Amateur Observations of Near-Earth Asteroids from South Africa

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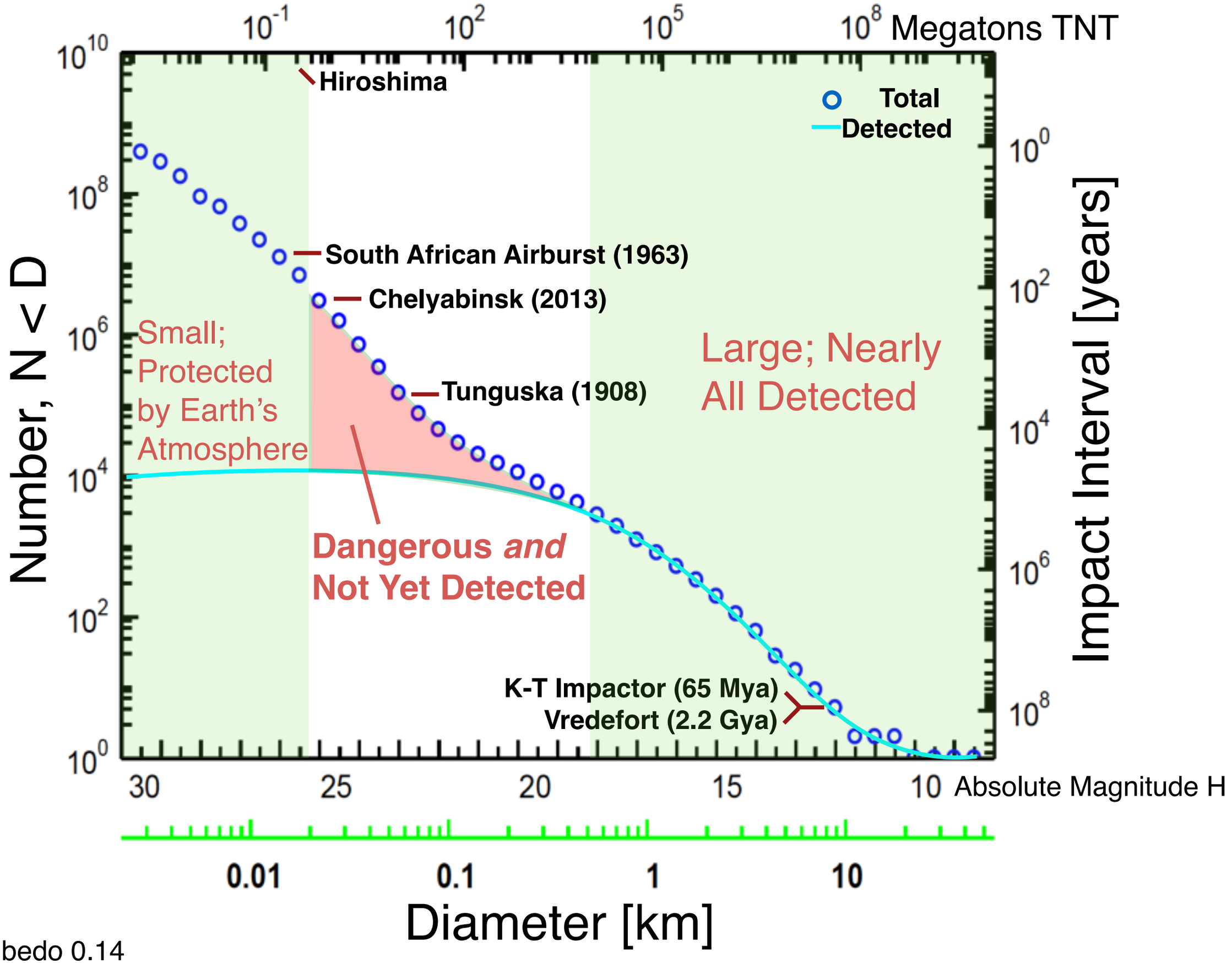
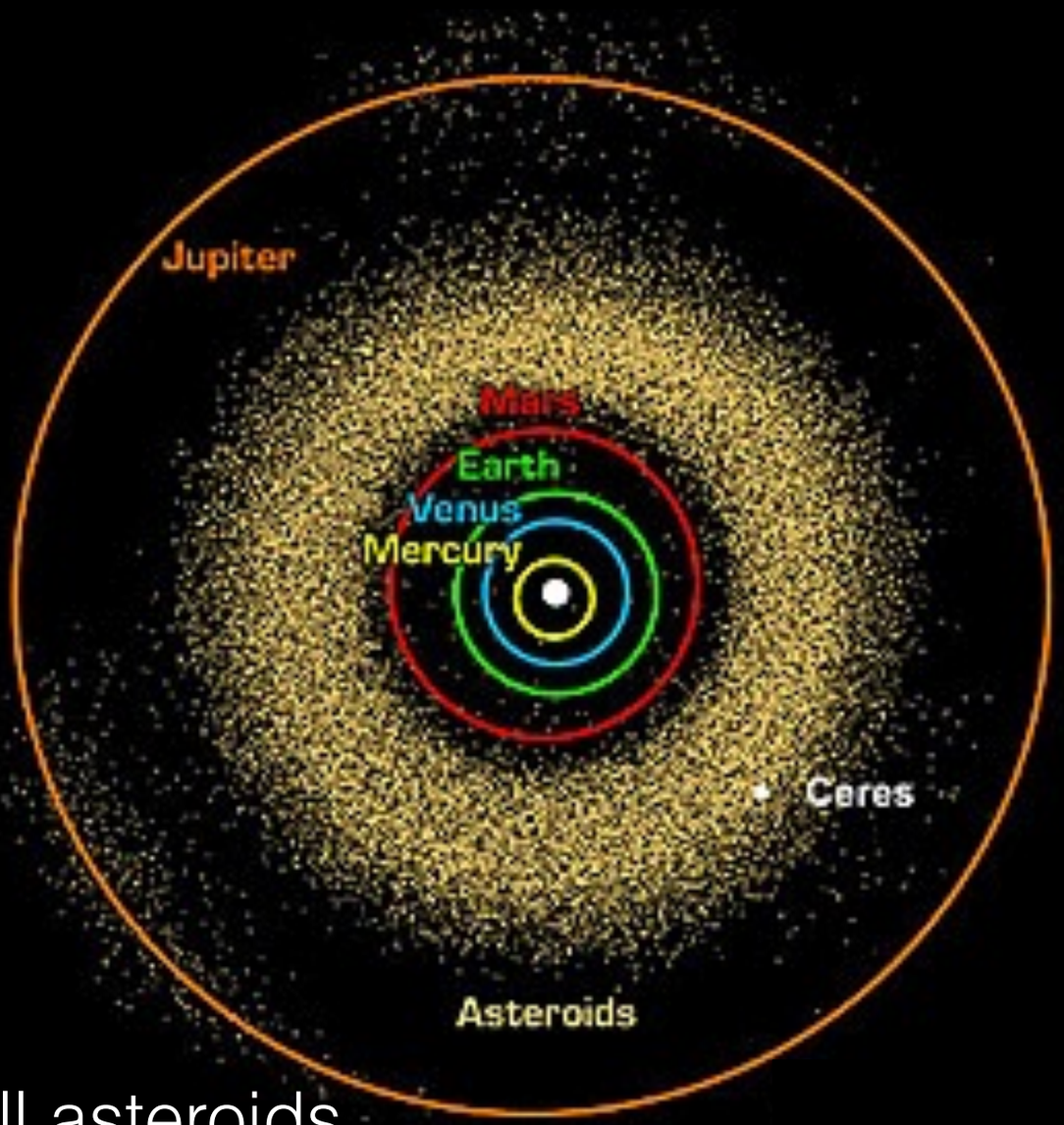
