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What kinds of interferometric science will be feasible from the ground?

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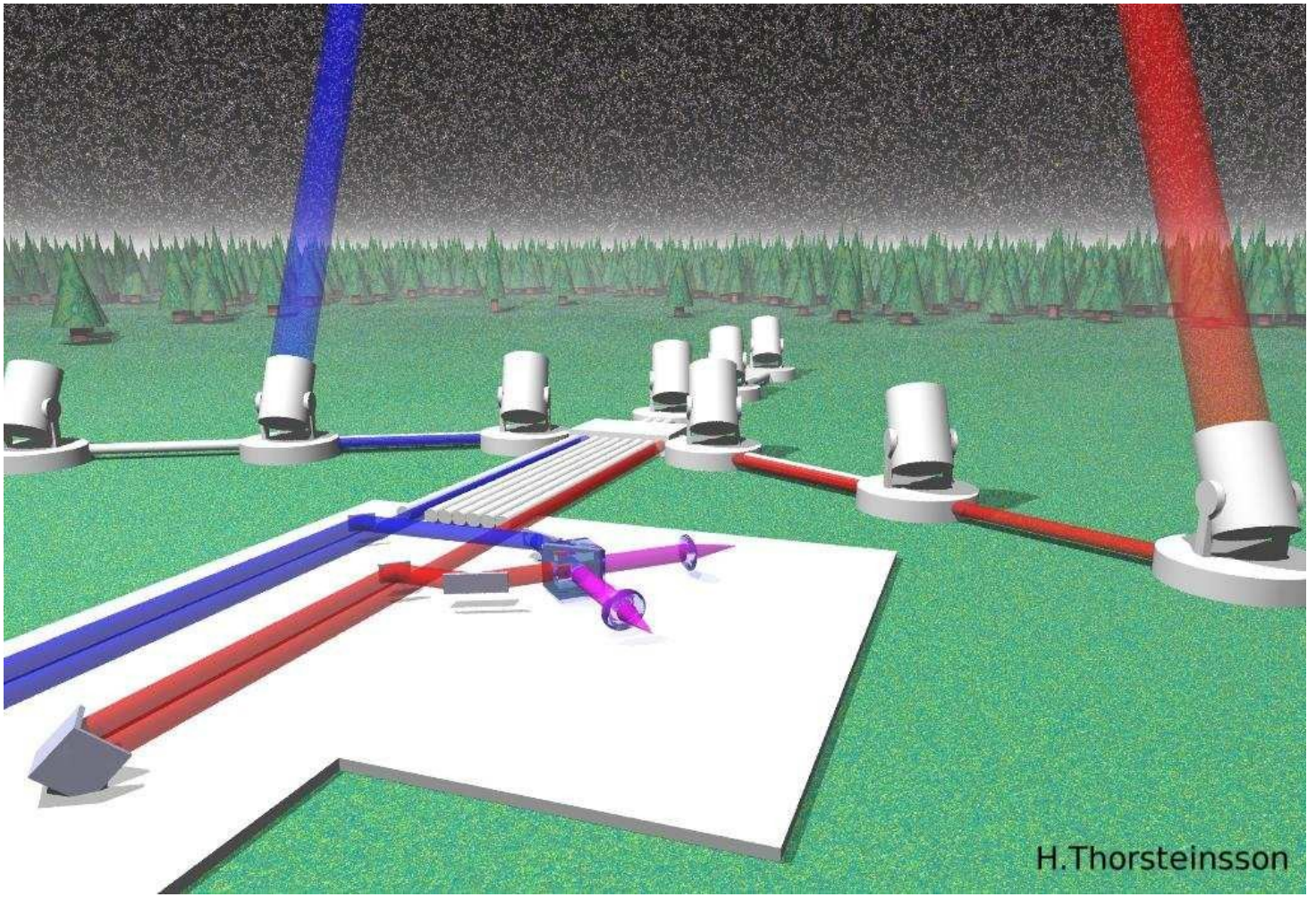
We would like to develop science cases for a new interferometer



A purely “science-driven” approach can develop science cases which are infeasible

