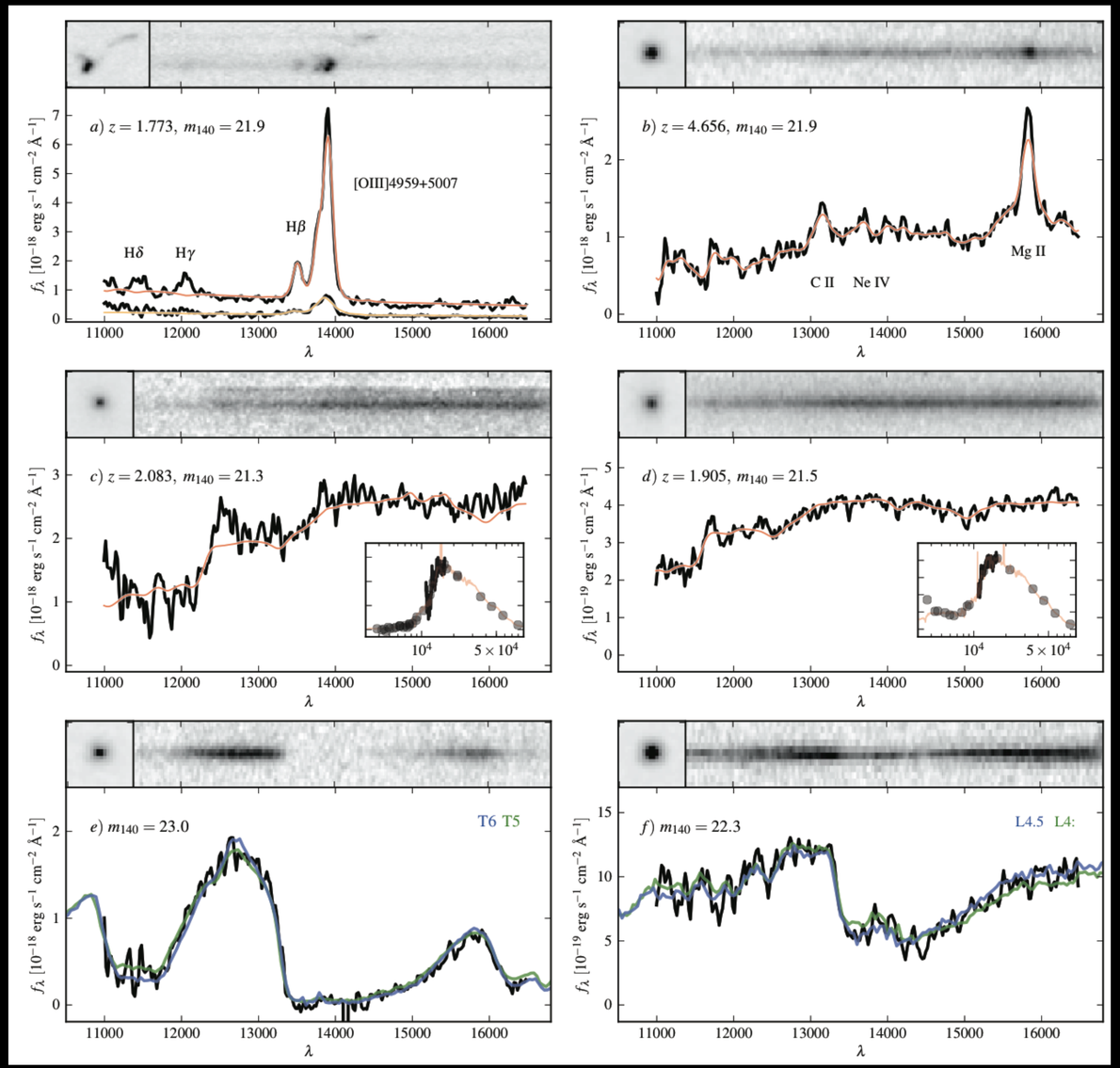
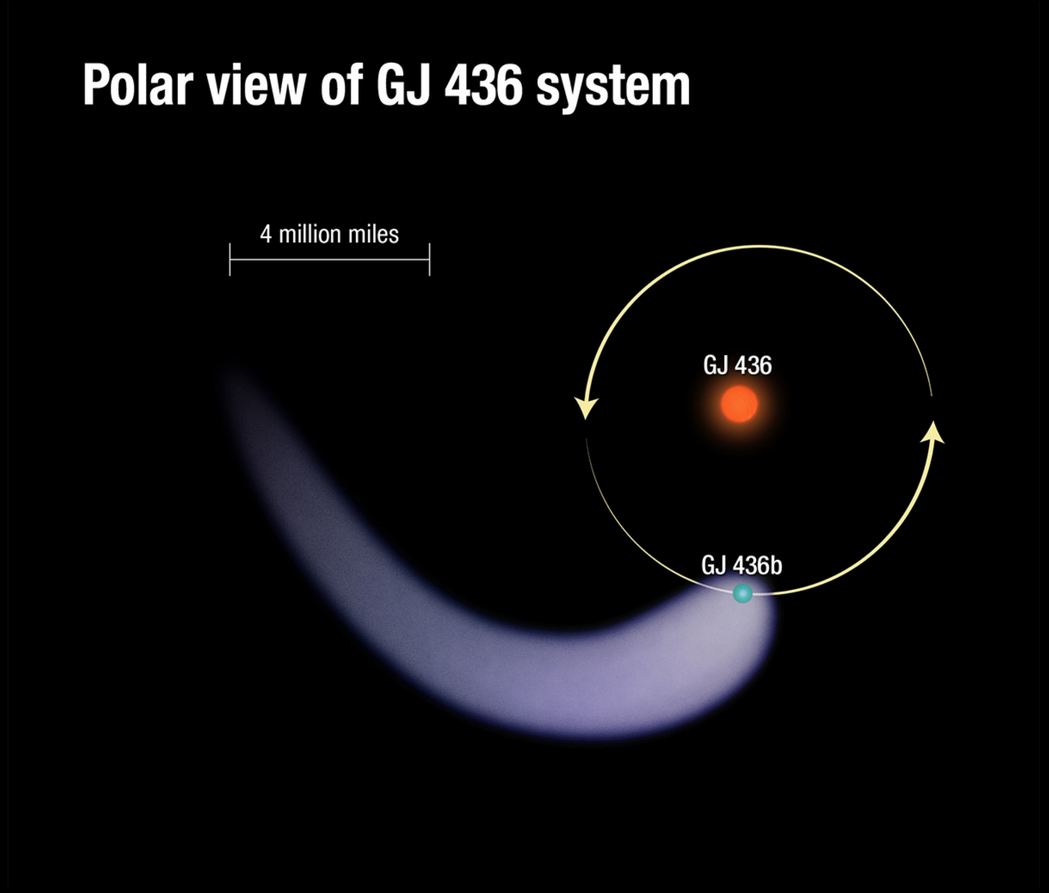
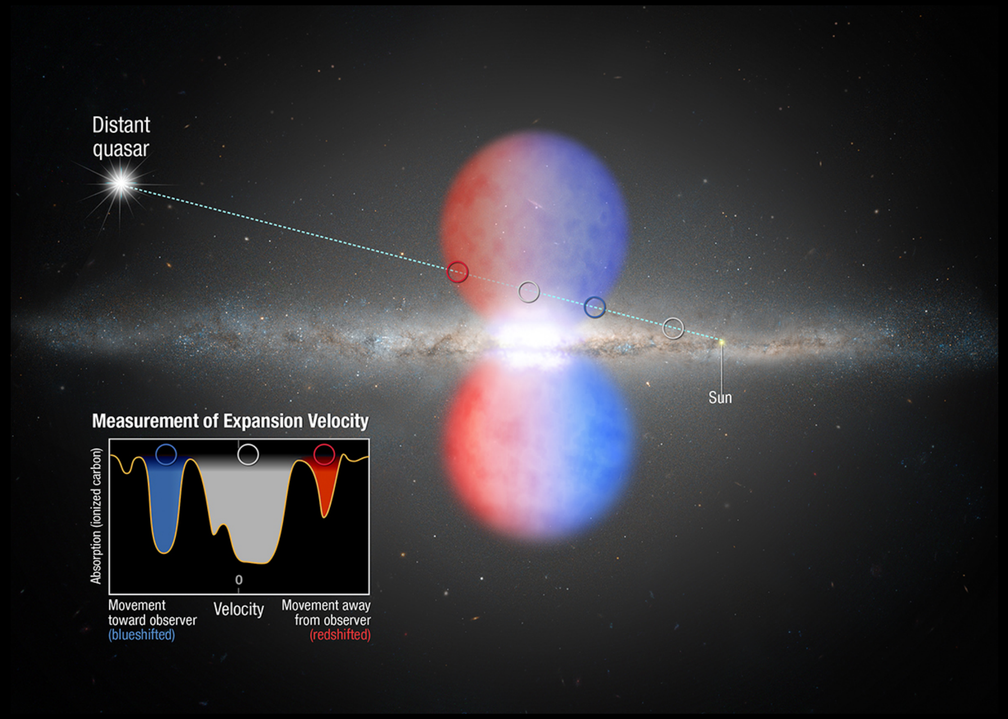
Spectroscopy is 40% of Hubble's time



