Just What Are We Talking About?

What we will lose:

Imaging at $\lambda > 5\mu m$

Spectroscopy at all λ

What we will retain:

Imaging at 3.5 & 4.5μm

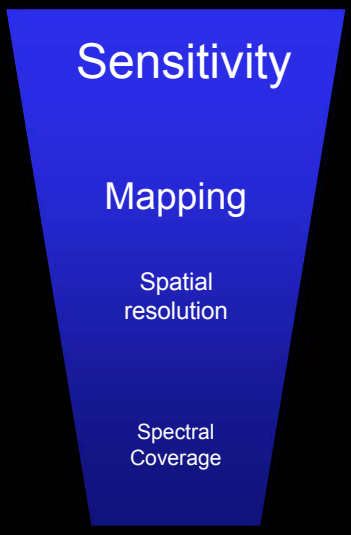
How long do we have:

3 - 5 years - 21-35,000 hrs

15 years of HST

3000 yrs of Keck at 3.5μm !

Your very own MidEx mission!



Big Picture Science Questions

…. Its not a sure thing

Science Priorities from the Decadal Survey:

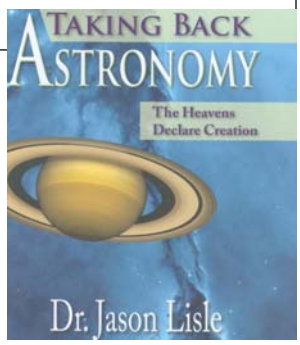
- Large-Scale properties of the Universe, Matter, Energy, Expansion History ✓
- First Stars and Galaxies ✓
- Formation and Evolution of Black Holes ?
- Formation of Stars and Planetary Systems ✓
- Impact of Astronomical Environment on the Earth ✓

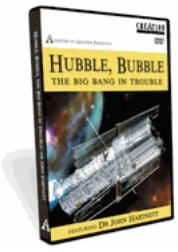
Big Picture Science Questions

Other Science Questions:

- Is there evidence that the Universe was created?
- How and when did the Sun and Moon form ?
- What are stars and how did they form?
- What are redshifts and do they support a *Big Bang*?
- What about black holes?

How did Noah get all those dinosaurs on the Arc?



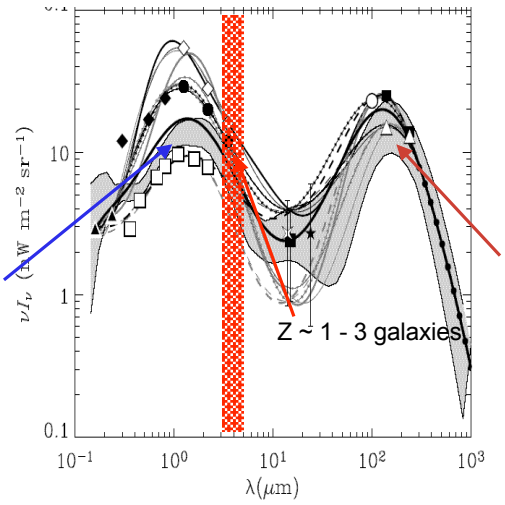


SYNERGY!

Where are We in the Big Picture?

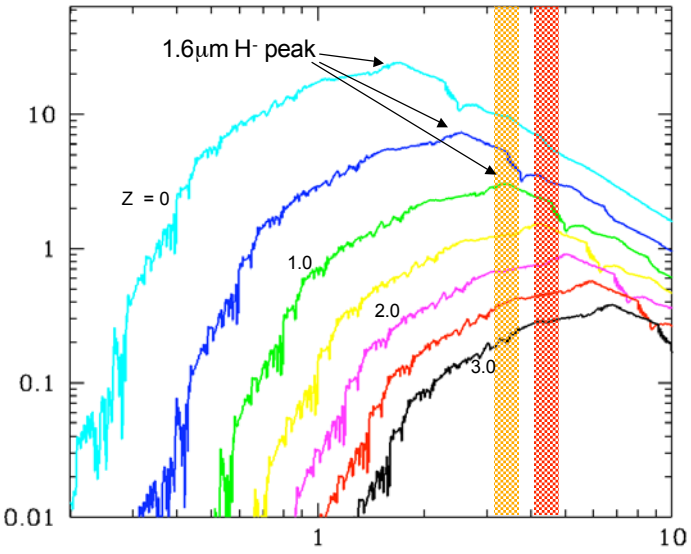
Integrated Extragalactic Background Light

