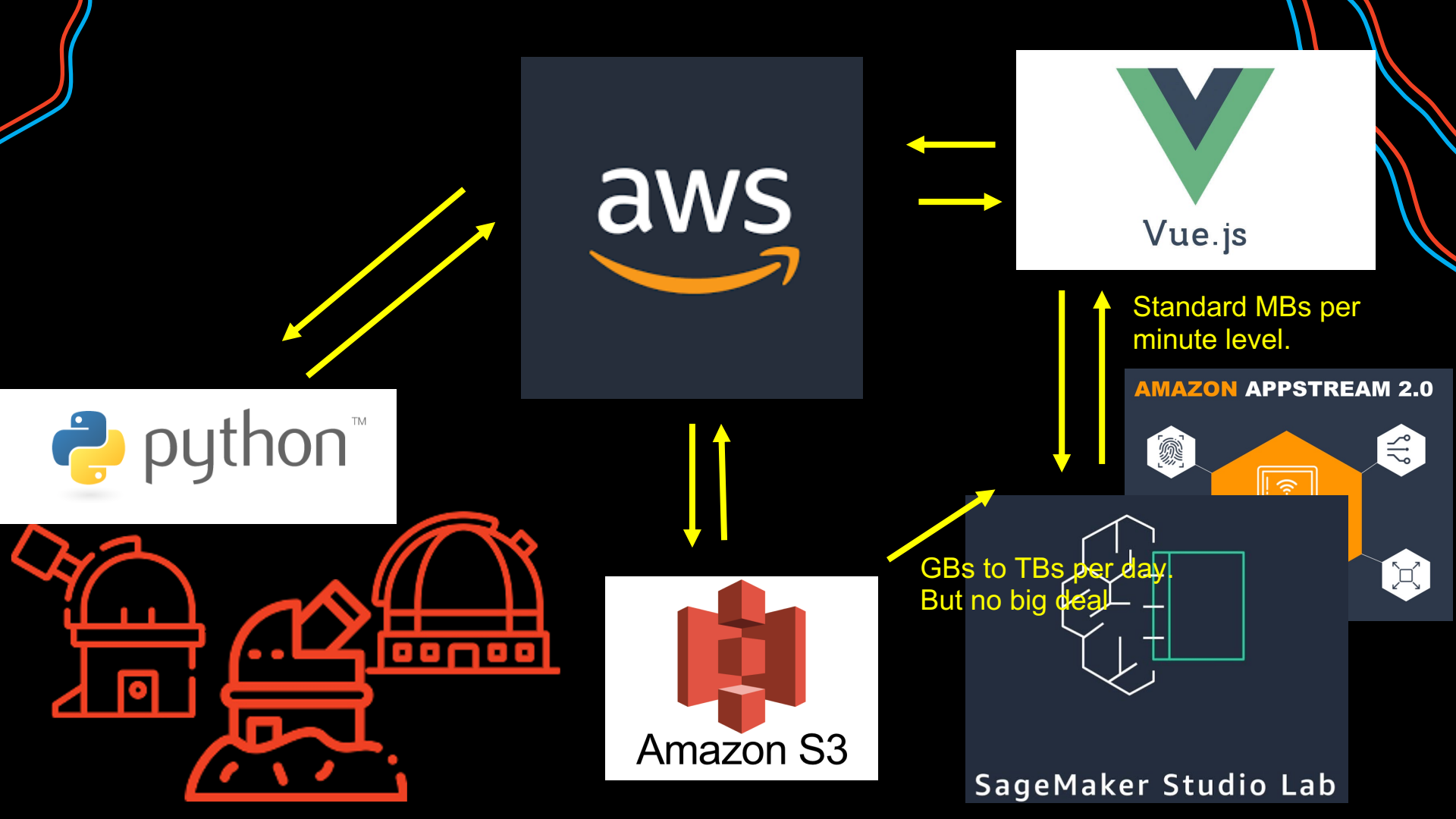
Ingestor Library

This python library is available on PyPI as `ocs_ingester` is used to upload data products to an AWS S3 bucket, and to update the **Science Archive** with metadata for that data product. It validates that the metadata contains all the required values, and adds in values for which it can determine a default value. It can accept data products of any file type, but if it is not a FITS file, the proper FITS header data will need to be supplied as a dictionary along with the file so the file is queryable.