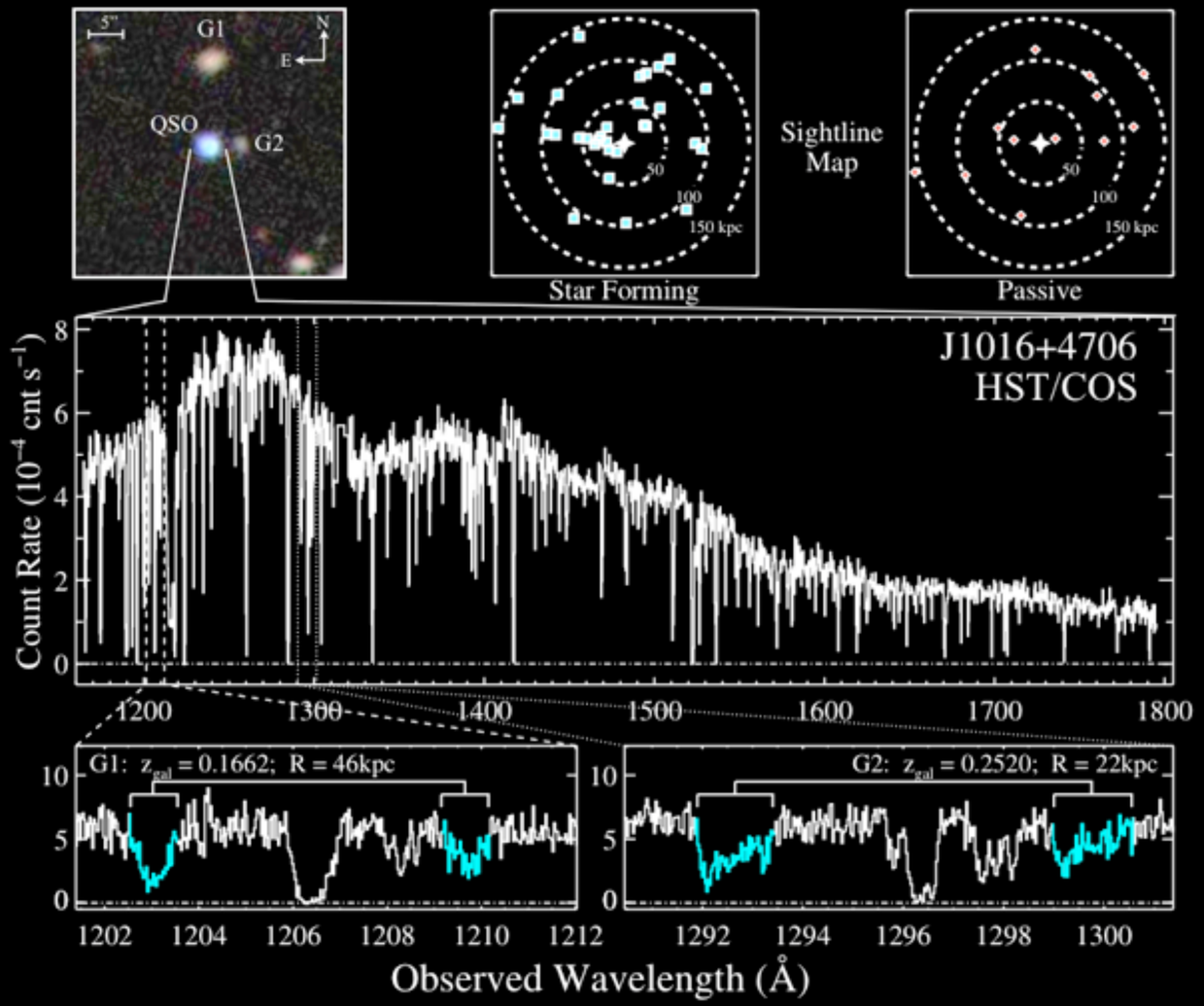
Star formation and chemical evolution in galaxies at the cosmic “high noon”



Exo-Neptunes evaporated by the radiation of their parent star.