Photospheres of stars and accretion disks

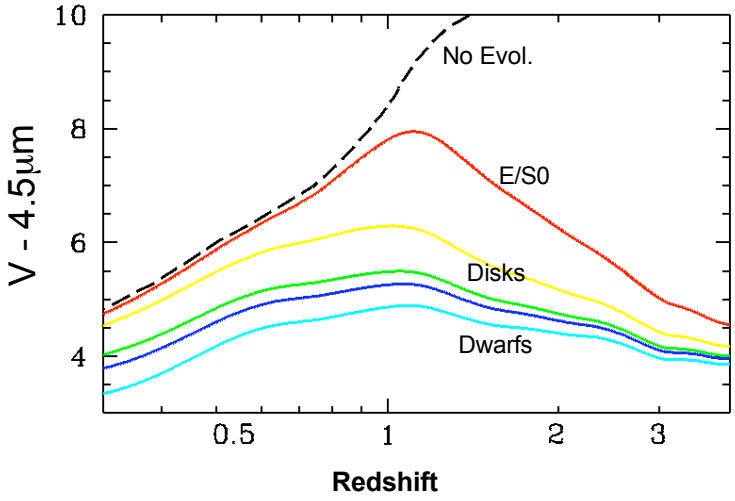


Reprocessed light from stars and accretion disks

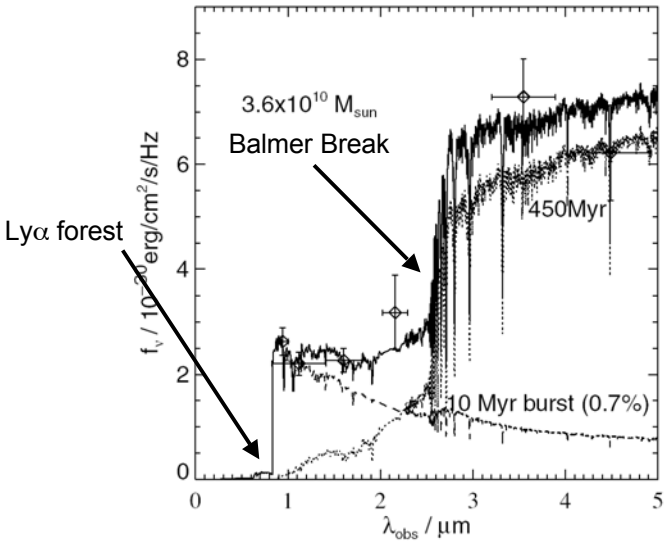
Evolved Galaxies

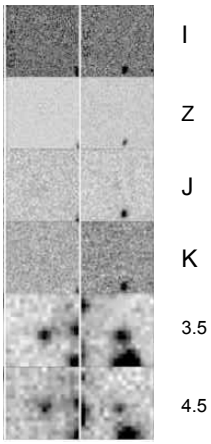


Evolved Galaxies



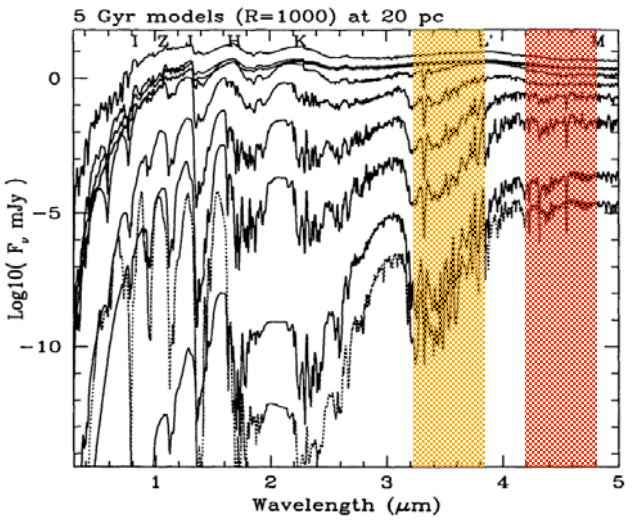
Z = 6 Galaxies





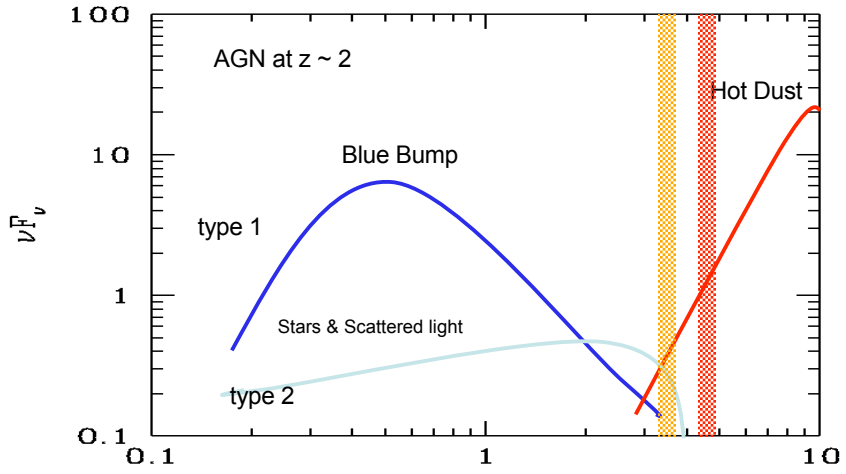
Eyles et al.

