THESEUS IRT

Secondary

perspective

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THESEUS IRT

- It is a 70cm telescope in orbit, with 0.6" angular resolution, with imaging and spectroscopic (up to R~500) capabilities, up to the H band (1.8 micron).

Theseus Slaying Minotaur (1843)
bronze sculpture by Antoine-Louis Barye

- It is supposed to reach H~20.6 in 300s (imaging), H~18.5 (low-res spectroscopy) and H~17.5 in 1800s (high-res spectroscopy) with S/N~5.

- In order to keep things simple, these performances are not that far, in exposure time required for a given S/N at the given magnitude, to a few meters class telescope for imaging and spectroscopy. Definitely of interest.

THESEUS IRT

Theseus Defeats the Centaur
Antonio Canova (1804–1819)

- The IRT will be active when major facilities such as ATHENA, CTA, ELT, JWST, LSST, and SKA will be operational.

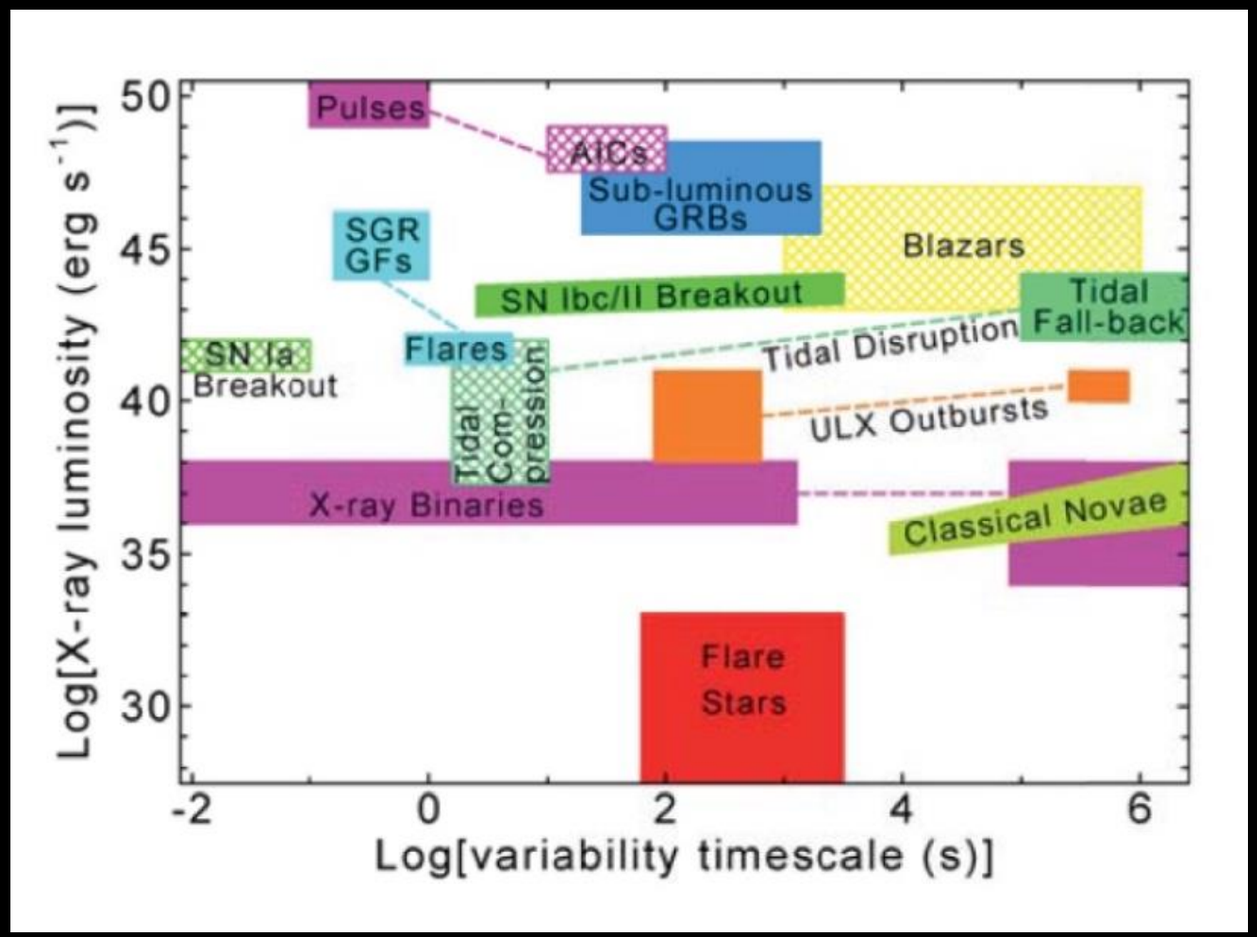
- It is for instance conceivable that efficient all-sky surveys in various bands will be available.