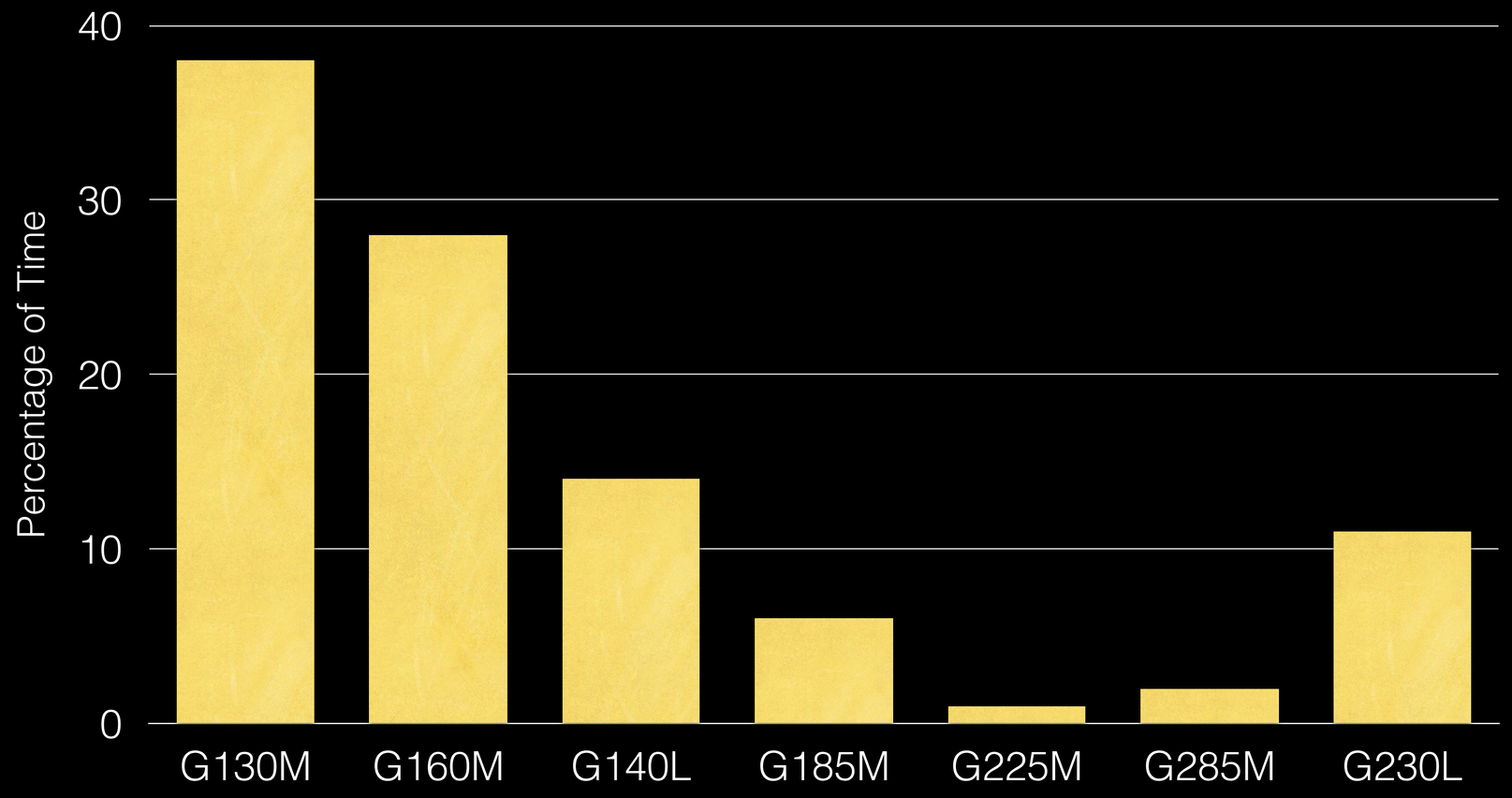


Galactic outflows powered by ancient AGN

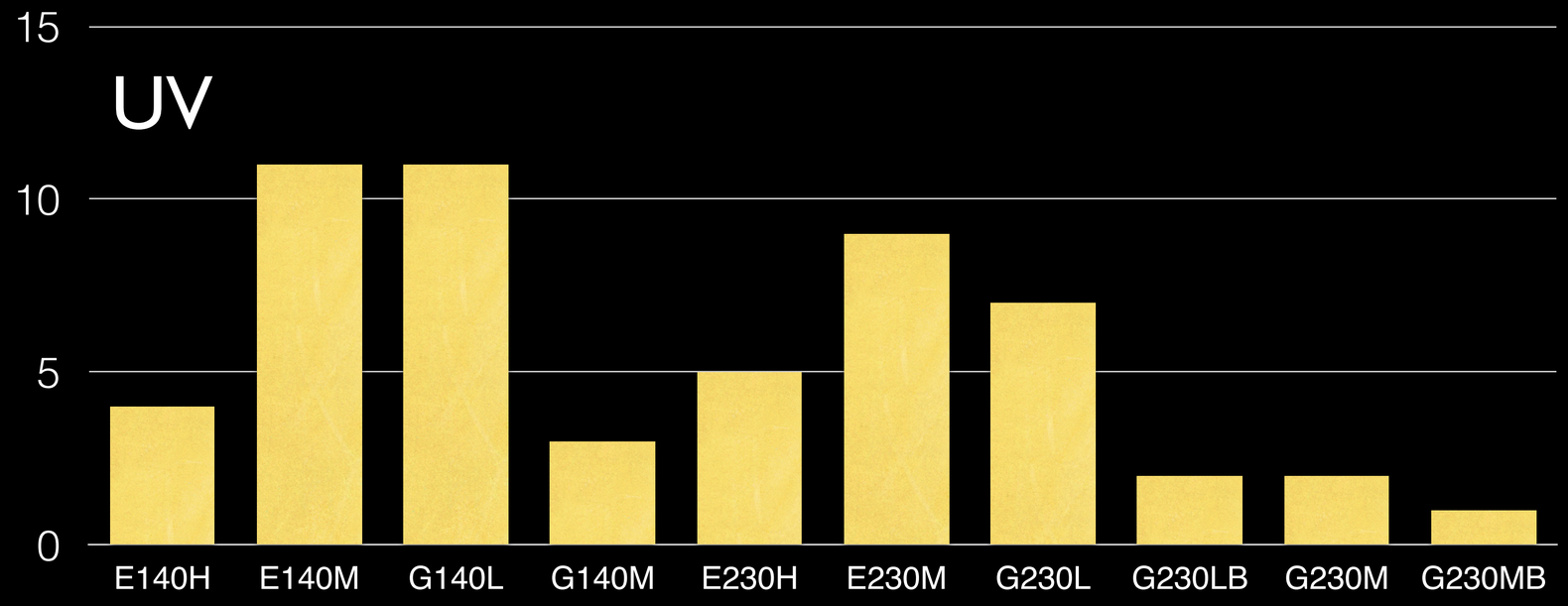


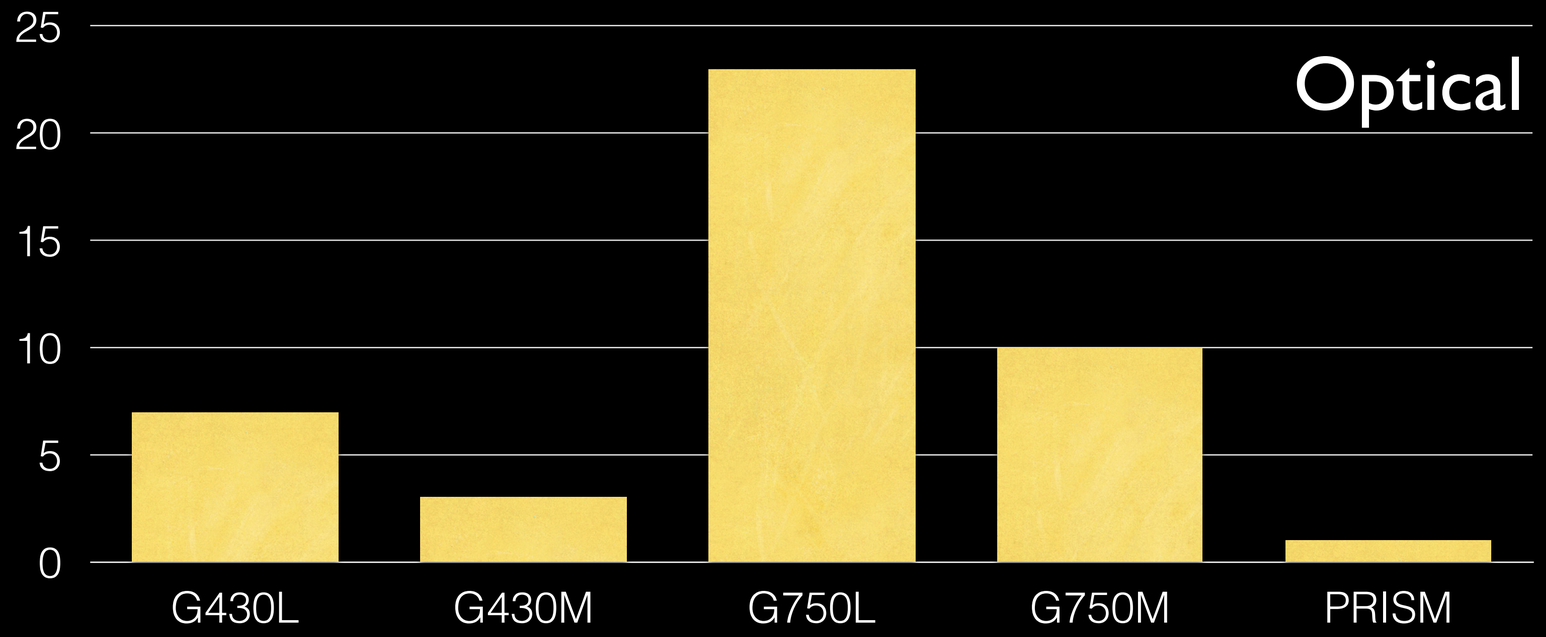
Circumgalactic gas as a galactic
fuel tank, waste dump, and recycling center

COS Usage by Element



STIS Usage by Element






Enhancing the Legacy
of HST Spectroscopy
Nov 15-16 2012

STScI

Jason Tumlinson (chair, MESA+HSTMO)

Andrew Fox (co-chair, COS/STIS)

Molly Peeples (COS/STIS)

Cristina Oliveira (COS/STIS)

Alessandra Aloisi (OED, previous WG chair)

Community Experts

Edward Jenkins (Princeton)

Charles Danforth (Colorado)

Tom Ayres (Colorado)

Brian Keeney (Colorado)