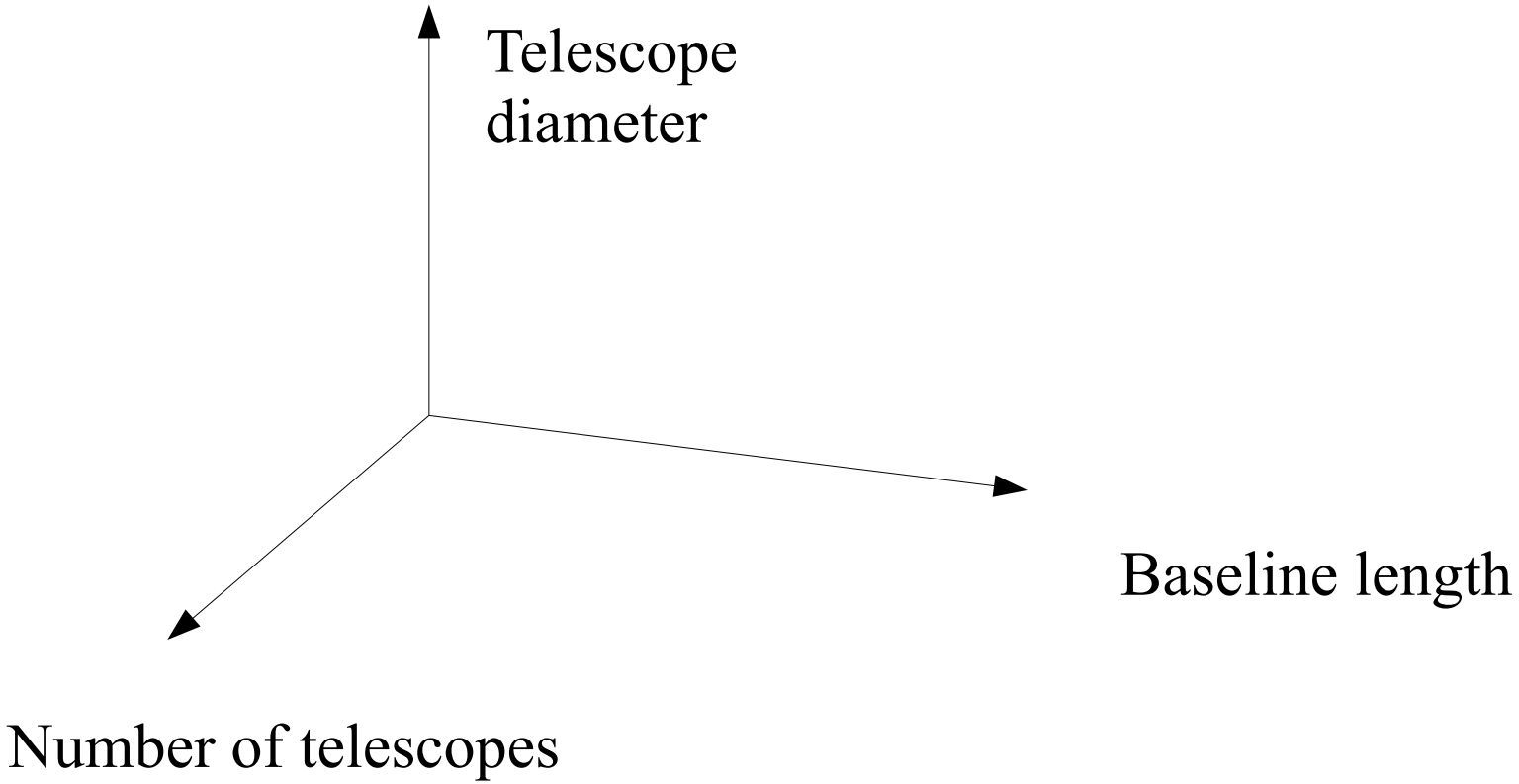
Understanding the technical limitations will serve to focus the science