- Advanced spectroscopic facilities with multi-slit or simultaneous multi-band capabilities will be widely available.

Thus, what can we do with the IRT
in such an environment?

Transient Astronomy

- No doubt that the high-energy transient sky is full of treasures still to be discovered.



Theseus saves Hippodameia, work by Johannes Pfuhl

- For essentially all categories of high-energy transients a NIR follow-up is precious opportunity.

Multi-Messenger Astronomy

Theseus and Aethra, by Laurent de La Hyre

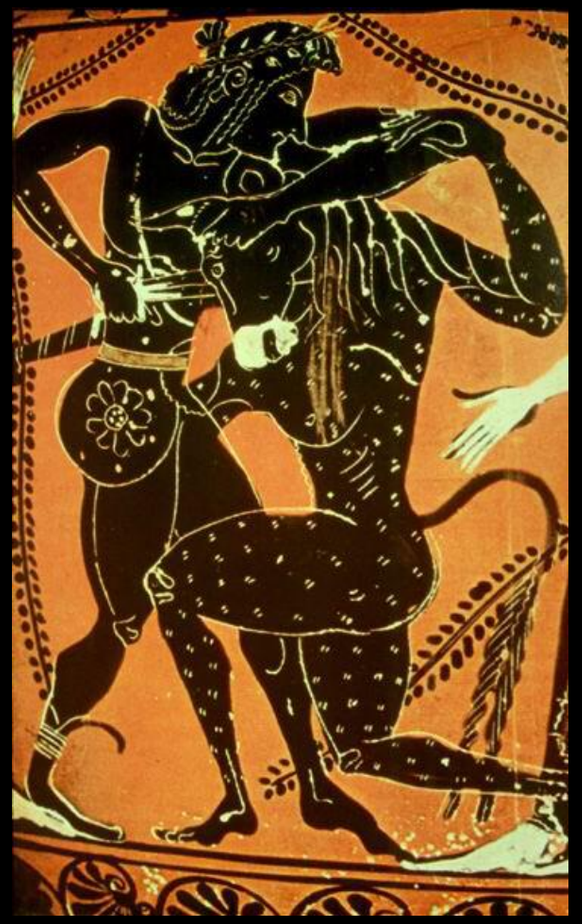
- Synergy with emerging new observational windows can really be crucial for the success of the mission.

- THESEUS will be able to locate and identify the electromagnetic counterparts to sources of gravitational radiation and neutrinos, which will be routinely detected in the late ’20s / early ’30s by next generation facilities like aLIGO/aVirgo, eLISA, ET, and Km3NET (*from the White book...*)

GW observations			THESEUS XGIS/SXI joint GW+EM observations		
Epoch	GW detector	BNS horizon	BNS rate (yr^{-1})	XGIS/sGRB rate (yr^{-1})	SXI/X-ray isotropic counterpart rate (yr^{-1})
2020+	Second-generation (advanced LIGO, Advanced Virgo, India-LIGO, KAGRA)	~400 Mpc	~40	~0.5-5	~1-3 (simultaneous) ~6-18 (+follow-up)
2030+	Second + Third-generation (e.g. ET, Cosmic Explorer)	~15-20 Gpc	>10000	~15-25	$\gtrsim$100

GRB related topics

- Global star formation rate
- High-z galaxy luminosity function
- Build-up of dust, molecules and gas
- Topology of reionization
- Population III stars



Theseus and the Minotaur on 6th-century black-figure pottery

These topics will not be completed by the JWST and SKA

AGN

- Obscured AGN and galaxies are a natural target for an IR telescope

The deeds of Theseus, on an Attic red-figured *kylix*

- H_α can be observed from z~0.1 to ~1.7, H_β from z~0.4 to 2.3. Balmer decrement and its evolution can be measured.
- Imaging capabilities are well below the JWST, yet statistically solid samples of active and evolved galaxies can be studied.
- Spectra of rare or peculiar galaxies selected from imaging surveys can be obtained.
- Long-term variability can be studied, even in connection with other facilities.

A key word: flexibility

A fresco depicting Theseus, from Herculaneum

- No doubt that a ~1m NIR space telescope can be a precious facility

- However, the winning factor is the synergy with the other THESEUS instruments.

- And a flexible scheduling, similar to what it is done with *Swift*

- Although identifying ancillary science core-programs is mandatory, allowing the community to interact with THESEUS with flexible ToOs and regular GO programs will definitely improve the “attractiveness” of the mission.