API documentation for the `ocs_ingester` is available on [ReadTheDocs](#)



Las Cumbres Observatory



Standard MBs per minute level.


GBs to TBs per day. But no big deal



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powered by 

Filter files by name

/ sagemaker-studiolab-notebooks /

Name	Last Modified
exampledirectory	20 days ago
images	a year ago
Getting Started.ipynb	a month ago
tfn0m410-kb24-20...	17 days ago
tfn0m410-kb24-20...	17 days ago
tfn0m414-kb95-20...	17 days ago
Untitled.ipynb	a month ago
Untitled1.ipynb	17 days ago
wgetLCO.ipynb	17 days ago

Getting Started.ipynb x Untitled.ipynb x wgetLCO.ipynb x **Untitled1.ipynb** x Terminal 1 Console 1

Code default:Python

```
[ ]: from ptr-lab import *
      smartstack(file1, file2, file3)
      psf_photometry(file1)
      display_psf(file)
      display_photometry(file1)
      search_for_variables(dataset)
```

Getting Started.ipynb ×

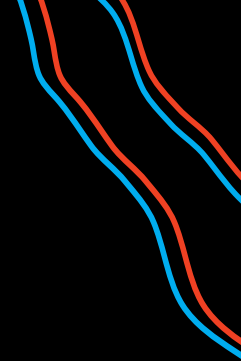
Untitled.ipynb ×

wgetLCO.ipynb ×

Untitled1.ipynb ×

Terminal 1 ×

```
(studiolab) studio-lab-user@default:~$ Look I can type in Linux![]
```



(studiolab) studio-lab-user@default:~\$ Look I can type in Linux!

Filter files by name

/ sagemaker-studiolab-notebooks /

Name	Last Modified
exampledirectory	20 days ago
images	a year ago
Getting Started.ipynb	a month ago
tfn0m410-kb24-20...	17 days ago
tfn0m410-kb24-20...	17 days ago
tfn0m414-kb95-20...	17 days ago
Untitled.ipynb	a month ago
Untitled1.ipynb	17 days ago
wgetLCO.ipynb	17 days ago

```
[1]: !pip install wget
      !pip install astropy
      import wget
      import json
      import sys
      import os
      import numpy
      from astropy.io import fits

      frames='(60397305 60397319 60396515)'
```

```
      authtoken="AUTHTOKEN"
      frame_url="https://archive-api.lco.global/frames/"

      frames=frames.replace('(','').replace(')','')
      frames=frames.split(' ')

      for frame in frames:
          if os.path.exists("download.wget"):
              try:
                  os.remove("download.wget")
              except:
                  print ("couldn't remove previous wget")
          wget.download(frame_url+frame + '/')
          with open('download.wget') as handle:
              dictdump = json.loads(handle.read())
          os.remove("download.wget")
```

Home

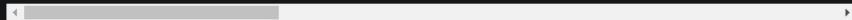
Targets

Observe

Calendar

Projects

site: mrc exptime: 120s ra: 9.926h dec: 69.065°
 filter: HA 2022-02-02 11:02 UTC airmass: 1.271 altitude: 51.844°



JS9 ◀◀ ◀ ▶ ▶▶

small fits large fits jpg last 24hrs fits

2022/02/02 22:04:41 new in s3: mrc-sq0003-20220201-00002186-e00.fits.bz2 | 12.6MiB | 2022-02-02T11:04:40Z

controls analysis data dev tools

Enclosure Screen Telescope Rotator Focuser Camera Sequencer Settings

Enclosure

ENC. MODE Automatic
 ENC. STATUS Closing
 OPEN OK No

Request Roof Open Request Roof Close

expand status

● online

02:38 17:42 01:42
 LMST OBS TIME UTC TIME

ENC. STATUS	Closing	ENC. MODE	Automatic	RA	2.59200h	AZIMUTH	179.999	CAMERA	ASCOM camera not implemented yet
WEATHER OK	Yes	WX HOLD	No Hold	DEC	-53.1267°	ALTITUDE	3	FILTER	HA
OPEN OK	No	HOLD DURATION	0	HA	+0.012	AIRMASS	10		

Home

Targets

Observe

Calendar

Projects



J2000d



FoV: 59.85°

chart settings

telescope controls

Search for objects...