By mapping out the “feasibility landscape” we can plan a route to the future

A new interferometer must have significant new capability to do new science

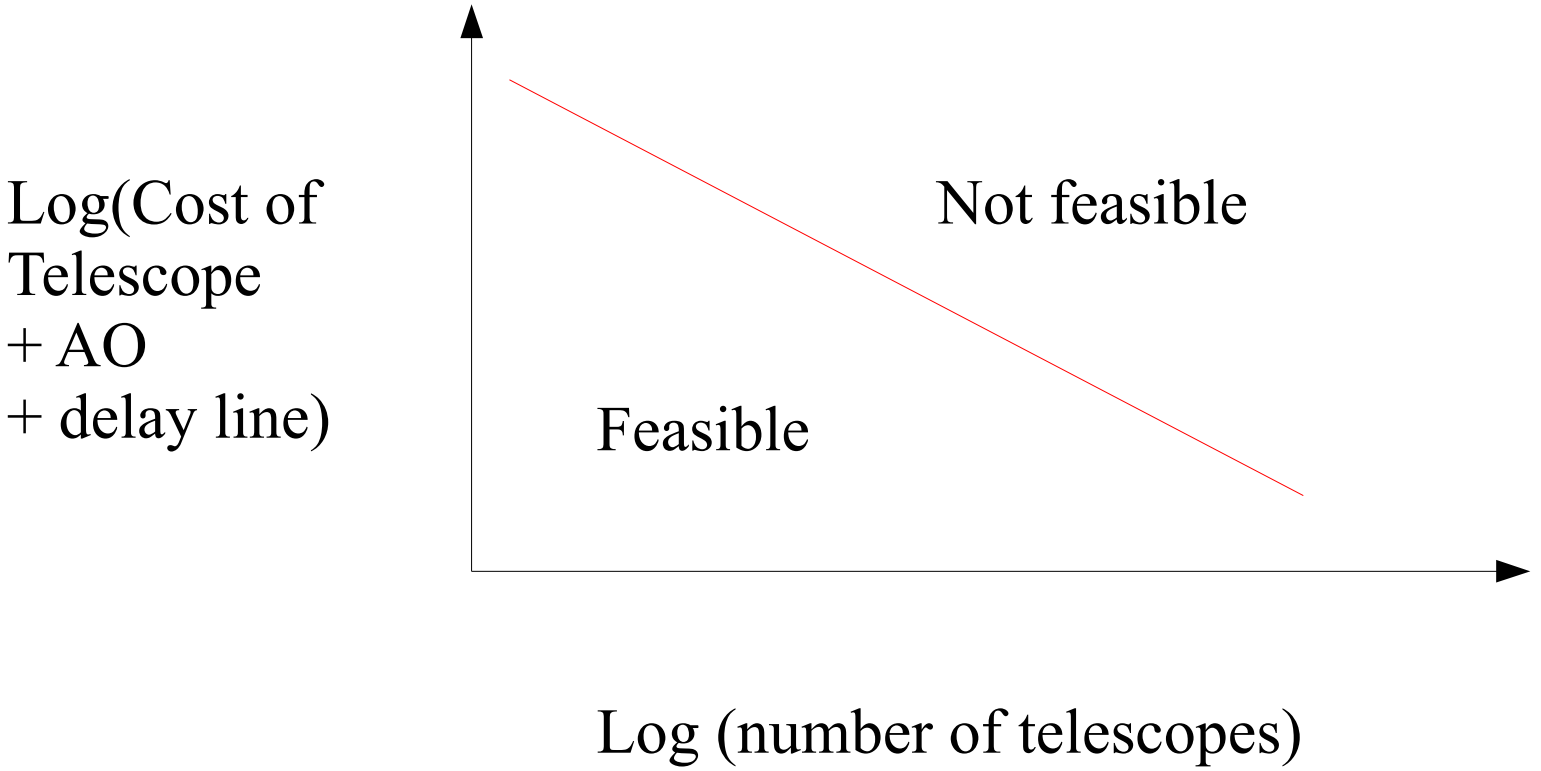
- Spatial resolution
  - Baselines of many km to resolve X-ray binaries
- Spectral resolution
  - R~30000 velocity-resolved stellar winds
- Dynamic range
  - Better than 10^4 needed for hot Jupiters
- Limiting magnitude
  - More targets
- Image complexity
  - Complex physics – turbulence, clumping

