SETI Strategy with the ATA

Assessing priors, relative advantages, and search optimization

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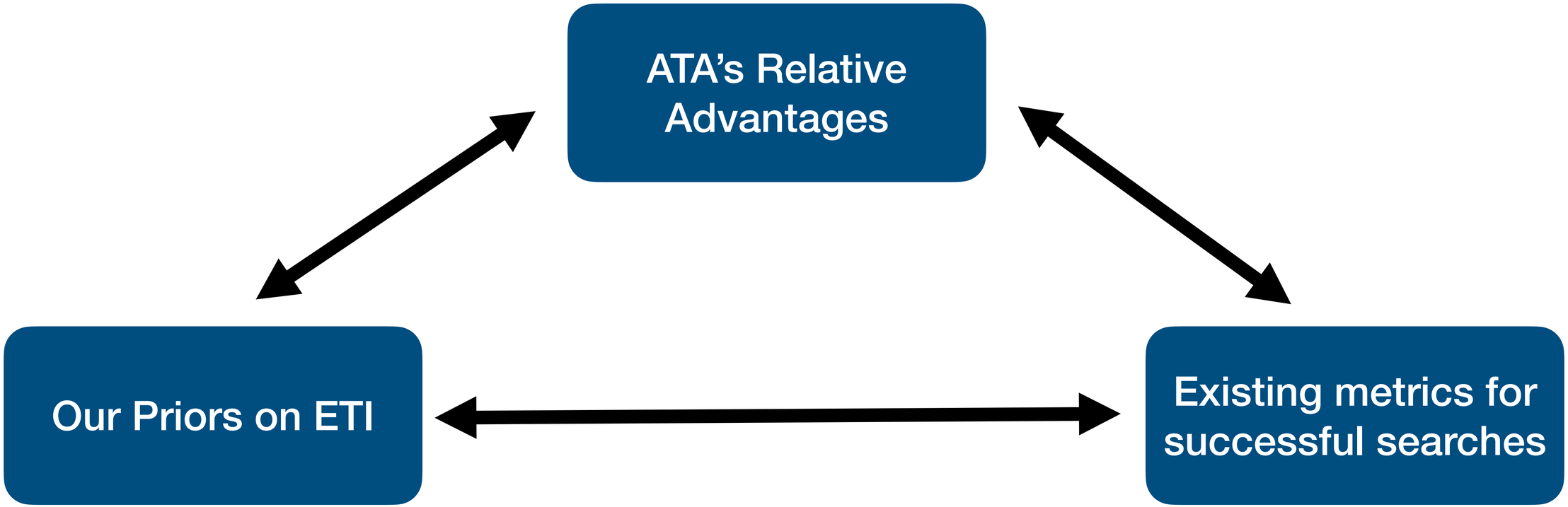
How do we design an optimal SETI Strategy for the ATA?



The ATA's Relative Advantages

- Volume of available observing time
- Large field-of-view
- Ability to perform synchronized observations with temporal events
- Large bandwidth (esp. at high frequencies)
- Good RFI rejection (compared to single-dish)
- **Comparative Disadvantages:** Not as sensitive as large single-dish, can only injest ~650 MHz at a time

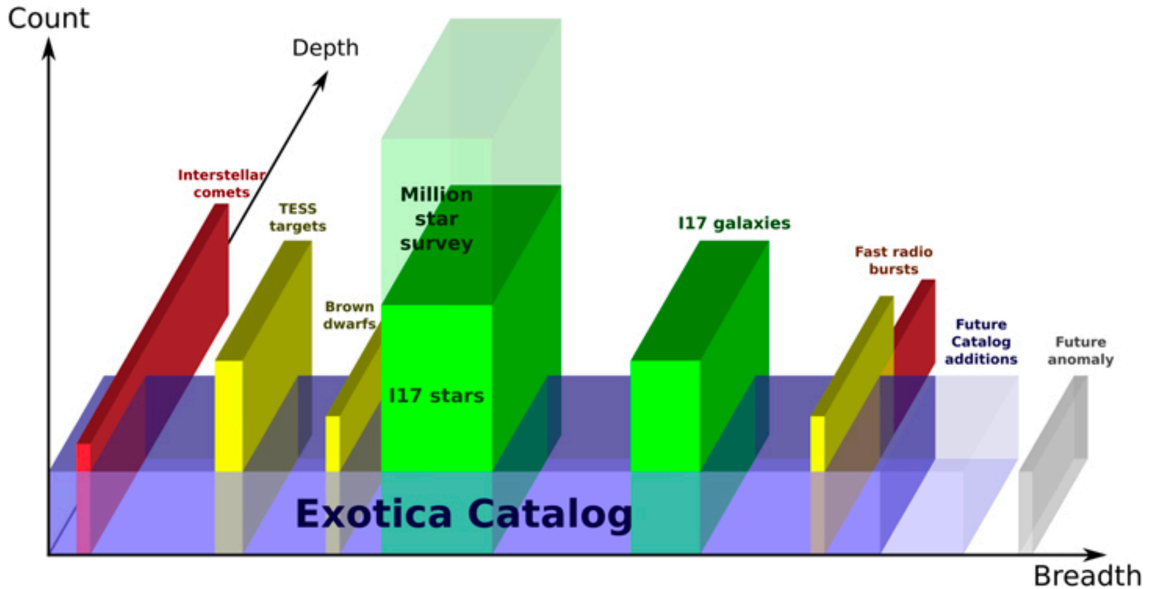
SETI Strategies that play to the ATA's Advantages