Telescope

observatory logs will appear here

● offline

ENC. STATUS

ENC. MODE

RA

AZIMUTH

CAMERA

00:36 18:49 02:49

LMST OBS TIME UTC TIME

WEATHER OK

WX HOLD

DEC

ALTITUDE

FILTER

OPEN OK

HOLD DURATION

HA

AIRMASS

Home

Targets

Observe

Calendar

Projects

Mountain Ranch Camp Observatory 0m35f7.2



key	date	site	user	UTC
<i>eve bias dark</i>	12/11	13:11:30	08:11:30	21:11:30
<i>end eve bias dark</i>	12/11	15:11:30	10:11:30	23:11:30
<i>ops window start</i>	12/11	15:12:30	10:12:30	23:12:30
<i>cool down, open</i>	12/11	15:13:30	10:13:30	23:13:30
<i>eve sky flats</i>	12/11	15:18:30	10:18:30	23:18:30
<i>sun set</i>	12/11	16:52:50	11:52:50	00:52:50
<i>end eve sky flats</i>	12/11	17:17:30	12:17:30	01:17:30
<i>civil dusk</i>	12/11	17:18:30	12:18:30	01:18:30
<i>naut dusk</i>	12/11	17:49:15	12:49:15	01:49:15
<i>clock & auto focus</i>	12/11	17:50:15	12:50:15	01:50:15
<i>observing begins</i>	12/11	18:04:32	13:04:32	02:04:32
<i>moon transit</i>	12/11	18:08:04	13:08:04	02:08:04
<i>astro dark</i>	12/11	18:19:49	13:19:49	02:19:49
<i>middle of night</i>	12/11	23:51:58	18:51:58	07:51:58
<i>moon set</i>	12/11	00:01:16	19:01:16	08:01:16

observatory logs will appear here

● **offline**

ENC. STATUS	Opening	ENC. MODE	Automatic	RA	7.67490h	AZIMUTH	179.999	CAMERA	ASCOM camera not implemented yet
WEATHER OK	Yes	WX HOLD	No Hold	DEC	-52.9369°	ALTITUDE	3	FILTER	w
OPEN OK	No	HOLD DURATION	0	HA	+0.009	AIRMASS	10		

00:37 LMST 18:50 OBS TIME 02:50 UTC TIME

Real Time

Enclosure | Screen | Telescope | Rotator
Focuser | **Camera** | Sequencer | Settings

Autofocus selected: camera_1_1

expose Cancel

Expose 1 seconds

Count - 1 +

Filter focus apply

Bin

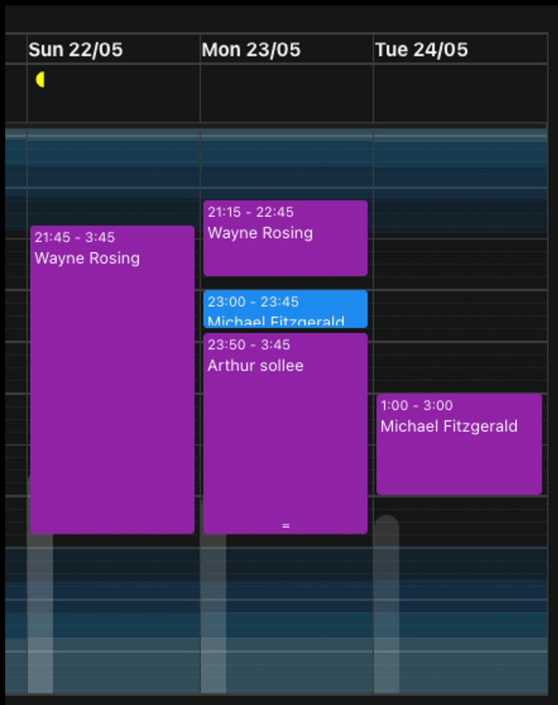
Area Full

Subframe Subframe not active
subframe: (0.00,0.00), (1.00, 1.00)