We can represent possible interferometers as points in a multi-dimensional space

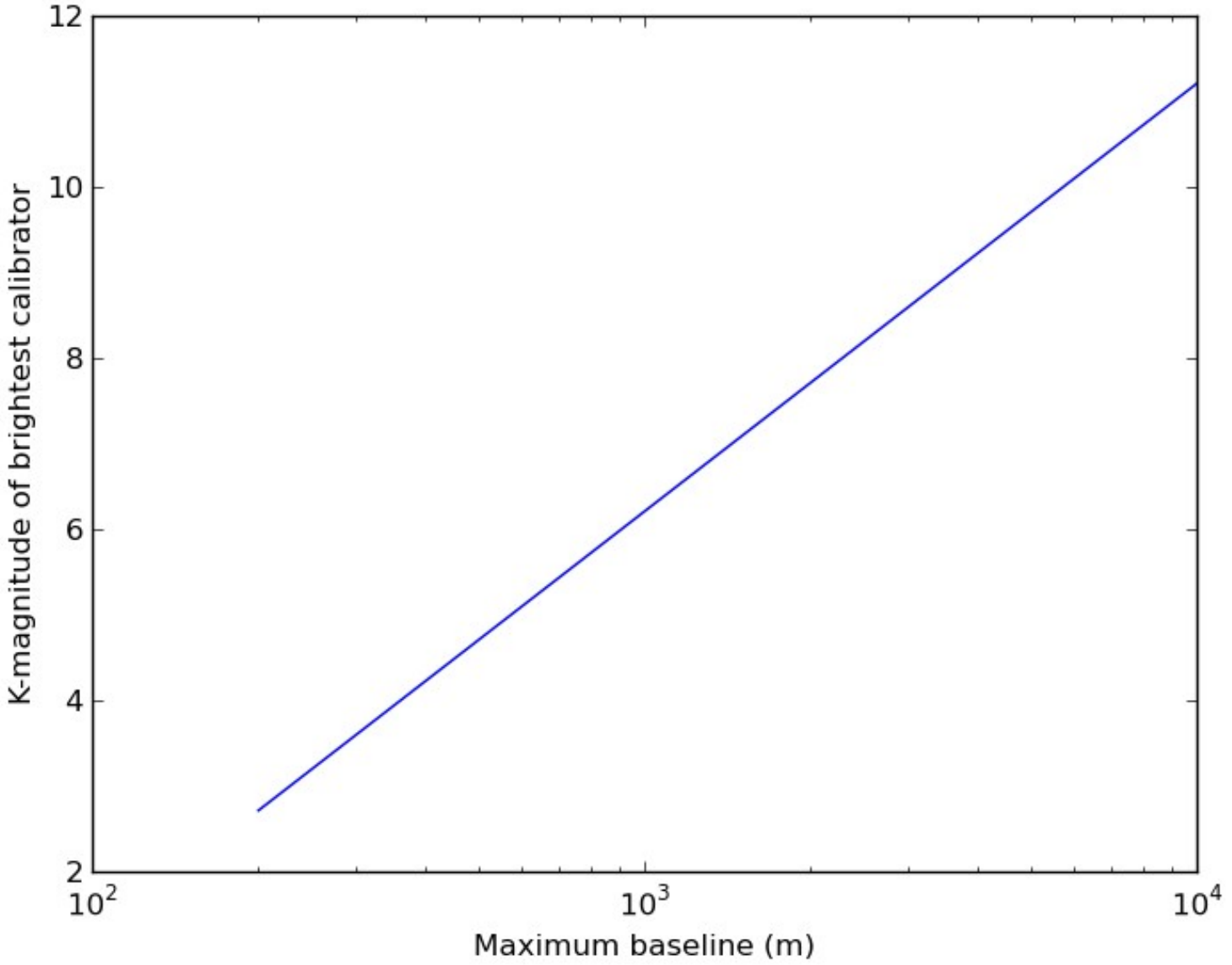