Cool Stars & Hot Planets



T_{eff}

Type I & II AGNs



What Should We Be Observing?

GOOD	Less GOOD
Galaxies 1 < z < ?	Star Forming Galaxies
Galaxy Clusters	AGN
Cool & Giant Stars	ULIRGs
Exoplanets	AGN
Planets & Small Bodies	Hot Stars

Key Science Questions

- What is the halo mass distribution as a f(time,environment)

  IRAC probes z > 6 to z ~ 1

- Does light trace mass (no!) - what is the bias?

  Spitzer & HST synergy via weak lensing

- When did the red sequence form and when did clusters & groups turn around?

  IRAC and ground-based Vis - Near-IR surveys

- How are stellar disks structured, how are they built and what truncates them?

  IRAC surface brightness sensitivity

- Do we understand the components and structure of the MW?

  Dust-penetrating & mapping power

Key Science Questions

- What is the stellar/substellar mass distribution as a f([Fe/H],environment)

  IRAC probes the bottom of the MS and beyond

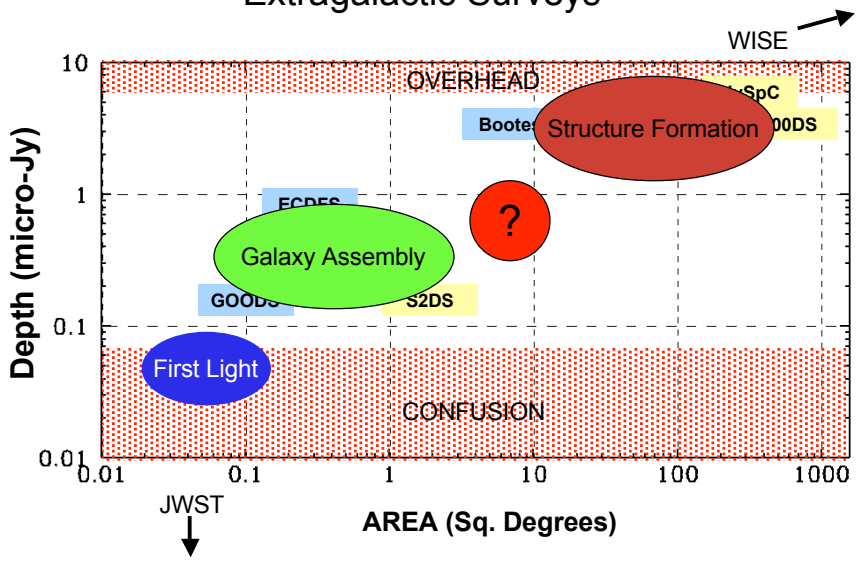
- How do protoplanetary disks form and evolve?

  Spitzer probes hot dust

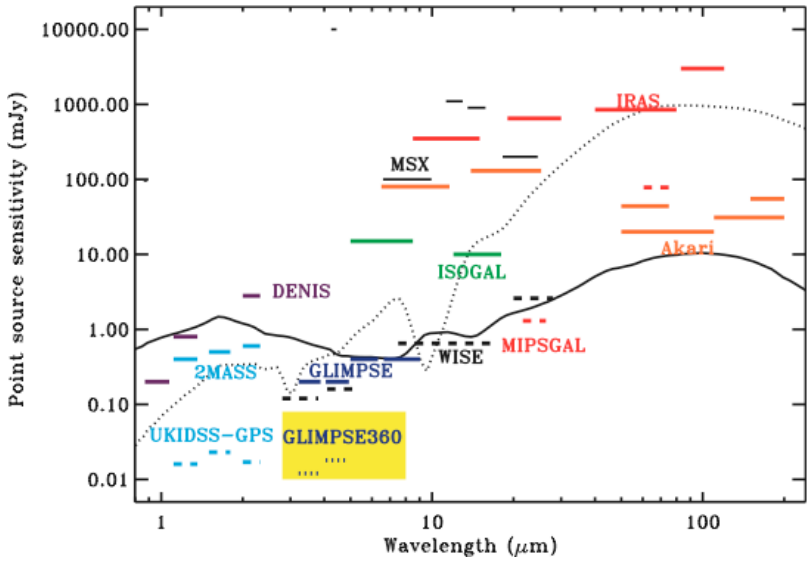
- What sets the equilibrium radii of giant planets & how are they inflated?

  300 micro-magnitude eclipse photometry!