Image Type light

Dither off

Note a camera note for the FITS head



Scheduled Observations

Pooled Projects

project name	object	ra	dec
> m101 neyle	M 101	-149.197500°	54.3488°
> M81 SRO Filters	M81	148.888500°	69.0653°
> Virgo Cluster no2 neyle	m49	-173.454300°	12.8920°
> Trifid SRO Filters	M 20	-89.325000°	-22.9717°
> M13 neyle	m13	-109.576500°	36.4613°
> M101 SRO Filters	M101	-149.197500°	54.3488°

Create a project

Modify Project

Clear Form

Project Name

Project Note

test project

Name

RA

Dec

Hours / Degrees ?

Sexagesimal ?

TCO ?

m45



3.7734

24.1140



Sites ?

Start Date (UTC) ?

Expiry Date (UTC) ?

Active ?

Deplete ?

Cycle ?

Select sites (1) ▾

12/5/2022, 3:34 AM



1/2/2023, 3:34 AM



Imtype

Count

Exp [s]

Filter

Resolution

Area

Dither

Drizzle

Photometry Defo



light



1

1

Lum



Optimal



Full



no



-



0



light



1

1

Lum



Optimal



Full



no



-



0



light



1

1

Lum



Optimal



Full



no



-



0



light



1

1

Lum



Optimal



Full



no



-



0

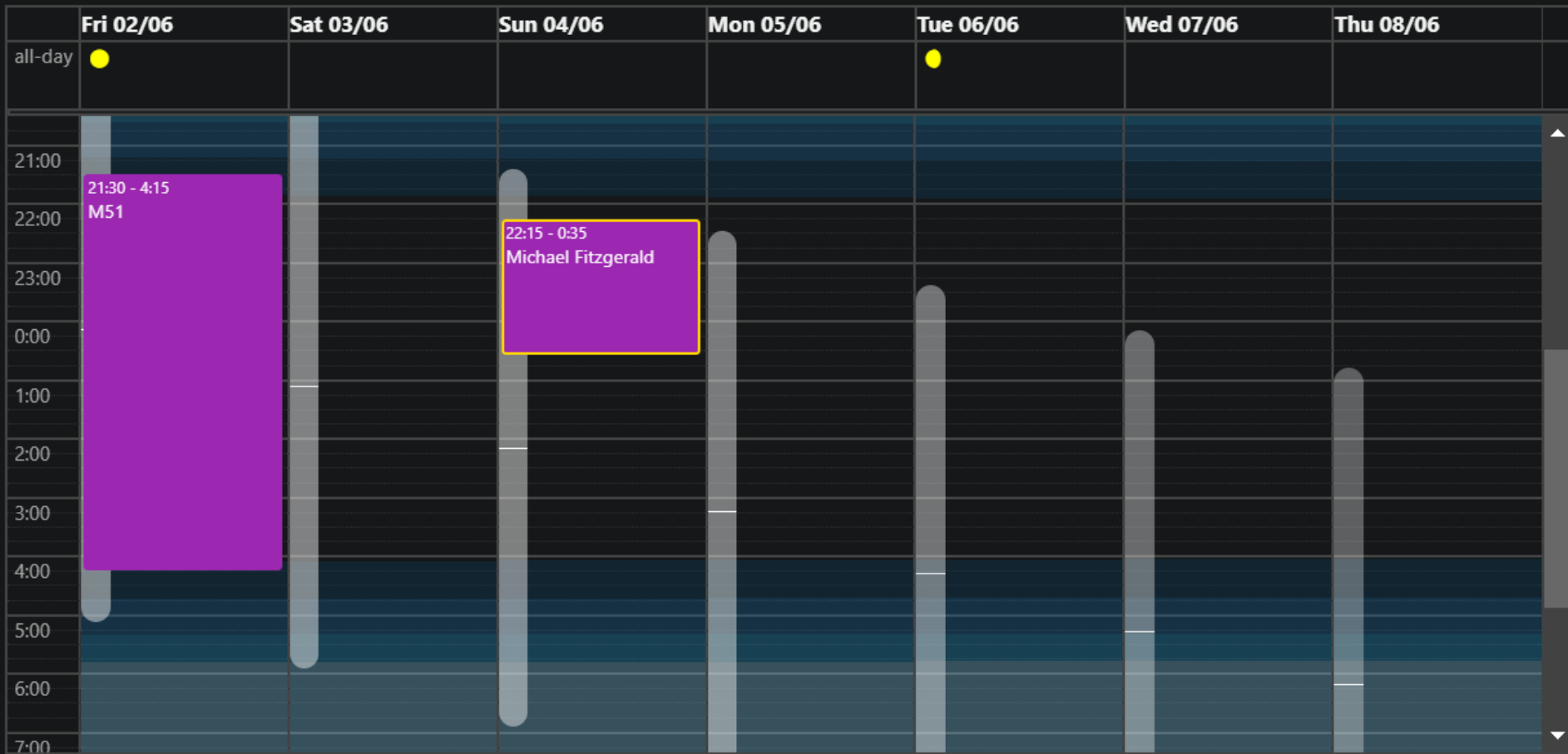


today

2 – 9 Jun 2023

month

week





(Me) Katie

Enclosure Screen Telescope Rotator

Focuser Camera Sequencer Settings

Autofocus

selected: camera_1_1

expose

Cancel

Expose 1 seconds

Count 1

Filter air apply

Bin

Area Full

Subframe Subframe not active

subframe: (0.00,0.00), (1.00, 1.00)

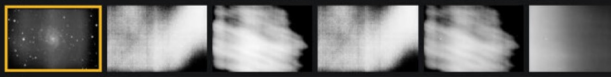
Image Type light

Dither off

Note a camera note for the FITS header

Darkslide unknown open close

site: mrc exptime: 120s ra: -149.197538° dec: 54.349°
filter: PR 2022-05-19 05:07 UTC airmass: 1.086 altitude: 66.995°
mrc-sq003-20220518-00001299



J59

draw shapes

crosshairs

none

J2000d 53.4621000 +30.6602000



FoV: 59.81°

Slew telescope here

Object



06/01 23:41:47

Exposure time remaining: -2.5

OSBY LOG: 06/01 23:41:49

Camera has read-out image.

