Science Planning for a Limited Lifetime Mission
- Spitzer Experience

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• Spitzer had a 2.5 year prime mission lifetime requirement, goal of 5 years (lasted 5.5)

• Spitzer had no precursor ‘finder charts’ at the sensitivity levels it would reach

• typical science cycle too long for a 2.5 year mission
  propose ➔ observe ➔ analyze ➔ publish ➔ interpret ➔ repeat
How to Maximize Science?

• Legacy Science Program

• First Look Survey

• Second-Look Observations
Legacy Science Program

- Select large, public programs to execute early in the mission
- Require data products to be returned to the archive
- Criteria for competitive peer review
  - Large, coherent projects, not reproducible by any reasonable number of combination of smaller GO programs
  - General and lasting importance to the broad astronomical community with the Spitzer observational data yielding a substantial and coherent database
  - Data public domain immediately upon processing and validation, thereby enabling timely follow-up
Legacy Science Program (2)

- 6 programs, 3160 hours selected in November 2000
  - Launch scheduled for 2001 when call for proposals issued, actual 2003

- Executed in first year of the mission
  - Half of the data in first year was non-proprietary

- Legacy programs solicited in Cycles 2-5
  - Continued with zero proprietary period and return of enhanced data products

- Legacy enhanced data products are some of the most popular data available in the archive
  - Same experience HST has with deep fields and Treasury programs
• First Look Survey (FLS) was designed to provide data to the community that characterized the Spitzer sky

• **100 hours of Director’s Discretionary Time**
  – 3 components: extragalactic, galactic, asteroids
  – Observations and field selection based on community input workshops
  – Execution and data reduction done by the SSC

• **First observations executed in nominal operations**
  – After 60-day In-Orbit Check-out, 30-day Science Verification phases
  – Early Release Observations primarily executed during IOC and SV
Second-Look Observations

- Spitzer cryogenic mission proposals allowed the inclusion of ‘second-look’ targets
  - Defined as something you could predict but you did not know the target positions
  - Used frequently with imaging surveys that proposed second-look spectroscopic observations
  - Did not have to wait for the next cycle to do spectroscopy on all of your targets
Other Observing Programs

- All other General and Guaranteed Time Observer programs had nominal one-year proprietary periods

- Many large programs waived the proprietary period (Legacy programs always zero)

- DDT programs have default zero proprietary period
  - Can request a maximum of 90-days
Warm Mission

• > 75% of the time awarded to > 500 hour programs
  – Default zero proprietary period, can request 90 days

• All other programs have default one-year proprietary periods
  – Many large (> 100 hour programs) waive the proprietary period or ask for a shorter period (90-180 days)
Landscape in 2003

- HST, Chandra, XMM operating
- GALEX launched in April
- Spitzer launched in August
- SWIFT, Fermi, Kepler, WISE, Herschel, Planck coming in the future
- JWST approved and planned for 2011 launch
Landscape in 2018

- HST?, Chandra?, TESS operating

- HST, Spitzer, Chandra, Kepler, etc. will have provided substantial initial target lists for JWST

- At launch, JWST data reduction pipelines, tools, etc., should be much more mature leading to a faster turnaround in data observation-to-publication
Closing Thoughts

- The Spitzer project implemented innovative programs to provide data to the community early in the mission to maximize the overall science return.

- Typical time period from observation to publication is 2-3 years, regardless of the proprietary period.

- Need creative policies to address the conflicting drivers, provide reward to GTOs, get data out early and prime the follow-up cycle to accelerate and maximize the science.