Two problems

Combining the data

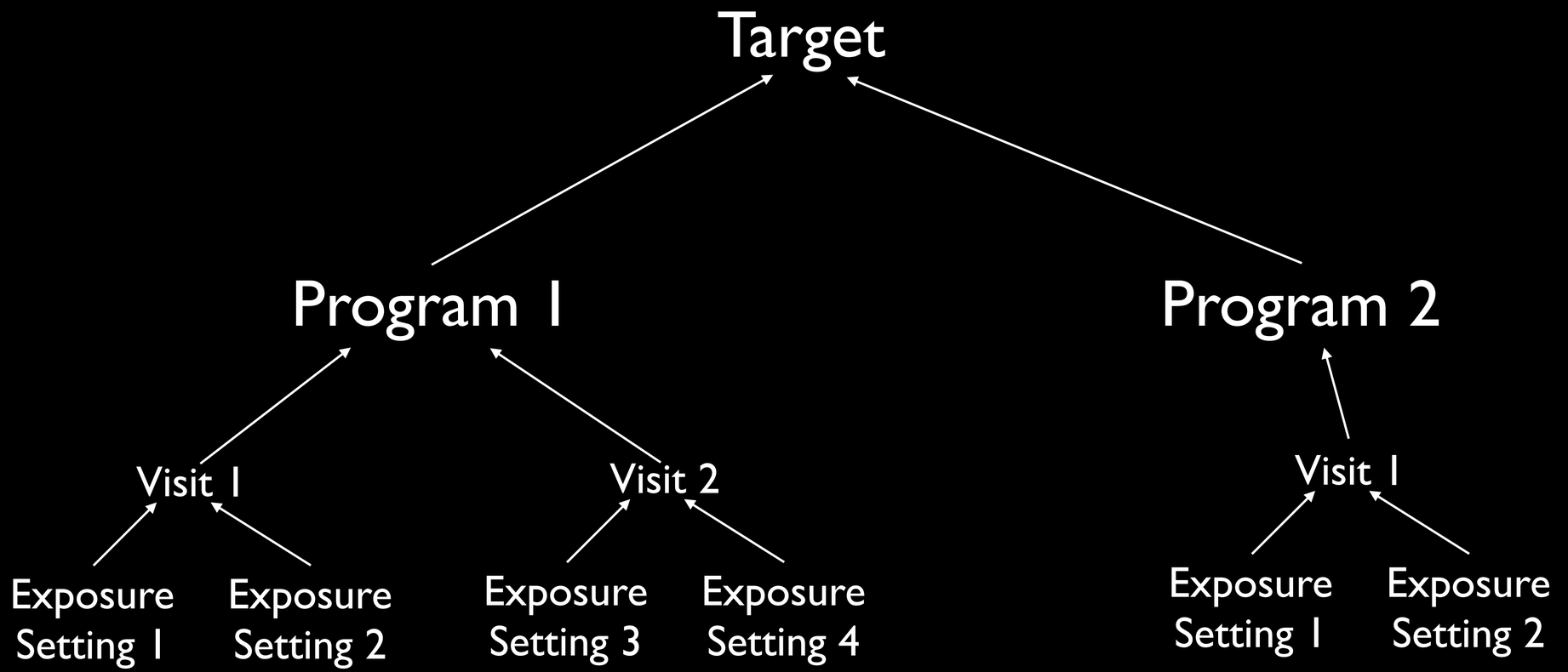
Finding your data

Two problems

Combining the data

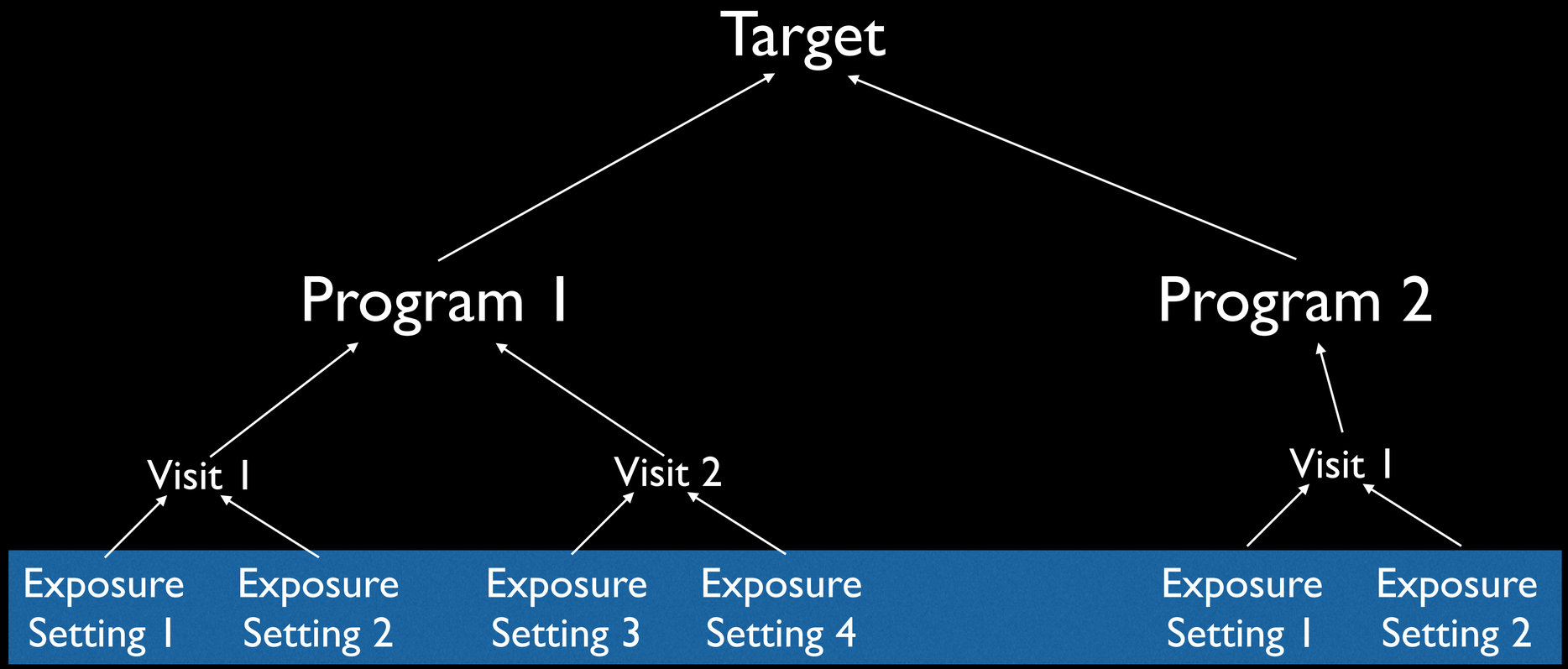
Finding your data

The hierarchy of combination



Science intent and use varies up and down the hierarchy.

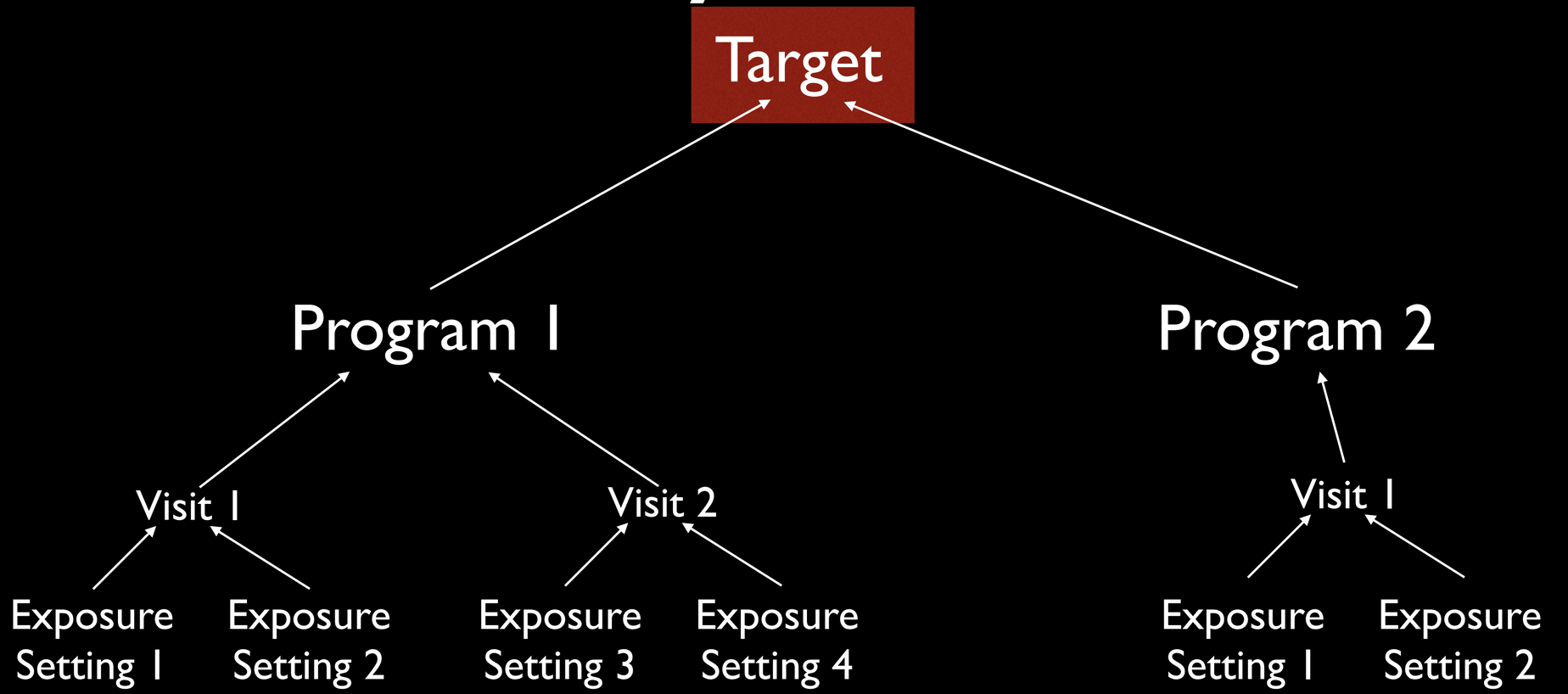
The hierarchy of combination



Current pipelines only add up to the exposure level.

e.g. CALCOS combines data taken with the same grating / central wavelength, aperture, and FP-POS (for imagers: this means per filter per dither position).

The hierarchy of combination



But many (most?) science cases need all data on a given target (with similar resolution).

We generally do not provide such HLSPs, though MAST does host community contributions of them.

Step	coadd_x1d (Colorado-COS IDT)	coscombine (Wisconsin)	counts_coadd (UMass/StScI)	Adopted
Decide which files to combine	input file	input file	named in input file	Automated search of target directory
Wavelength Shifts	cross-correlate strong ISM lines	cross-correlate on manually selected	manually derived from single line	iterative cross-correlation
Coadd method	nearest-neighbor	linear interpolation	shift & add (equiv to nearest neighbor)	shift & add
Renormalize	scale to reference	none	none	none
Units of coadd	flux	counts	counts	counts
DQ handling	discard or deweight	deweight	delete those counts	delete those counts
Background	done by CALCOS	done by CALCOS	subtract bckgnd from gross counts	subtract bckgnd from gross counts
Errors	fix w/ Keeney's empirical relation	compute from gross counts, correct for	Gehrels (1986)	Gehrels (1986)
Fluxing	yes, with scaling to reference	no scaling	No	apply mean flux curve
Binning	optional	optional	1, 3, or 6 pixels always generated	leave to user

“add.py” is a new python code for the combination of 1D spectra
it is a prototype for subsequent SSB development

produces simple counts-based combinations

all SI pipeline calibrations are taken as given

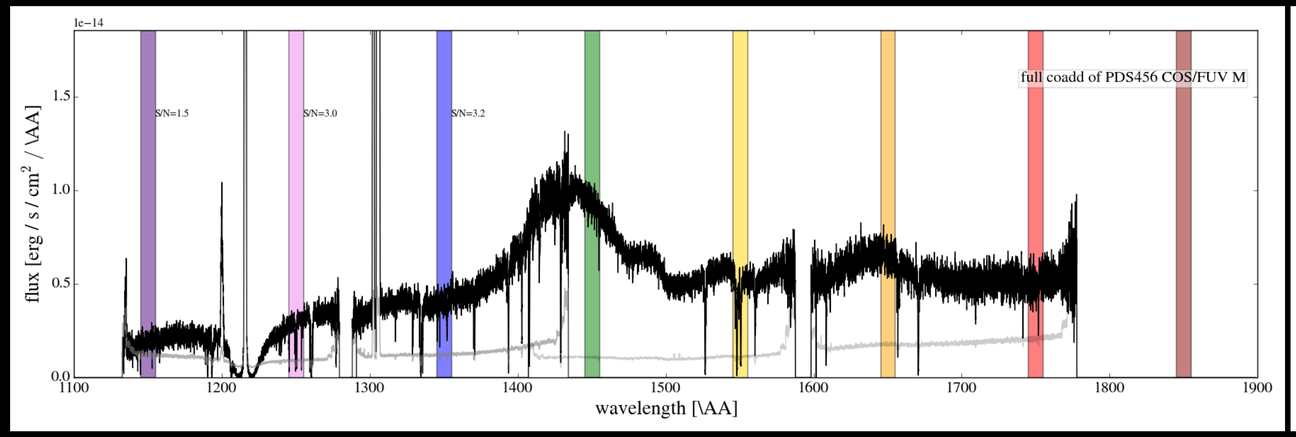
built to combine all data on a given target, grouped by SI mode