NEXT EVENTS: 06/01 17:39:42

no reported phase

offline

02:29 10:43 17:43

LMST OBS TIME UTC TIME

WEATHER OK Yes

WX HOLD false

HOLD DURATION 0

ENC. MODE Manual

ENC. STATUS Closed

DOME AZ 316.5

RA 128.067000°

DEC -53.6429°

HA -0.028

AZIMUTH 179.662

ALTITUDE 2.961

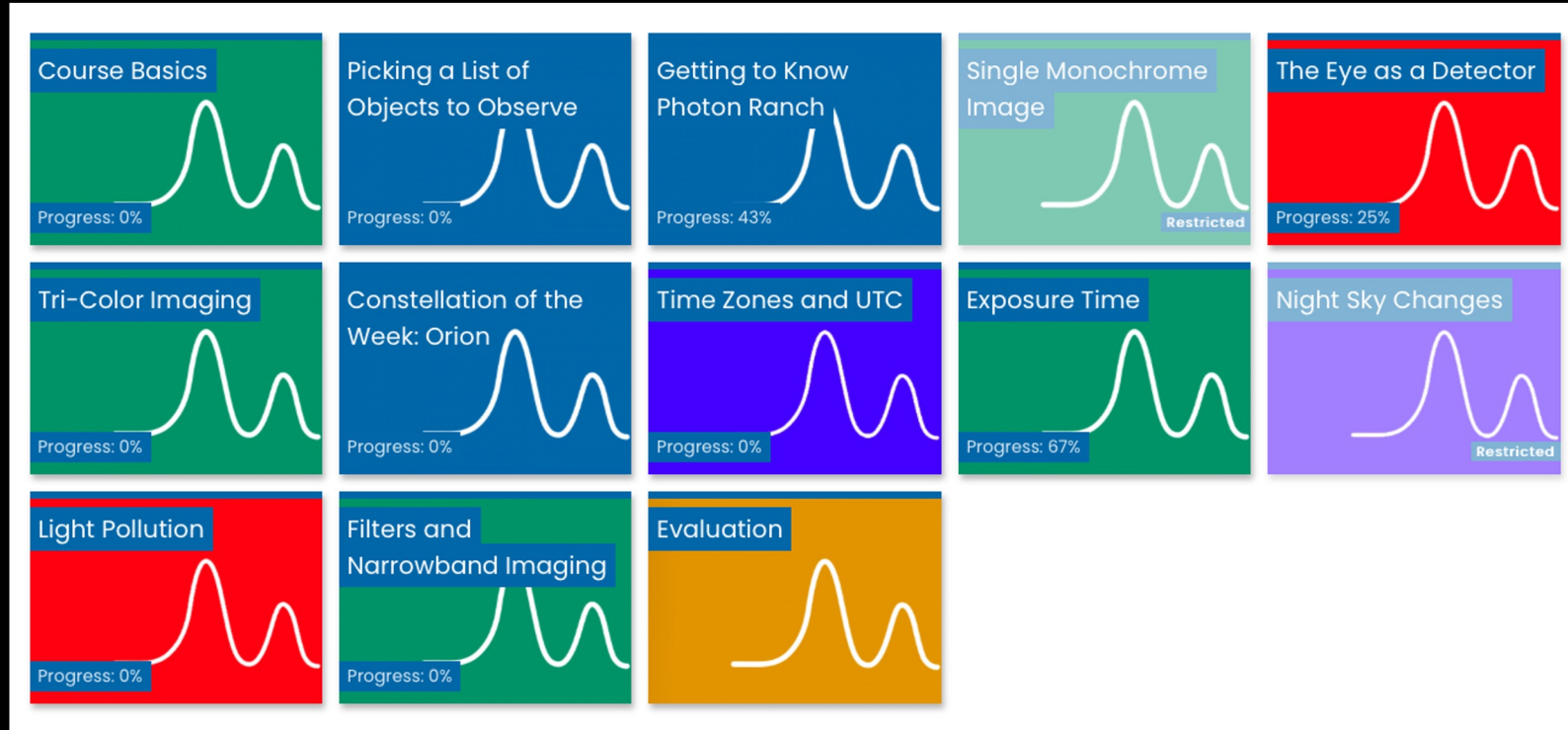
AIRMASS 10

CAMERA ASCOM camera not implemented yet

FILTER dark

Help

Module-Based Learning



Tuesday 6pm-7pm

Wednesday 7am-8am

Thursday 4pm-5pm

[Photon Ranch Telescope Website](#)

This is a link to the website where you directly drive, book and schedule the Photon Ranch Telescopes. **Currently the observatory we are using is the FAT or SRO observatory.**

[Link to the Observing Zoom](#)

In general, after you have your telescope license badge and are observing, you and other observers can sit in this zoom room to converse and observe.

 Hidden from students Course Basics	 Hidden from students Picking a List of Objects to Observe	Getting to Know Photon Ranch Progress: 17%	Single Monochrome Image Progress: 0% Restricted	The Eye as a Detector Progress: 0% Restricted
Tri-Color Imaging Progress: 10% Restricted	Constellation of the Week: Orion Progress: 0% Restricted	Why Do We Use Telescopes? Hidden from students	LCO Site: Australia Hidden from students	Timezones and UTC Progress: 0% Restricted

Star Counting Activity

Star Counting Instructions [[docx 522 KB](#)]

Star Counting Instructions [[PDF 532 KB](#)]

Star Counting in Stellarium

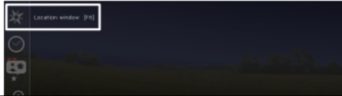
In this activity, we will use Stellarium to explore how different levels of light pollution affect the night sky.

Open up a word processing document or find a piece of paper to write on. Follow the instructions below, and write down your answers to the questions and any other observations you have. As always, feel free to play around more in Stellarium if you want to!