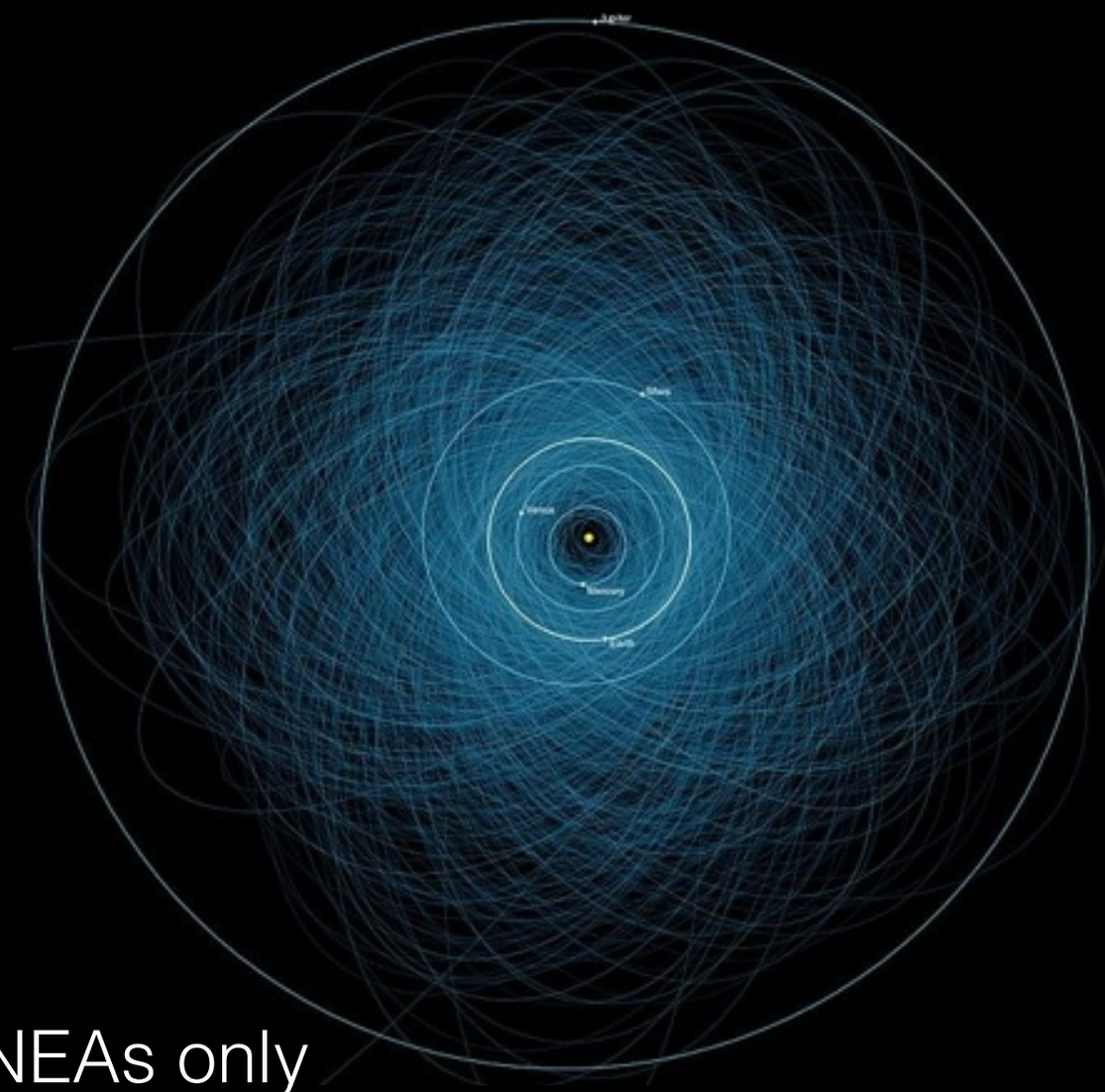
Inventory of Earth Impactors