Constraints on funding and timescales mean that we cannot do everything

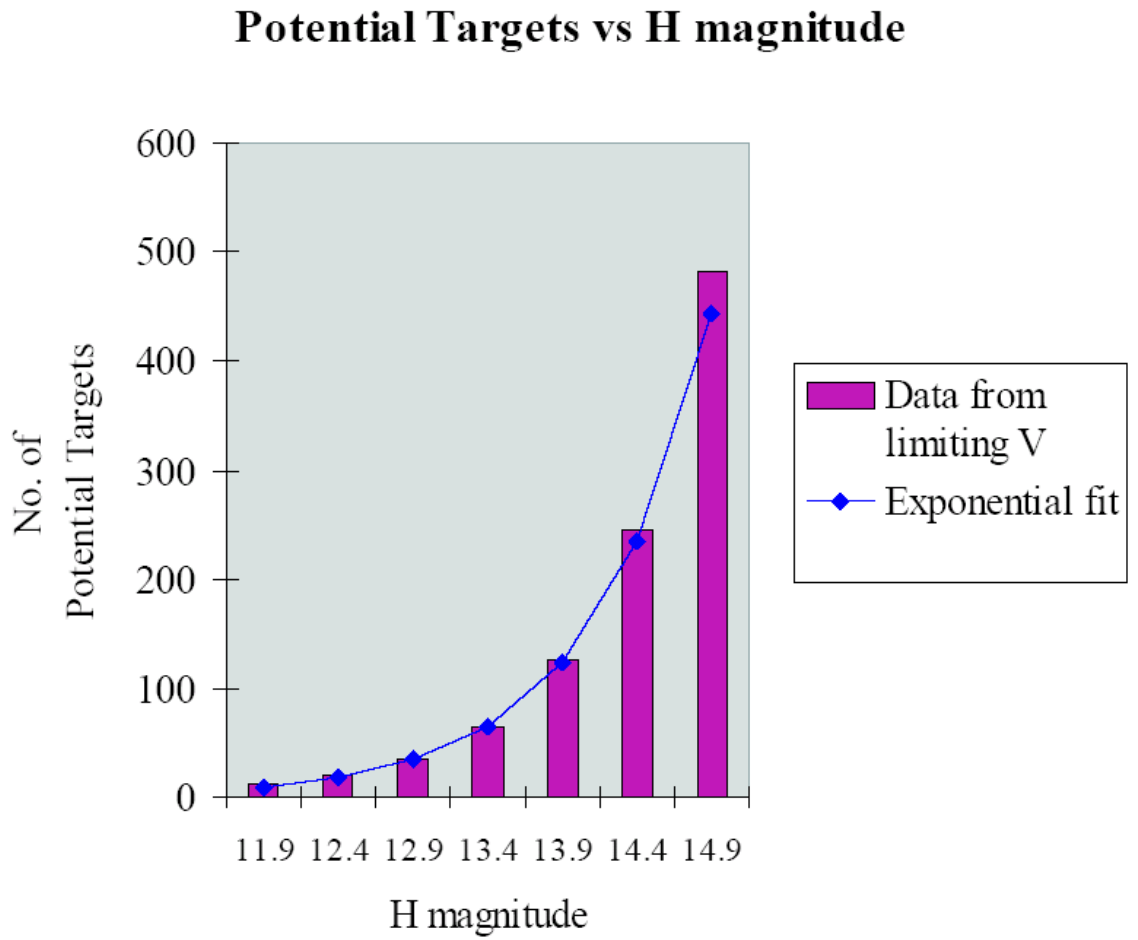
- Funding < $1 billion?
- Operational by 2030?