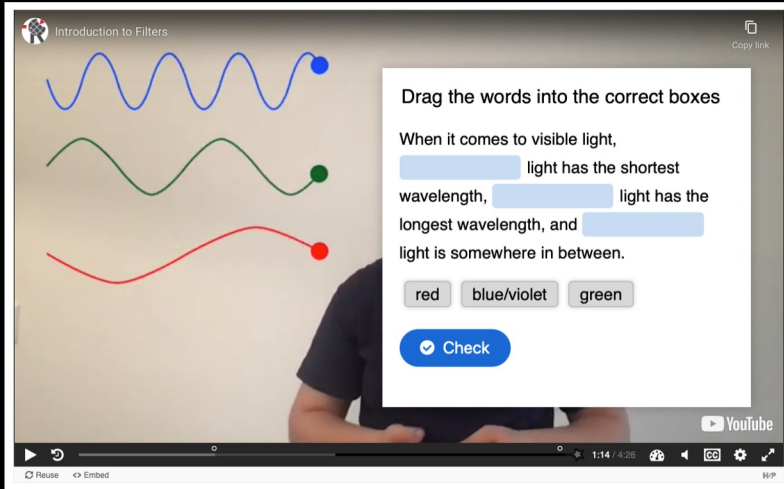
Tip: Press the "F11" key to use Stellarium in windowed mode.

Setup

- Open up Stellarium. On the lower left corner panel, click open the "Location window" (or hit the "F6" key). Set your location using the location search bar or by clicking on your region on the map.



Introduction to Filters



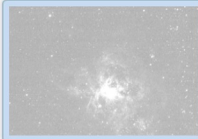
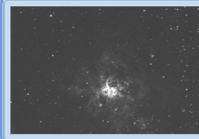
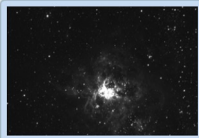
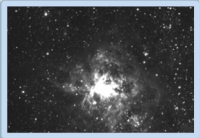
Drag the words into the correct boxes

When it comes to visible light, _____ light has the shortest wavelength, _____ light has the longest wavelength, and _____ light is somewhere in between.

Tarantula Nebula (NGC 2070) Varying Exposure Activity

Try to put the following exposures in the right order from least to most exposed. Keep in mind all of the patterns you see as exposure time increases. Which do you think is the best exposure time?