Assumes albedo 0.14



All asteroids



NEAs only

Asteroid Type	# Known
Main-Belt Asteroids	500,000
Near-Earth Asteroids (NEAs) Pass within 0.1 AU of Earth	11,000
Potentially Hazardous Asteroids (PHAs) Cross Earth orbit *and* r > 100 m	1400

How to Handle the Asteroid Risk?

Asteroid Grand Challenge

NASA must "**find all asteroid threats to human populations and know what to do about them.**"

- Detect all NEAs > 100 m
- Characterize them
- Determine a way to mitigate them

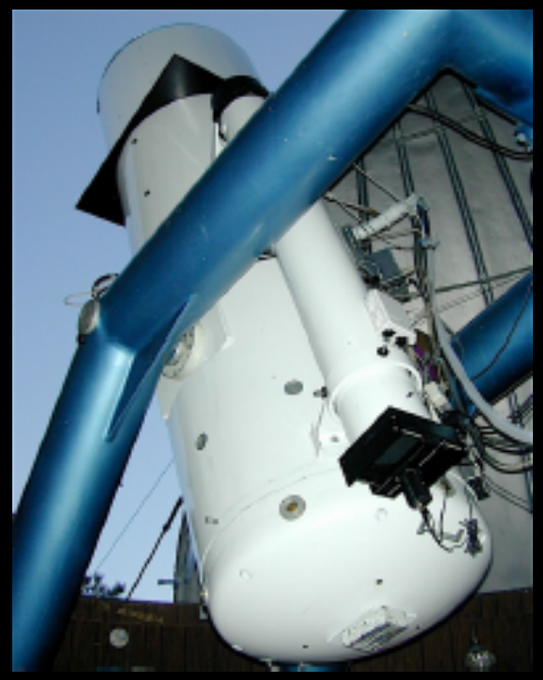
US Congress, July 2013

ASTEROID
GRAND CHALLENGE

There is a huge gap in global observational coverage of asteroids…
and it is centered on South Africa, which has a lot of telescopes!

How to Detect and Characterize Asteroids

MIT LINEAR
New Mexico



Catalina Sky Survey
Arizona & Australia

Pan-STARRS
Hawaii

- 1m - 2m wide-angle robotic telescopes have been very successful for *detection*: nearly 95% of all suspected NEAs > 1 km have now been detected.

- **But the vast majority of the NEOs discovered in these searches are never observed again! We know nothing about their shape, rotation rate, possible binaries, composition, size, etc.**

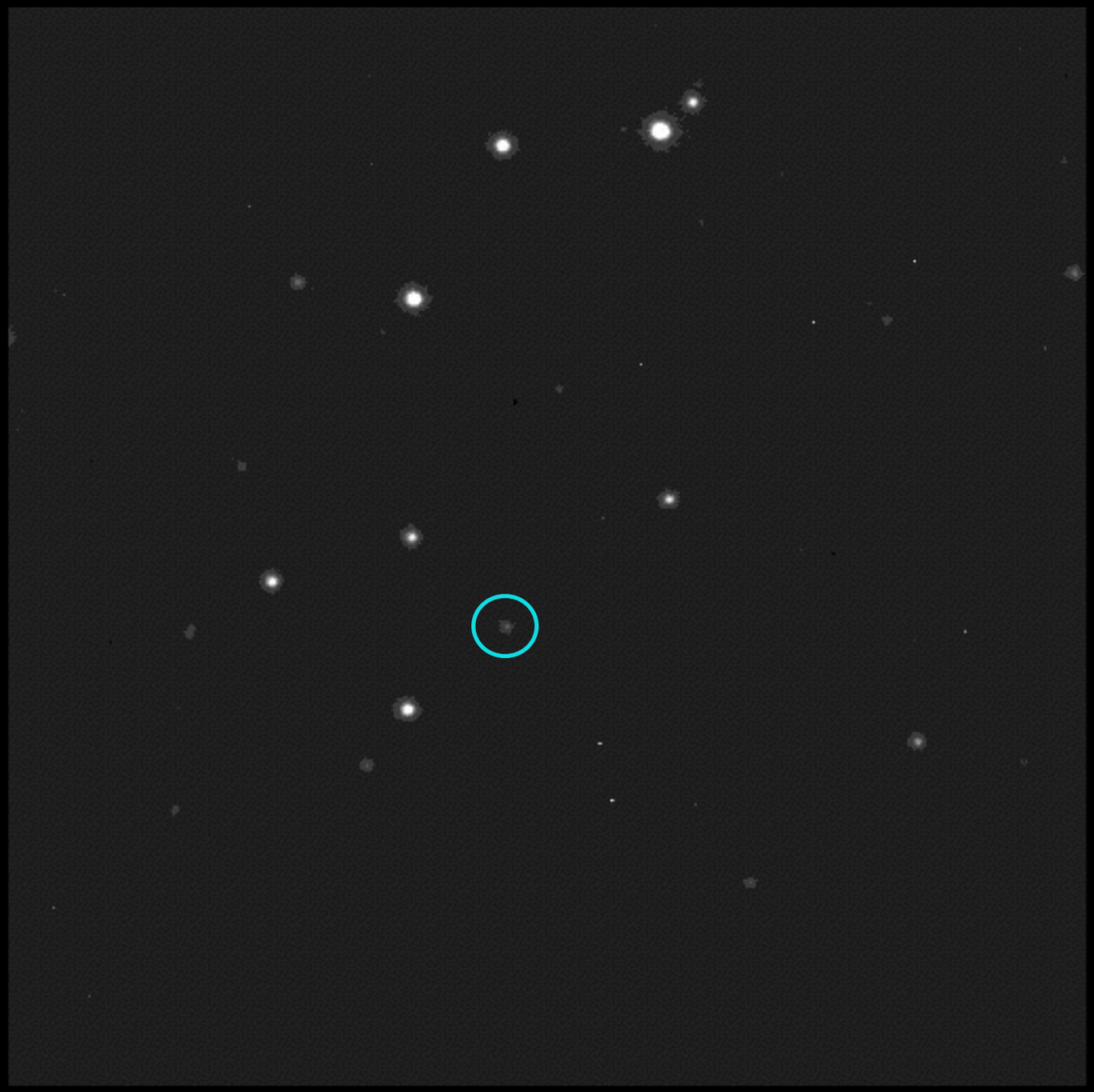
- **This is where amateurs with access to moderate facilities can play a key role.**

