Pitfalls in Making Pretty Pictures

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High-quality images for public outreach pushed by

- STScI/STECF, Hubble Heritage Project
- Jean-Charles Cuillandre, CFHT
- Adam Block, NOAO
- ...

Large investment of time, long learning curve

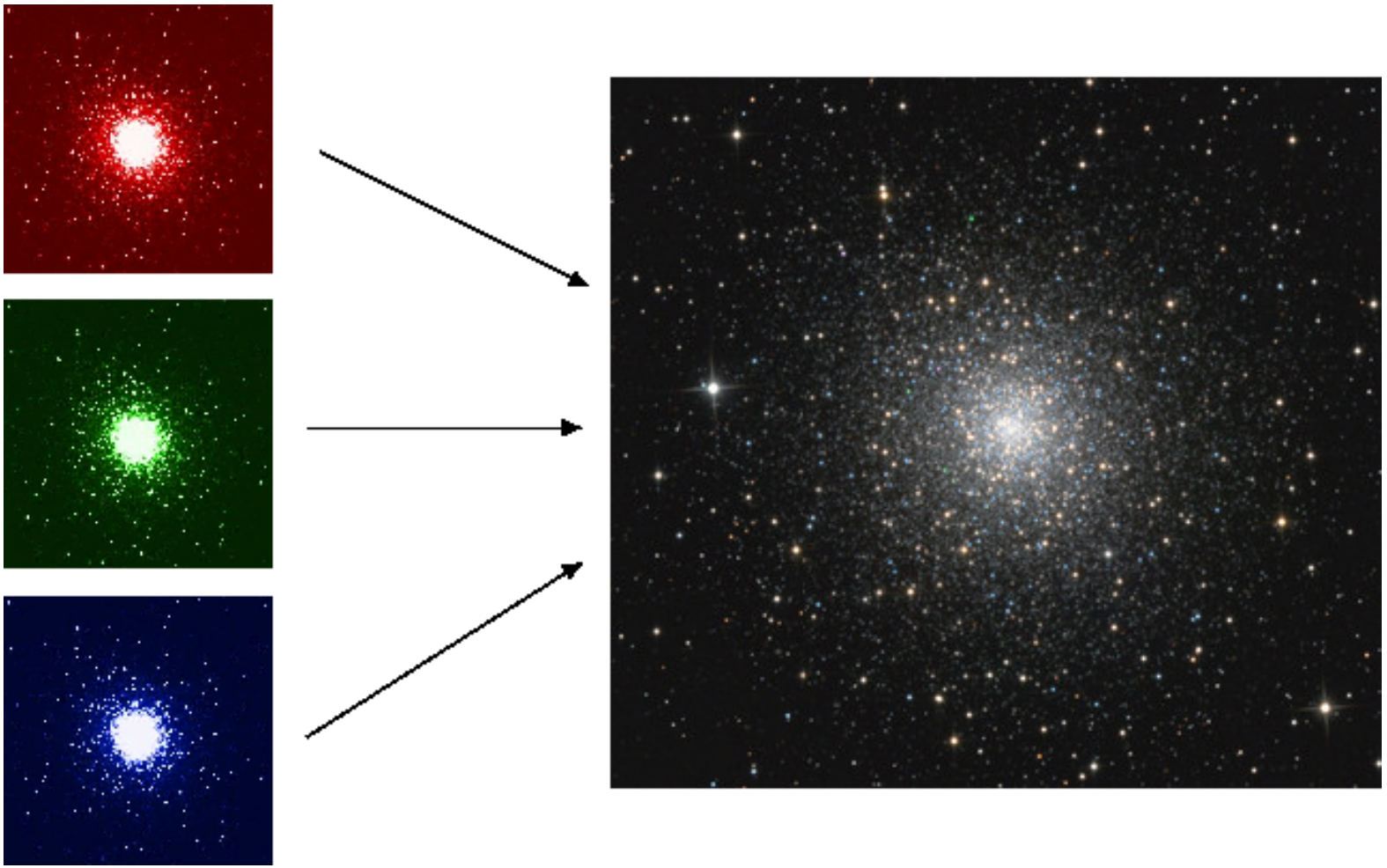
If you find your own images here: **I'm sorry!**

Content

1. Overview
   - Things that usually go wrong
   - Essentials for a good picture
2. Guidelines for pretty pics
   - Observations
   - Data reduction
   - Photoshop science

1. Overview

It looks all so simple...