Fundamental factors also serve to make our science parameter choices non-orthogonal



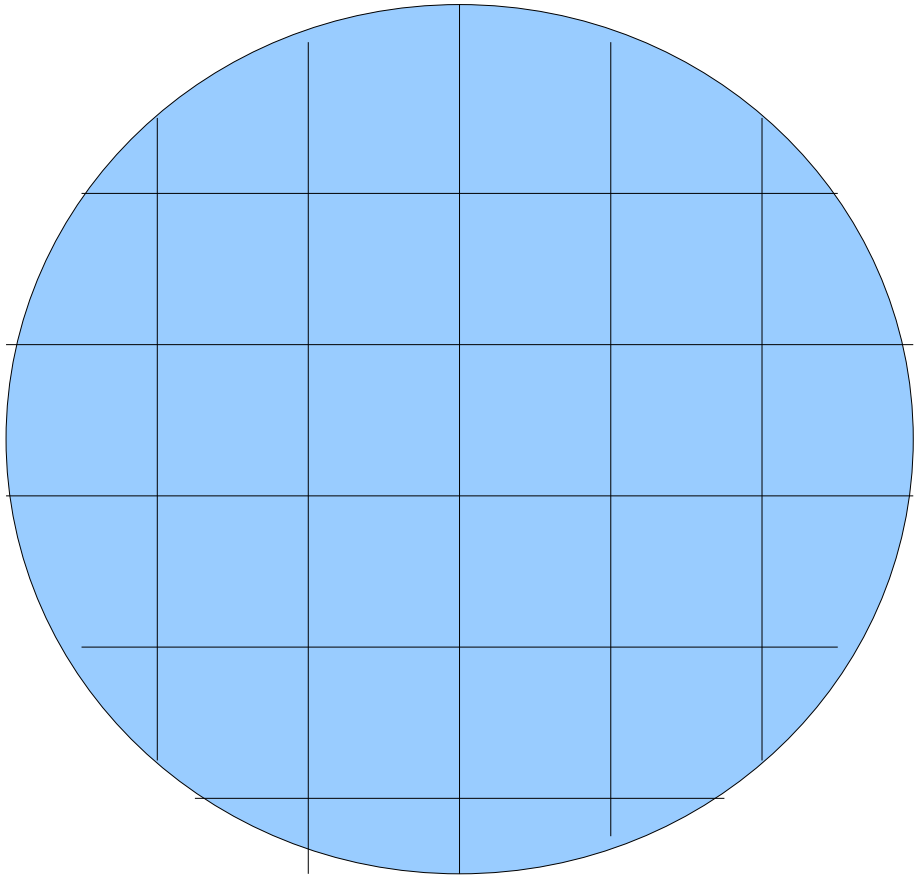
Increasing the limiting magnitude would allow access to many science targets

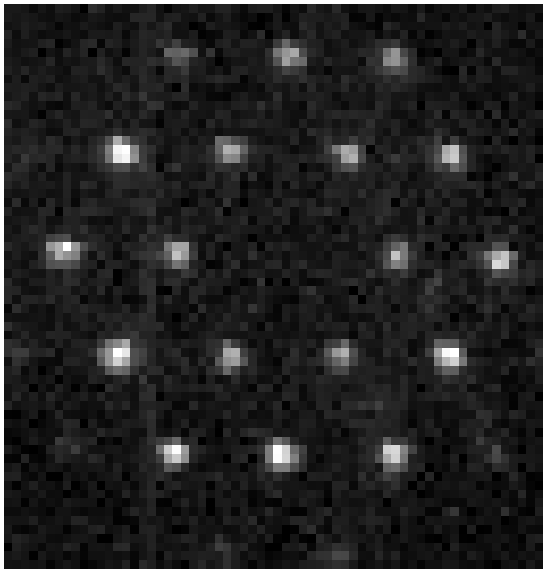


Perhaps throw money at large telescopes and lasers?

