



Triggering Active Galaxies: Swift Finds the Smoking Gun

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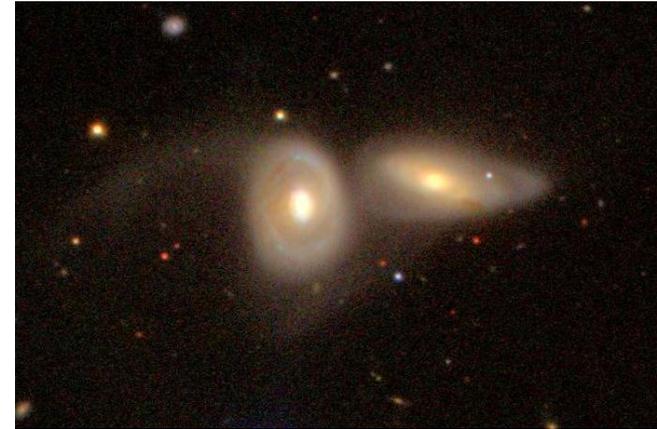
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Active Galaxies in the Swift BAT Survey

- Swift has detected 260 active galactic nuclei (AGN) in the BAT Hard X-ray Survey.
- For the first time, *we see about 25% of AGN in the process of merging with other galaxies.*



- This is very different from the approximately 2% of AGN found in merging galaxies by other surveys.
- Approximately 60% of the active galaxies will undergo a galaxy merger in the next billion years. This indicates that mergers play an important role in powering AGN.

Supermassive Black Holes

- ❖ Most big galaxies host big black holes (millions of times the sun's mass)
- ❖ About 1% emit enormous amounts of energy (as much as 10 billion suns)
- ❖ These are called active galactic nuclei (AGN).
- ❖ Why is this fraction so small? What makes them “light up” anyhow?



Artist's concept of a galaxy merger

[Play simulation movie](#)

How Do We Know a Merger is Occurring?

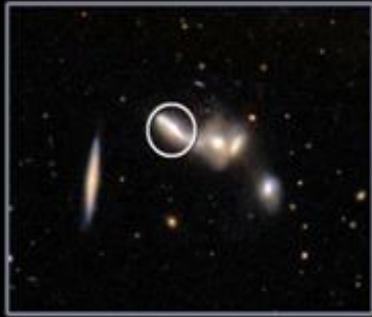


Shape: Severe distortion of the galaxy shapes as they tear each other apart and feed the black hole

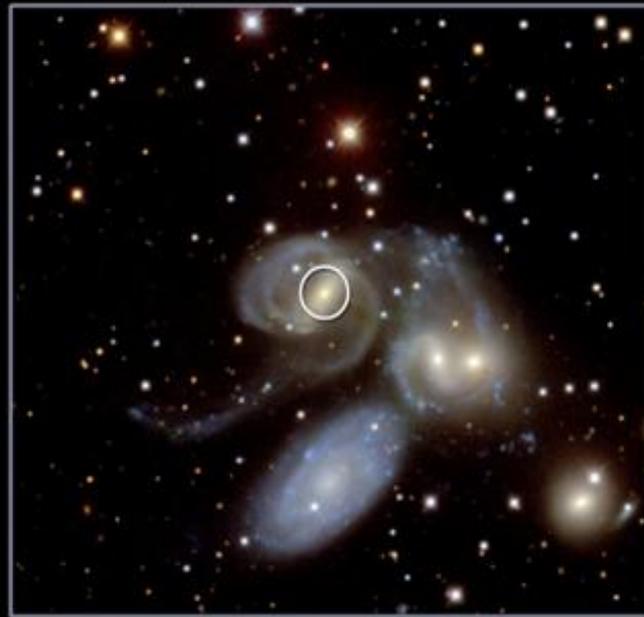
Proximity: These galaxies will merge in an astronomically short time (less than 500 million years).



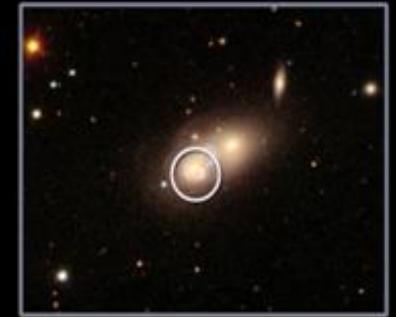
Some merging AGN found by Swift



UGC 06527



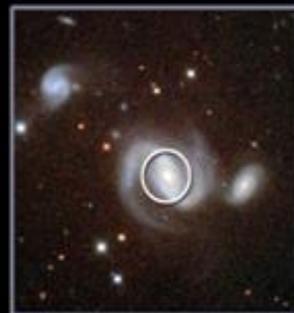
NGC 7319



NGC 1142



NGC 3227



MCG 0212050



NGC 2992

Conclusions

- The Swift BAT has opened up a fundamentally new way of finding feeding supermassive black holes. Hard X-rays penetrate gas and dust to directly image the AGN.
- **About 25% of AGN are in the process of merging.**
- This is a much higher percentage than found by other surveys.
- The finding indicates that a majority (60%) of active galaxies will completely merge in the next billion years. Mergers play an important role in powering AGN.