  - **Measuring rotational light curves (~4-12 hours) of NEOs when near periapse**

  - **Measuring positions of NEOs in the few weeks post-discovery for improved orbits.**

Asteroid 3288 Selucus

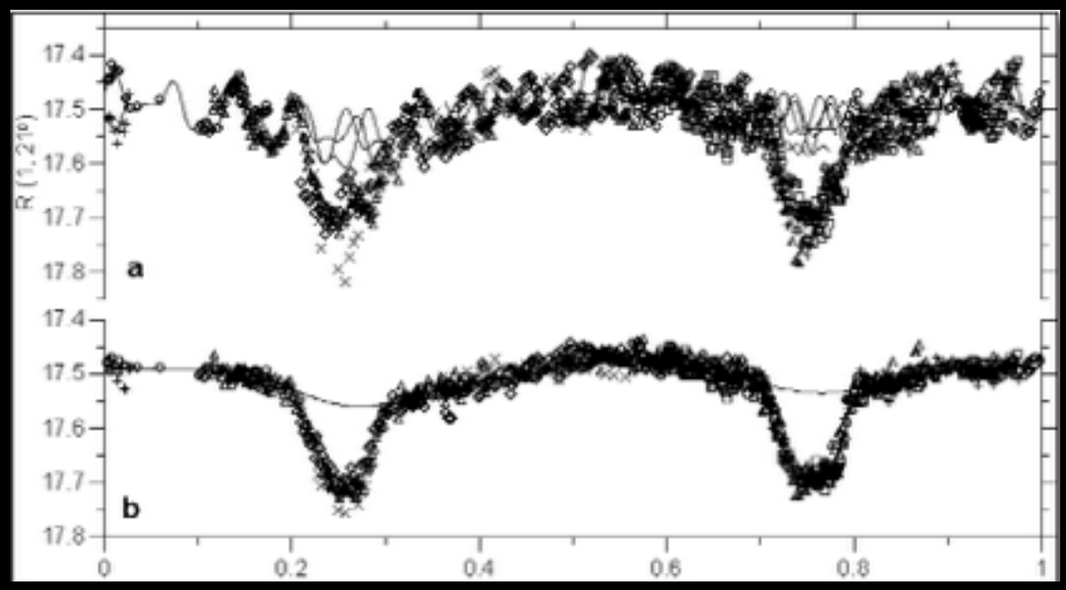
NEA, perihelion 1.1 AU, e = 0.45, H=15.3, v = 17, discovered 1982



June 2014, SAAO 1m
Throop / Reddy / Morris

We measure light curve to determine rotation rate, shape, binarity of asteroid.

Vast majority of NEAs have never been studied post-discovery.



How South Africa can play a role in the Asteroid Grand Challenge and NEA studies

✗	Discovering new NEAs	Requires wide-angle robotic telescopes
✓	Immediate followup post-discovery; orbital measurements	Geographic advantage of SA fills major hole. Ready access to moderate telescopes (<1m).
✓	Characterization: Shape, spin rate, composition	

Closing Thoughts

Impact risk is a non-negligible threat to humanity, of great interest to NASA and other countries.

The majority of potentially hazardous asteroids (PHAs) have not yet been discovered… and of those known, the majority have never been studied.

South African amateurs can make significant contributions to important science.

Thank you!

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