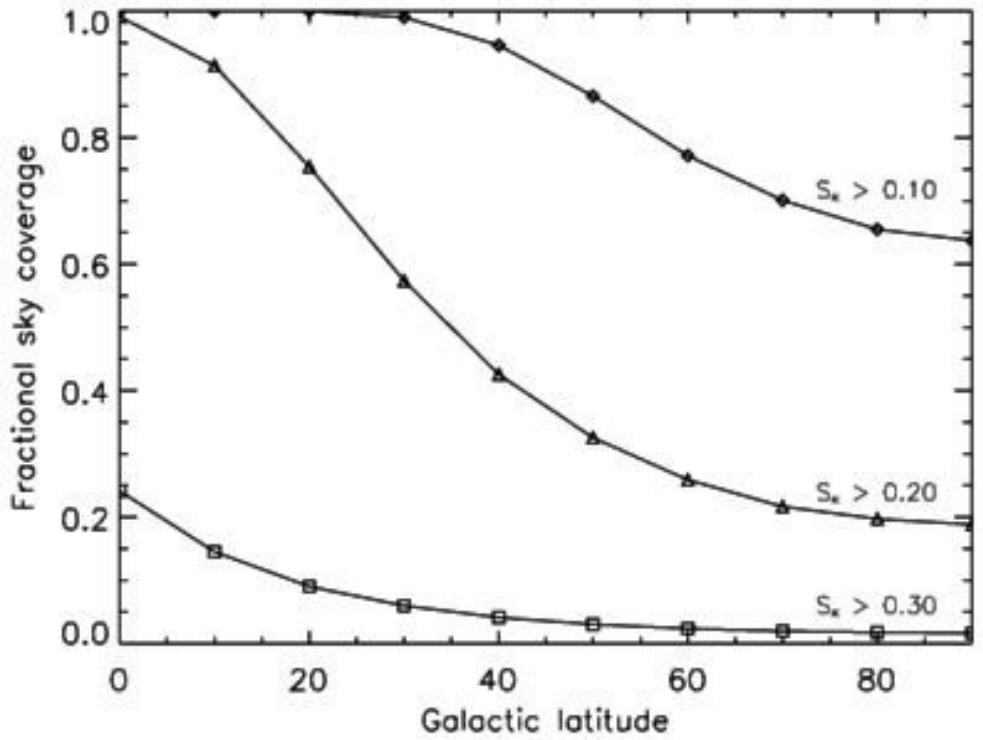
In practice we are still limited by the photons per r_0 patch per t_0

r0



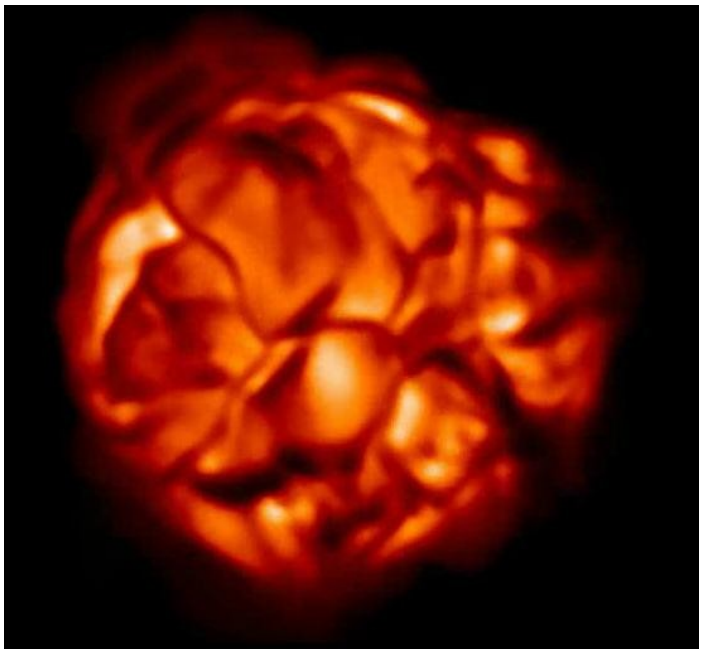


In reality there is no “magic bullet”



Increasing the number of telescopes offers a range of science advantages

- Number of baselines ~ Number of telescopes^2
- Number of "filled pixels" in image ~ Number of baselines
- Dynamic range ~ SNR*sqrt(Number of baselines)
- Baseline "bootstrapping" on extended objects



A straw-man proposal

- Increasing the limiting magnitude is not cost-effective versus buying more telescopes
- Can use self-referenced AO and modest sized telescopes to increase the magnitude at which we can “freeze the fringes” to perhaps K~13-14
- With good fringe tracking can do higher dynamic range, better spectral resolution.

Need to iterate between technology and science