- Huge, long-term surveys
- Synchronized "Schelling point" observations
- Targeted high-frequency observations of promising targets
- Follow-up on interesting astrophysical events
- **Strategies that do not suit the ATA:** Deep single-target observations

Metrics for successful searches

Breadth-Count-Depth

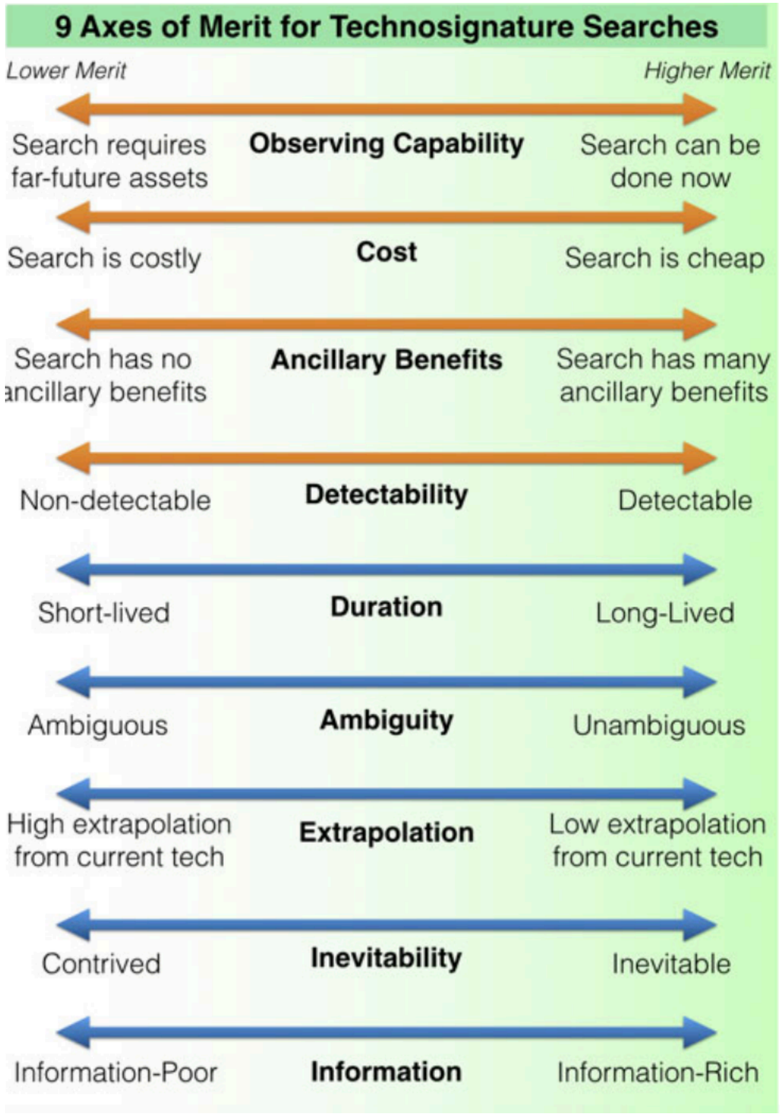
- Brian Lacki's **Breadth-Count-Depth** framework
  - **Breadth:** assume a fully uniform prior, look at every kind of astrophysical environment (unbiased)
  - **Count:** assume one kind of object (e.g., sunlike stars) is more likely than others, but assign a uniform prior to that class of objects
  - **Depth:** focus on a single object exclusively
- Informed by the previous slide, ATA is good for **Breadth** or **Count** strategies