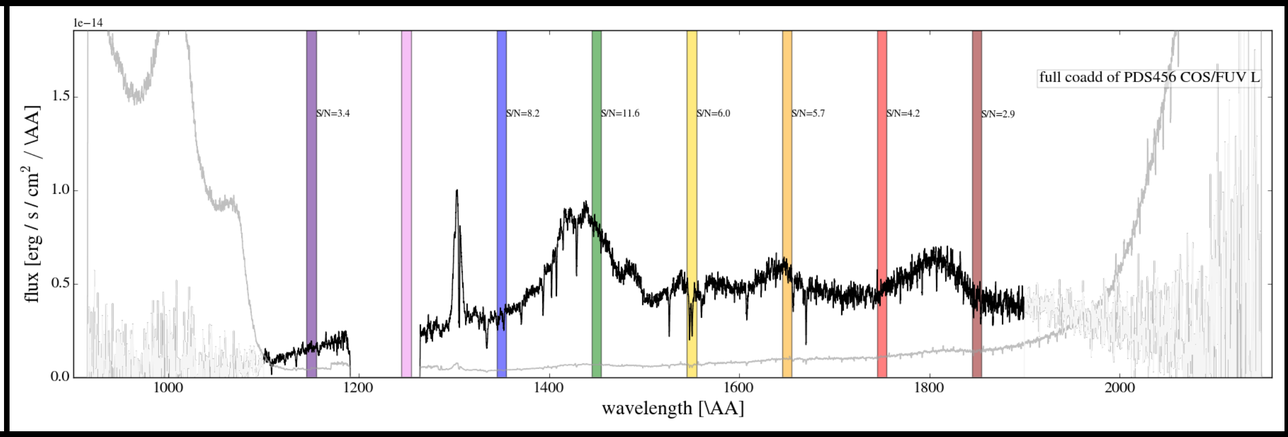
places all exposures in a single mode onto a common, fixed wavelength scale

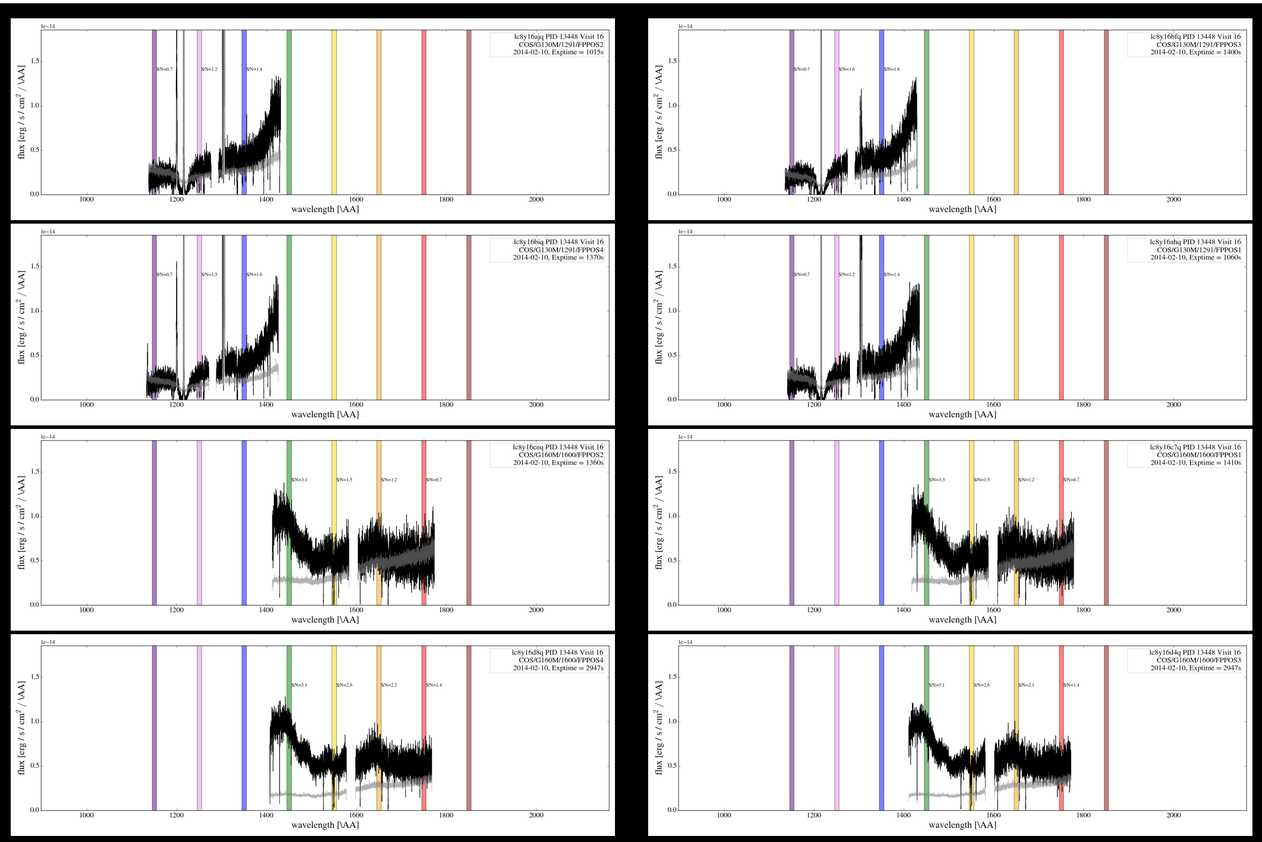
uses and retains all DQ flags

does not combine data at different dispersions (e.g. G130M and G140L)

