Galaxies from the inside out: from SAURON to Hexabundles

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SAURON Overview

- Spectrographic Areal Unit for Research on Optical Nebulae.
- Dedicated instrument mounted on WHT.
- TIGER → OASIS → SAURON.
- First IFU survey instrument.
- European collaboration led by R. Bacon (Lyon), R. Davies (Oxford), P. T. de Zeeuw (Leiden).
- 37 refereed publications since 2001.
SAURON design
SAURON specs

- 0.94" spatial sampling.
- FoV 33" × 44" → 1431 object lenslets + 146 sky lenslets 1.9' away.
- Spectral resolution 3.6Å, sampled at 1.1Å pix⁻¹.
- Wavelength coverage 4800 – 5400 Å (Hβ, [O III], Mg b, Fe5015, Fe5270).
- Total efficiency >20%.
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SAURON science I

- Survey of 72 Elliptical nuclei + S0/a bulges over 36 nights
SAURON science II

- Kinematically-decoupled core in NGC 4365, but same SFR
SAURON science III

- Counter-rotating gas in nuclear ring of NGC 7742.

NGC7742 (UGC12760)
α = 23h 41m 43s
δ = 10d 29m 25s
M_B = -19.76
e = 0.05
Field galaxy

Falcon-Barroso et al. 2006
SAURON science III

- Counter-rotating gas in nuclear ring of NGC 7742 from minor merger.

Mazzuca et al. 2006
CIRPASS IFU on Gemini South

The Original Hexabundle?
M83 with CIRPASS
M83 with CIRPASS
M83 with CIRPASS
M83 with CIRPASS
M83 with CIRPASS
M83 with CIRPASS
Age Gradient in M83

\( \alpha = 2.35, \frac{M_{up}}{M_\odot} = 100 \)

\( Z = 0.02 \)

\( \log L(\text{Fe II} \, 1.26 \mu m) \mathrm{[erg} \, \mathrm{s}^{-1}] \)

\[ \log W(\text{Pa} \beta) \]

6.2 Myr

7.6 Myr

6.5 Myr

7.6 Myr

10.6 Myr
SINFONI on VLT

Böker et al. 2008
Hexabundles

- 1 × 397 hexabundle spans ~7" @ 0.3"/core, or ~14" @ 0.6"/core.
- Well-matched to circumnuclear star-forming rings.
- In optical, can use Ca triplet + Hα to constrain burst ages and duration.
- Dusty/high-z nuclei require near-IR (OH-suppressing?) hexabundles.
Summary

- SAURON has demonstrated potential of optical Integral Field Spectrographs for dynamical, chemical, and historical deconstruction of galactic nuclei.
- CIRPASS & SINFONI reveal star formation history of obscured circumnuclear rings.
- Hexabundles could combine the best of both.