Metrics for successful searches

9 Axes of Merit

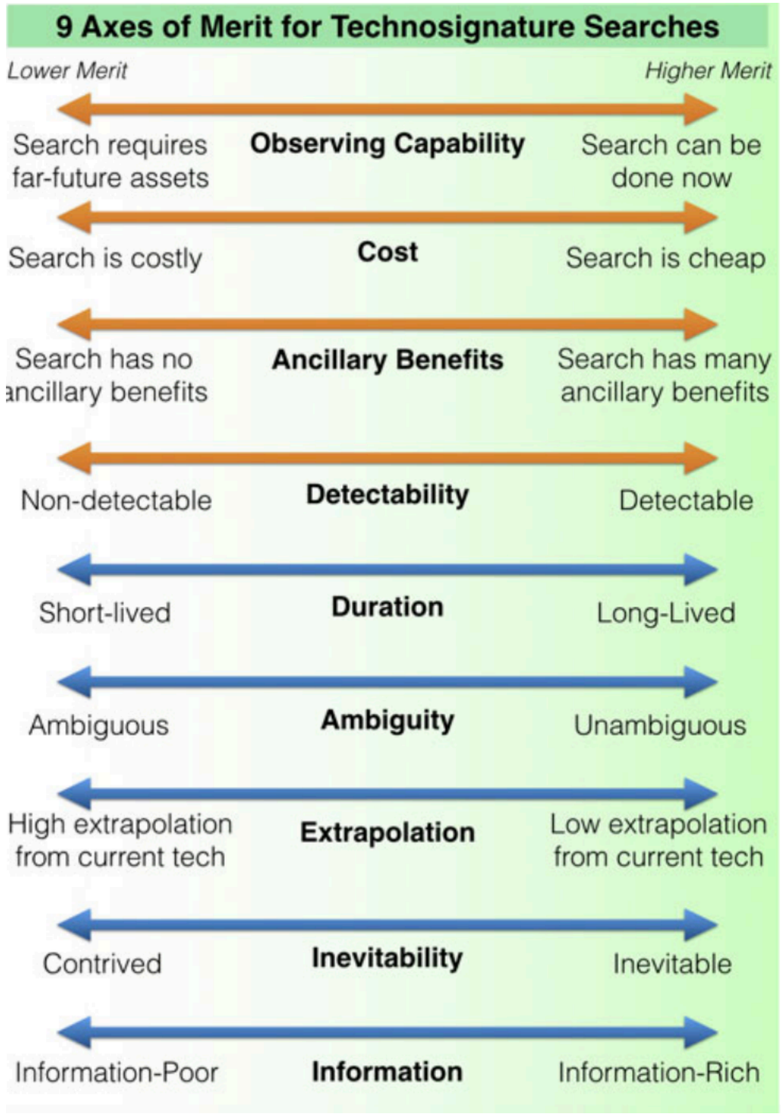
- My **9 Axes of Merit** framework
  - ATA scores well on the logistical part of the 9 Axes because…
    - Searches can be done now, with existing instrument
    - Don’t need to worry about pitching ancillary science benefits to a committee (can maximize other axes)
    - Note: Can’t set as stringent sensitivity limits



Metrics for successful searches

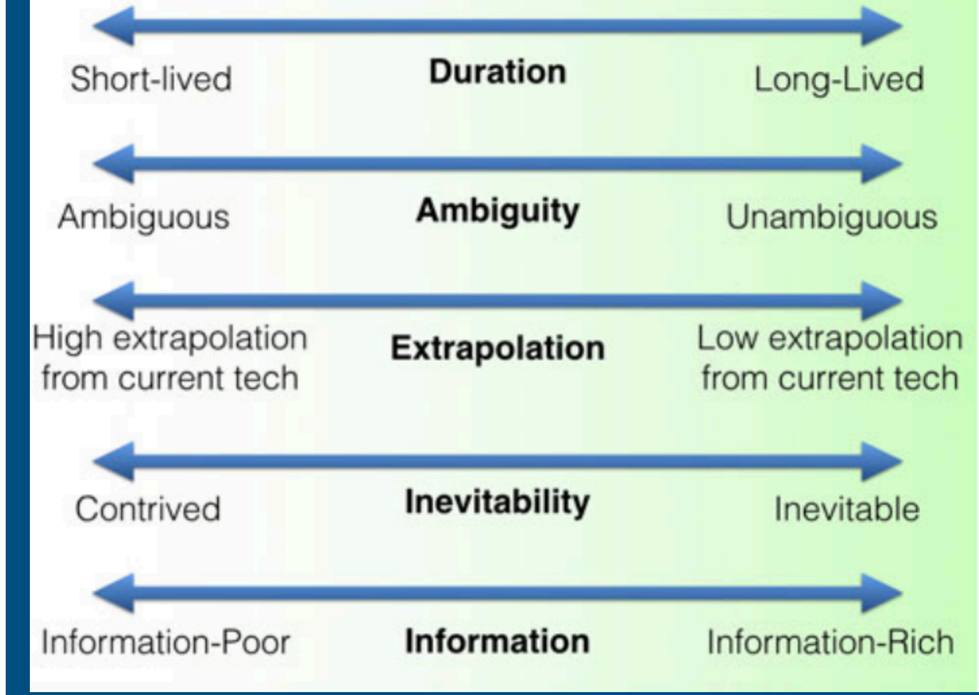
9 Axes of Merit

- My **9 Axes of Merit** framework
  - For the technosignature-specific part of the 9 axes, we need to convolve this with our priors…



Our Priors on ETI

- Are ETIs common?
- Are ETIs old (Myr-Gyr) or young?
- Is movement of ETI between stellar systems possible?
- Is movement of tech between stellar systems possible?
- Have ETIs invested resources in contact with other species?



Based on your answers, you can identify which of these axes to “strike out” or take a low score in

Our Priors on ETI

Example: Can use priors to design survey strategy

	ETI is bright	**ETI is faint**
ETI is common	Pointing doesn't matter too much: **full sky survey**	Focus on **nearby stars**
ETI is rare	Pointing important: Focus on dense regions like **galactic center**	Try larger selection of **near-ish stars** OR rely on **Schelling points**