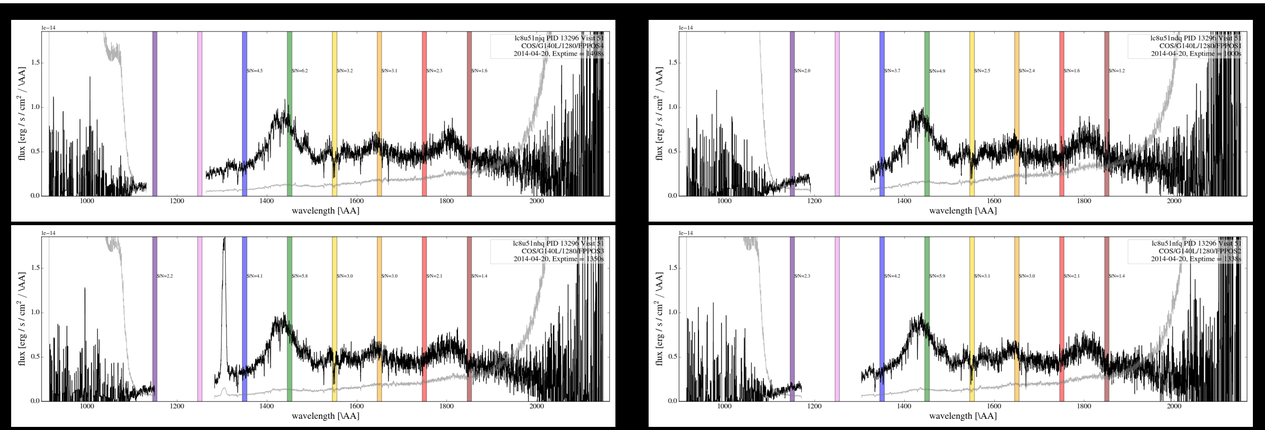
keeps “interpolation” to a bare minimum







G130M/G160M: 8 exposures



G140L: 2 exposures

PDS456

Two problems

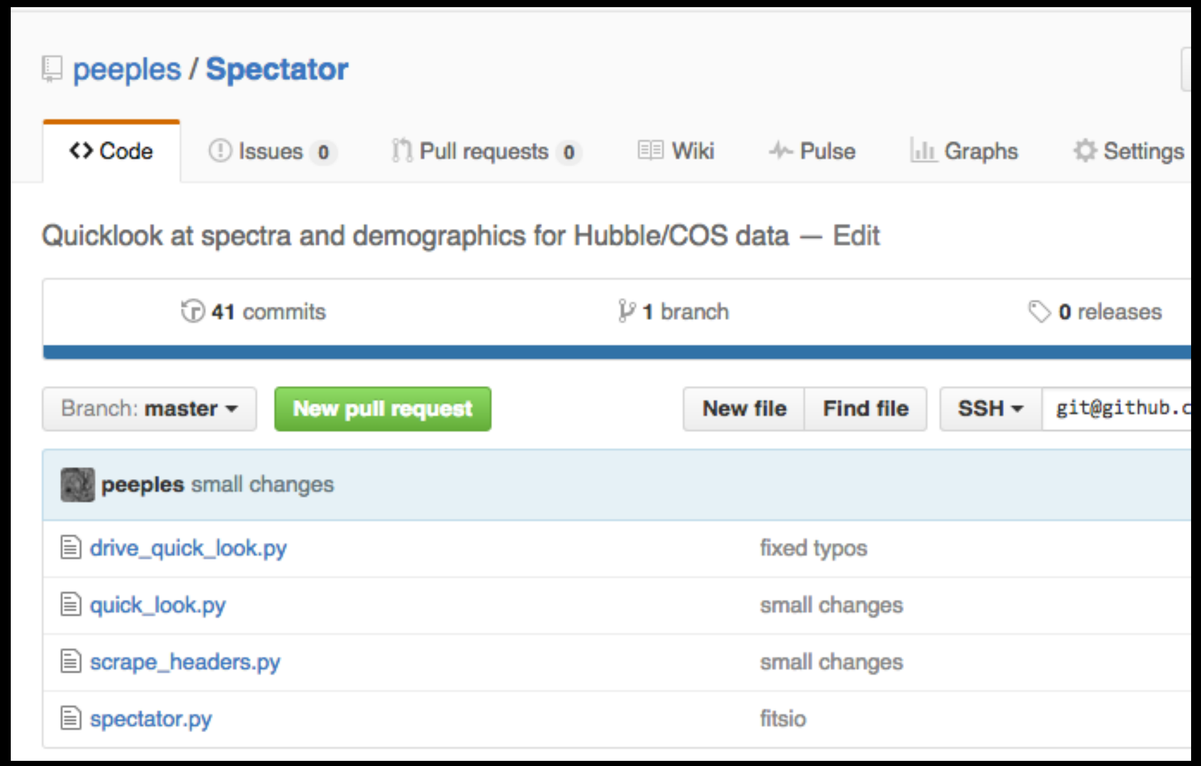
Combining the data

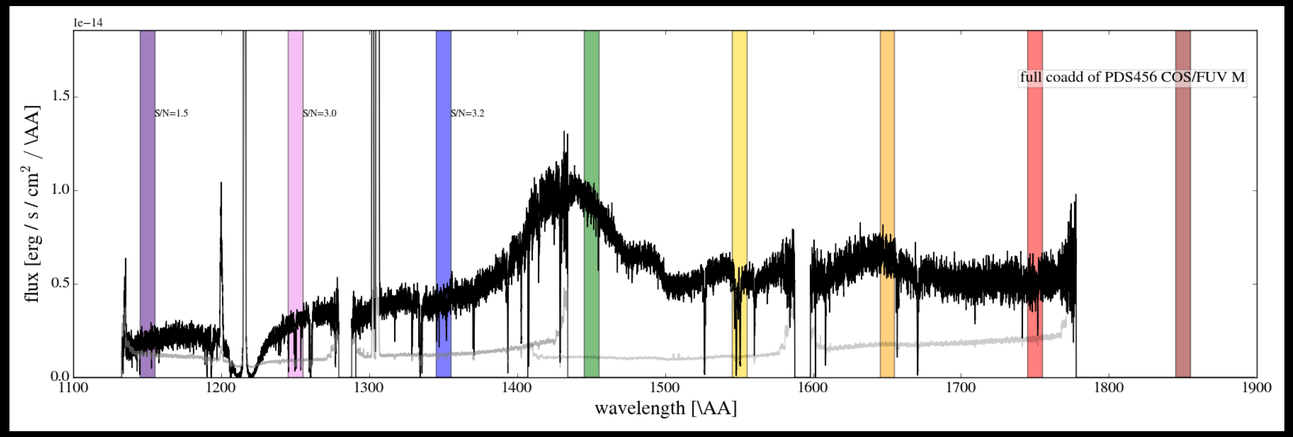
Finding your data

How data is organized
in the archive is a
critical factor in its
efficient use

Smart Archives

powered by “spectator”





curated collections common scientific purpose

organized by target type

includes best available HLSPs

data consolidated by target

user selectable subsamples

one-click downloads

open source on github

target aliasing

PG-1630+377

PG1630+377

[HB89] 1630+377

AzV 18

AZV18

AV-18

Sk 13

spectator allows data from “targets” with different names
to be combined under a single, customizable proper name

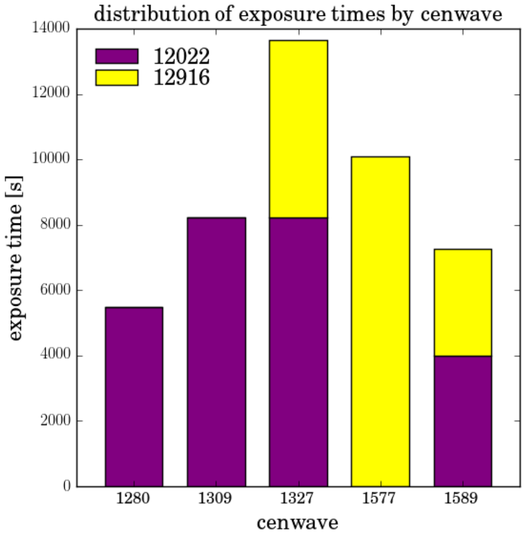
by default the assumed name is drawn from SIMBAD or
NED based on target coordinates

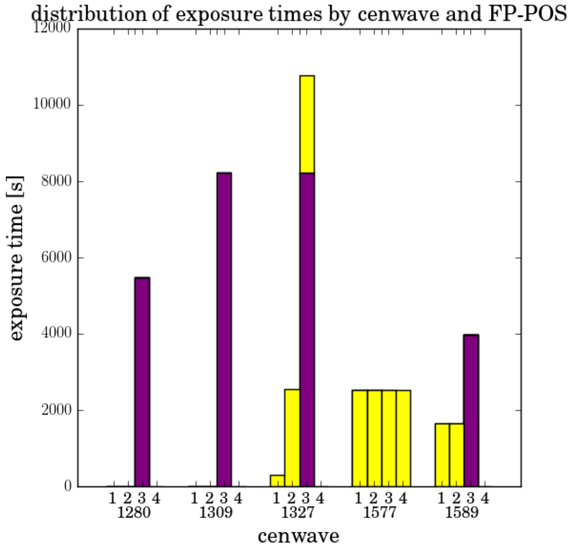
Demo

MARK509

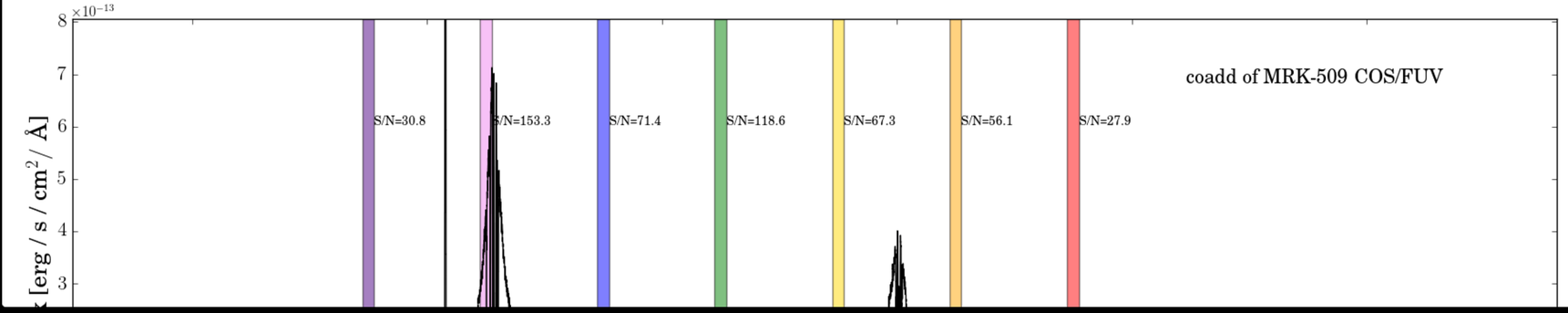
GALAXY;NUCLEUS;SEYFERT
at α = 311.040666667, δ = -10.7235277778 (20h44m09.76s -10d43m24.7s)