Tarantula Nebula (NGC 2070) Varying Exposure Activity

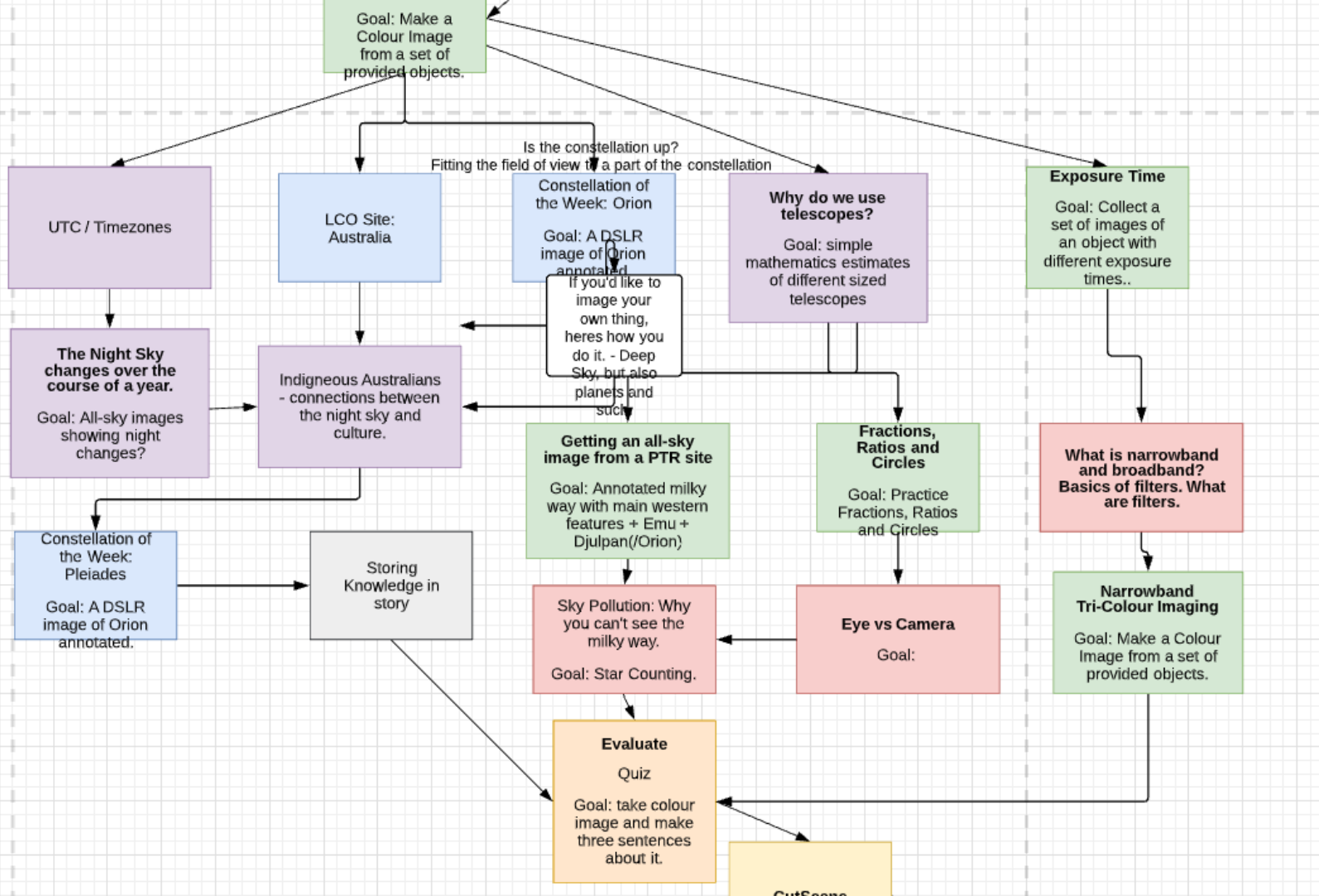
8 seconds	16 seconds	32 seconds	64 seconds
			
128 seconds	256 seconds	512 seconds	124 seconds
			

Santiago, Chile has an offset of UTC-3 in the summer time during daylight savings. If the time is currently 18:00 UTC on the 17th of November, what time would a clock in Santiago show?

- a. 3:00pm, 17 November
- b. 9:00am, 17 November
- c. 9:00pm, 17 November
- d. 6:00pm, 17 November
- e. 6:00am, 17 November
- f. 3:00am, 17 November

The course

- Self-paced course
- Online
- Modular
- Mastery driven
- Gamified
- Just-in-time.
- Flows like a tech tree.
- Open to all age
- A potential community of like minded learners.



Disciplinary Foci:

Engage

- Specialized introductory engagement activities

Core Content

- Astronomy - a broad survey
- Cosmography - a sense of place in the universe

Philosophy/Sociology

- Critical Thinking - with a focus on knowledge of biases
- Philosophy - of science and epistemology
- Nature of Science and Scientific Inquiry
- History and Sociology of Science

Geography/General History/Night Sky Familiarity

- Organized around LCO sites
- Constellation of the Week

Developmental/Mastery Foci:

Skills

- From short readings to long readings
- From simple mathematics to fundamental principles of scientific mathematics
- From no coding to broad appreciation of coding
- From small investment to large investments of effort and time.
- From minimal management skills to some

Perception

- Spatial Thinking
- Disciplinary Discernment
- The ability to manipulate representations, maps, diagrams, sketches etc.
- Metacognition

Evaluate and Communicate

- How am I doing?
- Communication Skills: A slide then a poster then a recorded talk.

Collaboration Support



Focused Coursework



PTR 



More Info?

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Michael Fitzgerald
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ptredu.org

Katie Ciurleo
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Darren Hunt
dhunt@lco.global

PHOTON RANCH @ LCO  