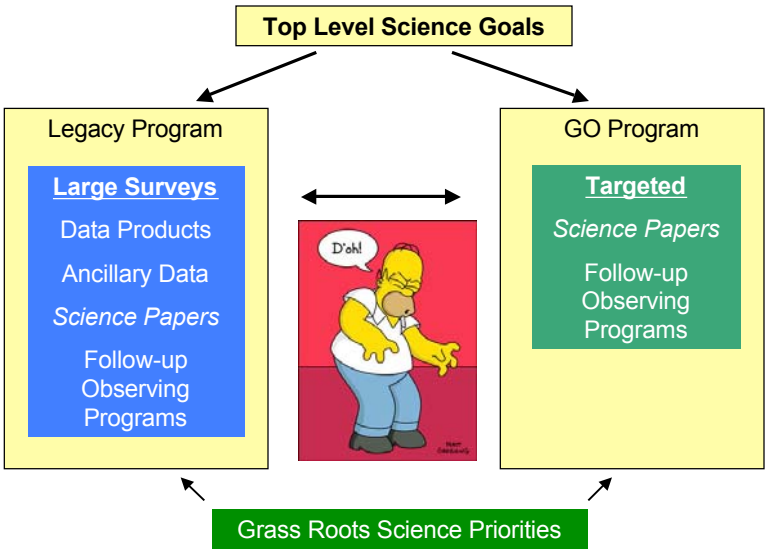
Extragalactic Surveys



Galactic Plane Surveys: A Comparison



How Should We Observe?



Where will the supporting data come from?

From the ground:

SDSS, HyperSuprime, VST, PanStarrs, LSST

UKIIDS, NEWFIRM, VISTA

CARMA, ALMA

From Orbit:

HST/WFC3, JWST, JDEM

Spectroscopy:

VIMOS, IMACS, Gemini/Subaru WFMOS

Should we attempt coordination or continue with laissez faire

& (caveat emptor!) ?

Questions?

- What are the most important science drivers for a warm Spitzer mission?
  We're working on it
- What should be the duration of the warm mission?
  As long as possible/practical
- What is the appropriate balance between smaller and larger programs?
  One size does not fit all!

Questions?

"Far" extragalactic best served by large/huge programs
"simple" experiments at point of diminishing returns?
"Near" extragalactic best addressed with medium programs?
Objects are diverse and low sky density
Milky Way & Stellar Astrophysics needs a mix
Contiguous surveys and target programs
Planets and Exoplanets work well in the current model
The field moves too fast to commit for long periods of time

Questions?

- Should any science programs be specifically solicited for the warm mission?
- Are there any 'huge' (> 5000 hours) projects that should be done? If yes, how should they be selected and organized?
- How does the community participate in science of big projects if not part of the executing teams?
- Can most of the review process be done remotely instead of bringing 100 people to Pasadena annually for week?

A Modest Proposal…..

Science Planning in the Warm Era

Consider this:

There is only one observing mode

PI's propose: (1) What science they want to do, (2) **where to point**, (3) **how long to expose**, and (4) how they will analyze their data.

Reviewers will discuss: (1) did they write a good science story, (2) **are they pointing in a sensible place**, (3) **are they exposing for the right duration**, and (4) can they properly analyze their data.

The proposal process should not be a creative writing contest with Spitzer time as the first prize

Science Planning in the Warm Era

Alternatively one could:

• Identify a number of Key Science Areas and some guidelines for programs that address these

• Invite teams to propose (1) **where to point** and (2) **how long to expose**, and describe what **ancillary data** they can bring to bear on a problem.

• Invite teams to propose for funding to deliver high-level data products and tools to the Spitzer archive

• Enable coordination with other large data sets & instruments/facilities

• Allow proposals for large programs outside the Key Science Areas

• Set a threshold below which proposals are *reviewed and judged by a standing review committee* (30 hours?) Change the cadence for these?

• Decouple funds from observing time for small programs (?)

• Remove proprietary period for programs above the internal review threshold

Questions?

- How should we balance archival support vs. support for new data?
- What public 'HDF-style' program should be prepared for the cryo/warm transition period?
- Are ToOs an important component of the warm mission? If yes, at what level?

Some Possible Key Science Programs

- Complete surveys of galactic plane (GLIMPSE2/360?)
- Survey of open clusters
- Structure of disk galaxies
- Exoplanet transits/eclipses
- Survey of SS small bodies
- Searches for T & Y dwarfs *in parallel?*
- IR-excess in white dwarfs
- Ultra-Deep survey of the end of the Dark Ages
- Spitzer deep survey for galaxy and structure building
- Ultra-wide survey for clusters at z > 1

Questions?

WHERE DO WE GO FROM HERE?

More science planning discussions, coordination with VISTA, UKIIDS,VST, Gemini/Subaru WFMOS, discussions with STScI RE WFC3

Refine science priorities and straw persson programs
How do we engage a larger community?
How would this community like to engage in the future?