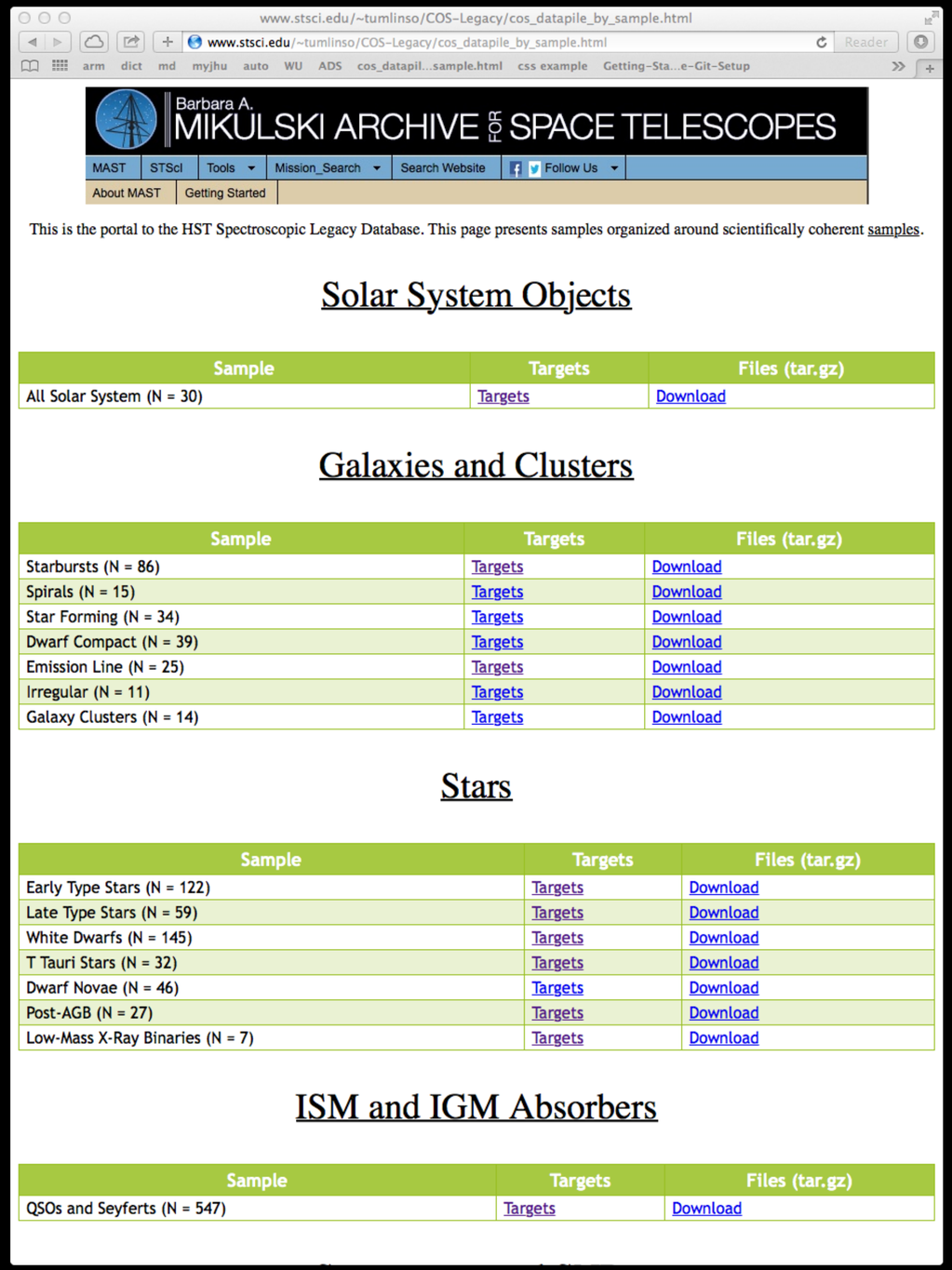
COS quick look of
Programs: 12022 12916





Legend: **flux in black**, **errors in grey**, both smoothed over 7 pixels (~1 resel). S/N=median(flux/error), per unsmoothed pixel, in shaded window.





COS FUV M and L

1394 targets

13121 exposures

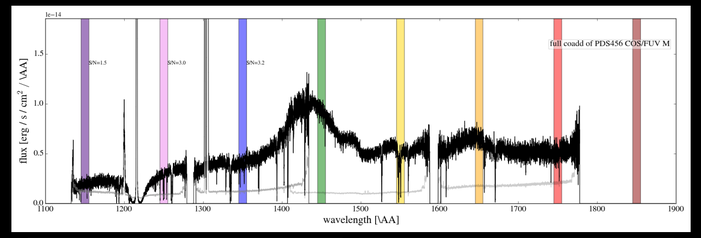
1722 coadded 1D spectra

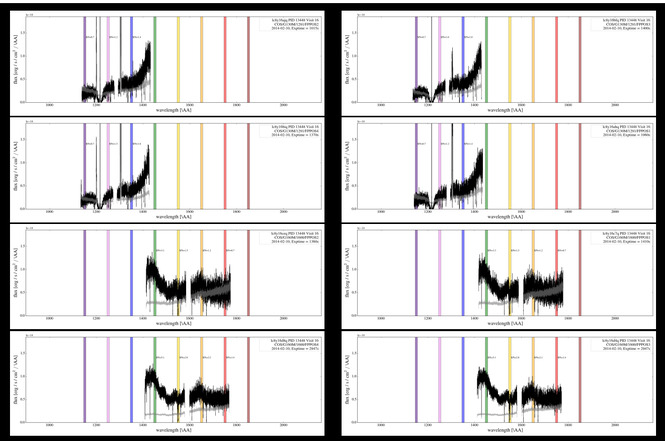
18 science-ready samples

one-click downloads

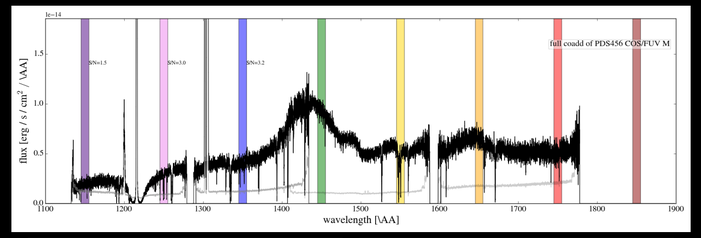
COS NUV+STIS to come

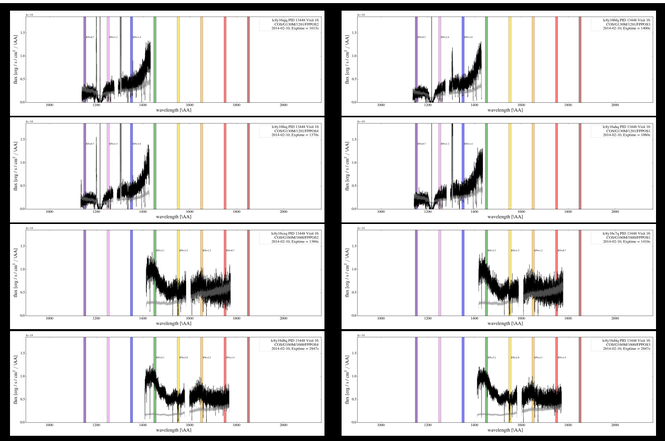
better products



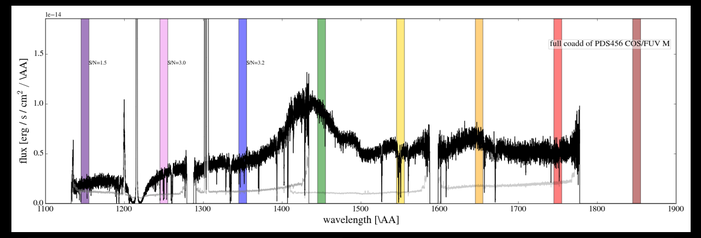


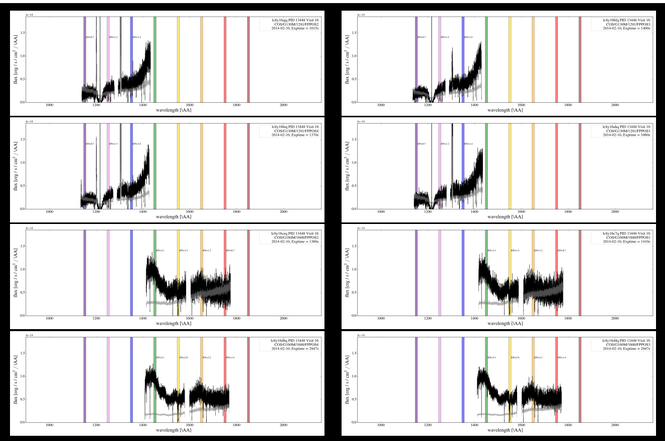
better products +





better products + easier mining





www.stsci.edu/~tumlinso/COS-Legacy/cos_datapile_by_sample.html

Barbara A. MIKULSKI ARCHIVE FOR SPACE TELESCOPES

MAST | STScI | Tools | Mission_Search | Search Website | Follow Us | About MAST | Getting Started

This is the portal to the HST Spectroscopic Legacy Database. This page presents samples organized around scientifically coherent samples.

Solar System Objects

Sample	Targets	Files (tar.gz)
All Solar System (N = 30)	Targets	Download

Galaxies and Clusters

Sample	Targets	Files (tar.gz)
Starbursts (N = 86)	Targets	Download
Spirals (N = 15)	Targets	Download
Star Forming (N = 34)	Targets	Download
Dwarf Compact (N = 39)	Targets	Download
Emission Line (N = 25)	Targets	Download
Irregular (N = 11)	Targets	Download
Galaxy Clusters (N = 14)	Targets	Download

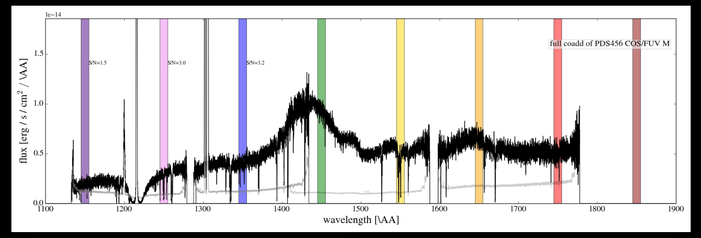
Stars

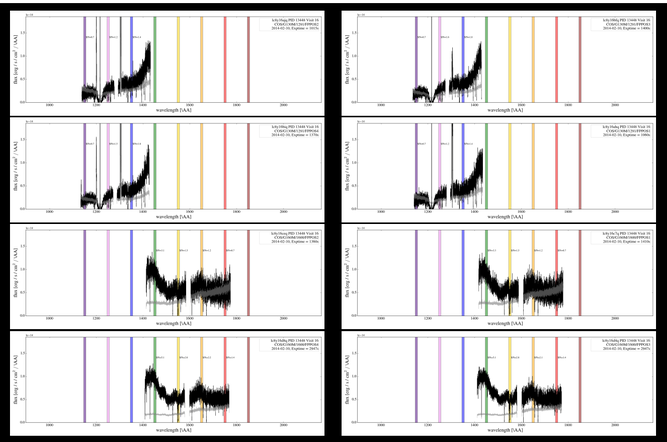
Sample	Targets	Files (tar.gz)
Early Type Stars (N = 122)	Targets	Download
Late Type Stars (N = 59)	Targets	Download
White Dwarfs (N = 145)	Targets	Download
T Tauri Stars (N = 32)	Targets	Download
Dwarf Novae (N = 46)	Targets	Download
Post-AGB (N = 27)	Targets	Download
Low-Mass X-Ray Binaries (N = 7)	Targets	Download

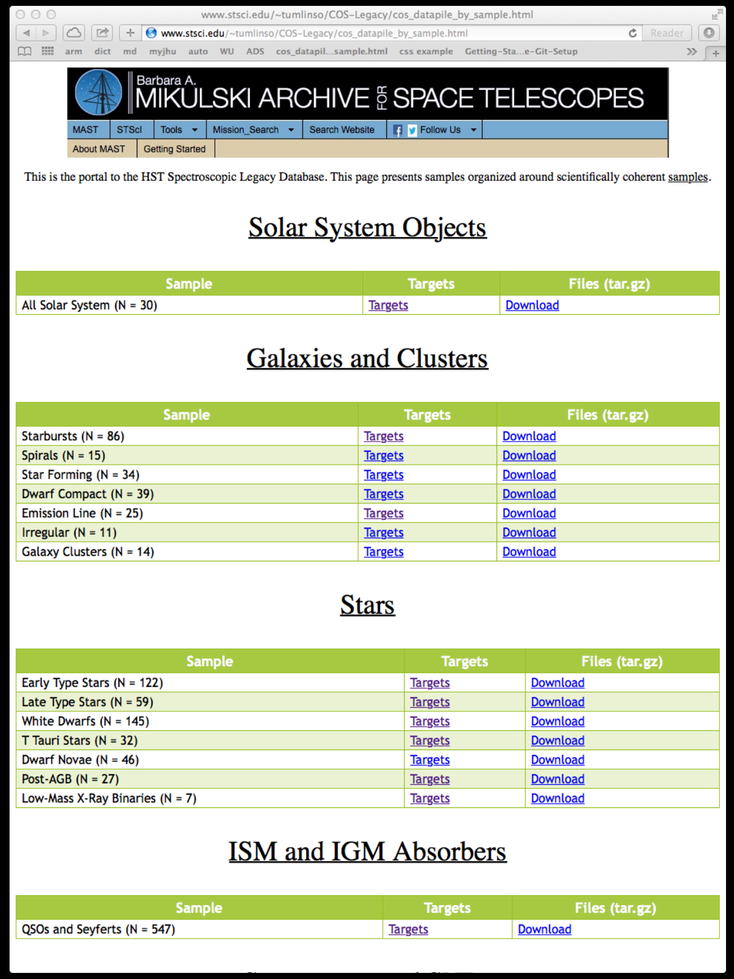
ISM and IGM Absorbers

Sample	Targets	Files (tar.gz)
QSOs and Seyferts (N = 547)	Targets	Download

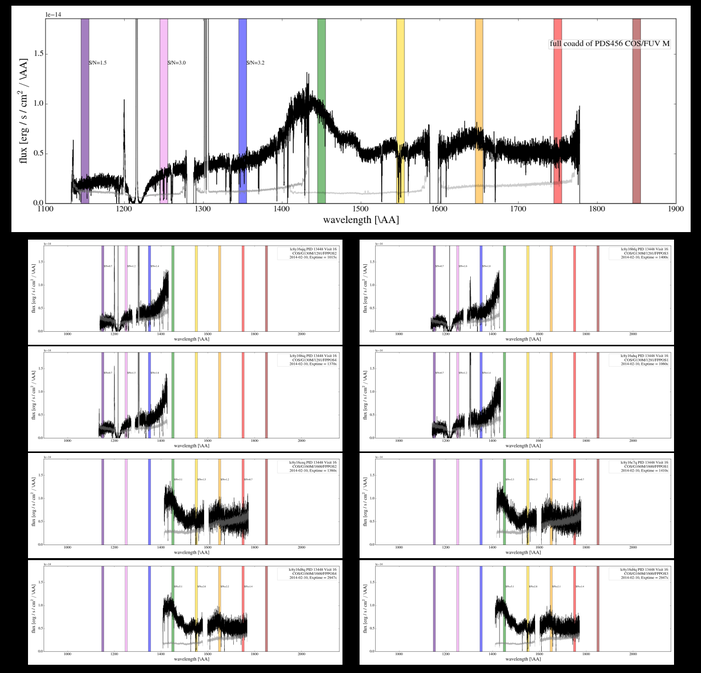
better products + easier mining =

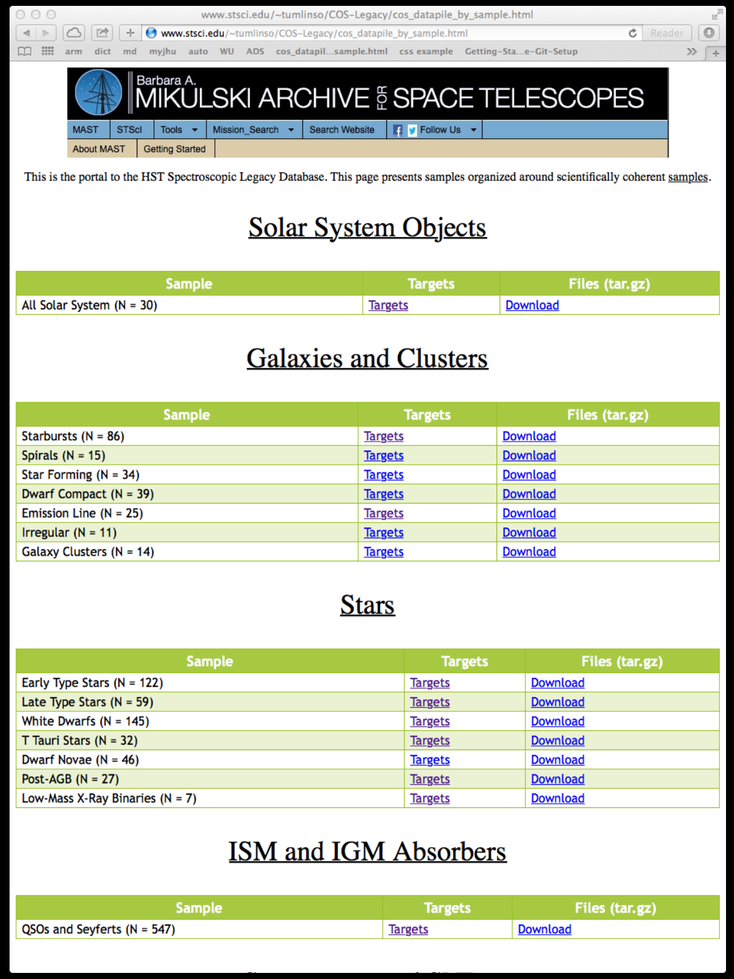


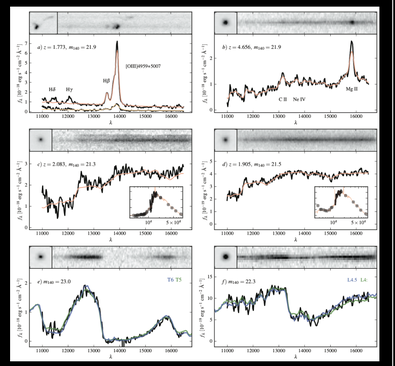


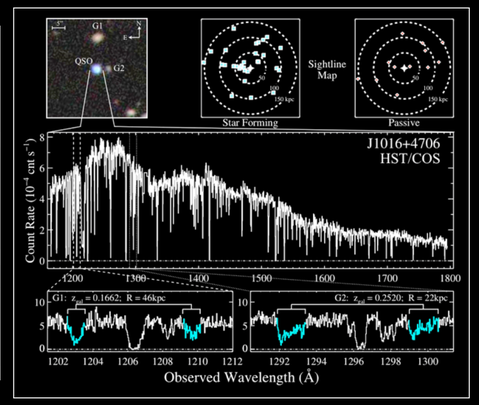


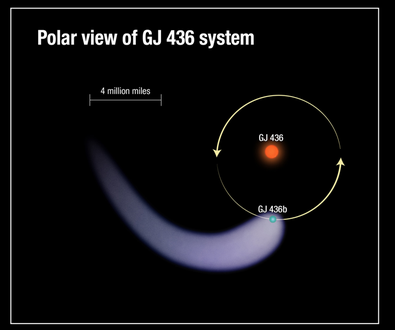
better products + easier mining = more science impact

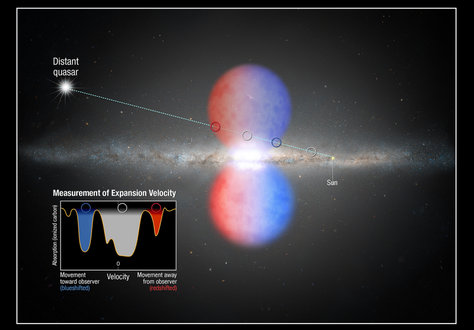












Available online for Cycle 24

$9.99 on iTunes

Free

Beta available today

http://www.stsci.edu/~tumlinso/COS-Legacy/cos_datapile_by_sample.html