Things that usually go wrong

In the order encountered by beginners:

- Dynamic range compression: Saturation
  Background clipping
- Distortion correction
- Colour calibration
- Over-processing and under-exploitation

(C) ESO, M83, SOFI

Use ESO FitsLiberator

(Lars Lindberg Christensen)

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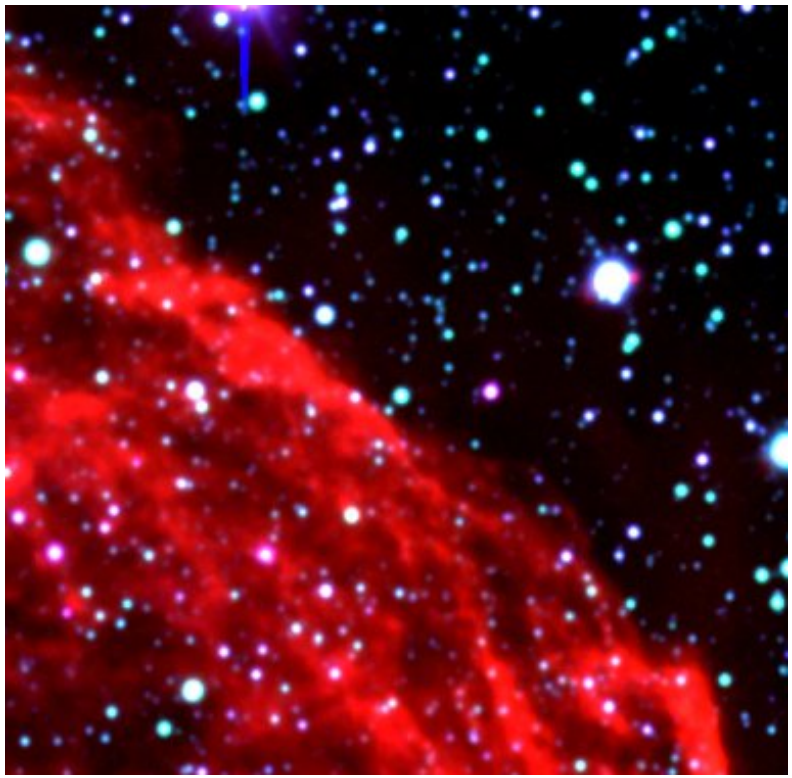

(C) ESO, Part of LMC, WFI

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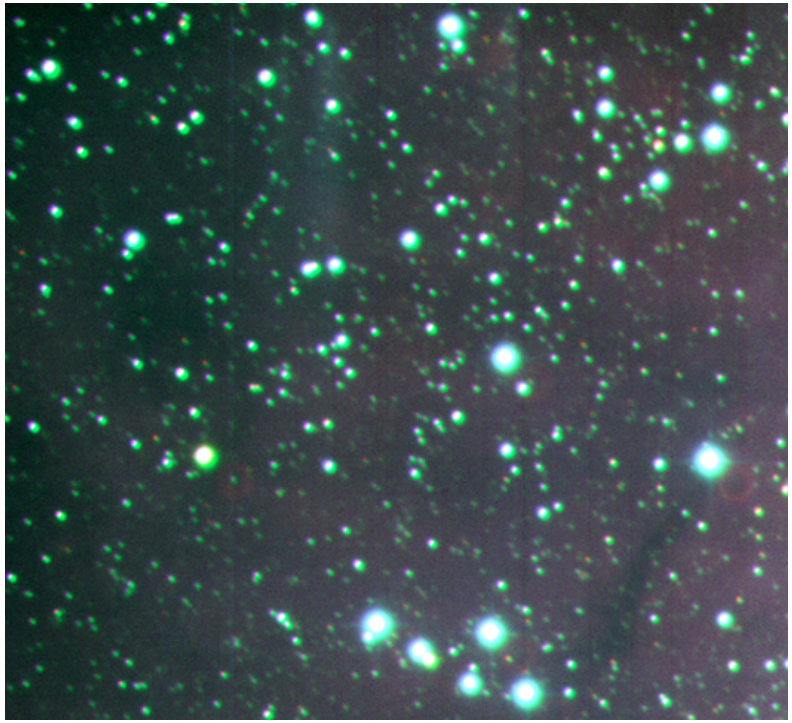

(C) ESO, RCW108, WFI

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(C) Jim Misti, M63

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Do it right from the beginning, and your PR officer will love you

Essentials for a good pretty picture

Observing

- A good observing strategy

Data reduction

- Get the relative astrometry right
- Careful sky background modelling for extended targets and multi-chip cameras
- Absolute colour calibration
  (5% of all astronomers are colour blind)

Photoshop science

- Dynamic range compression
- Avoid over-processing

2. Guidelines – Observations

No good observating strategy:

No good science

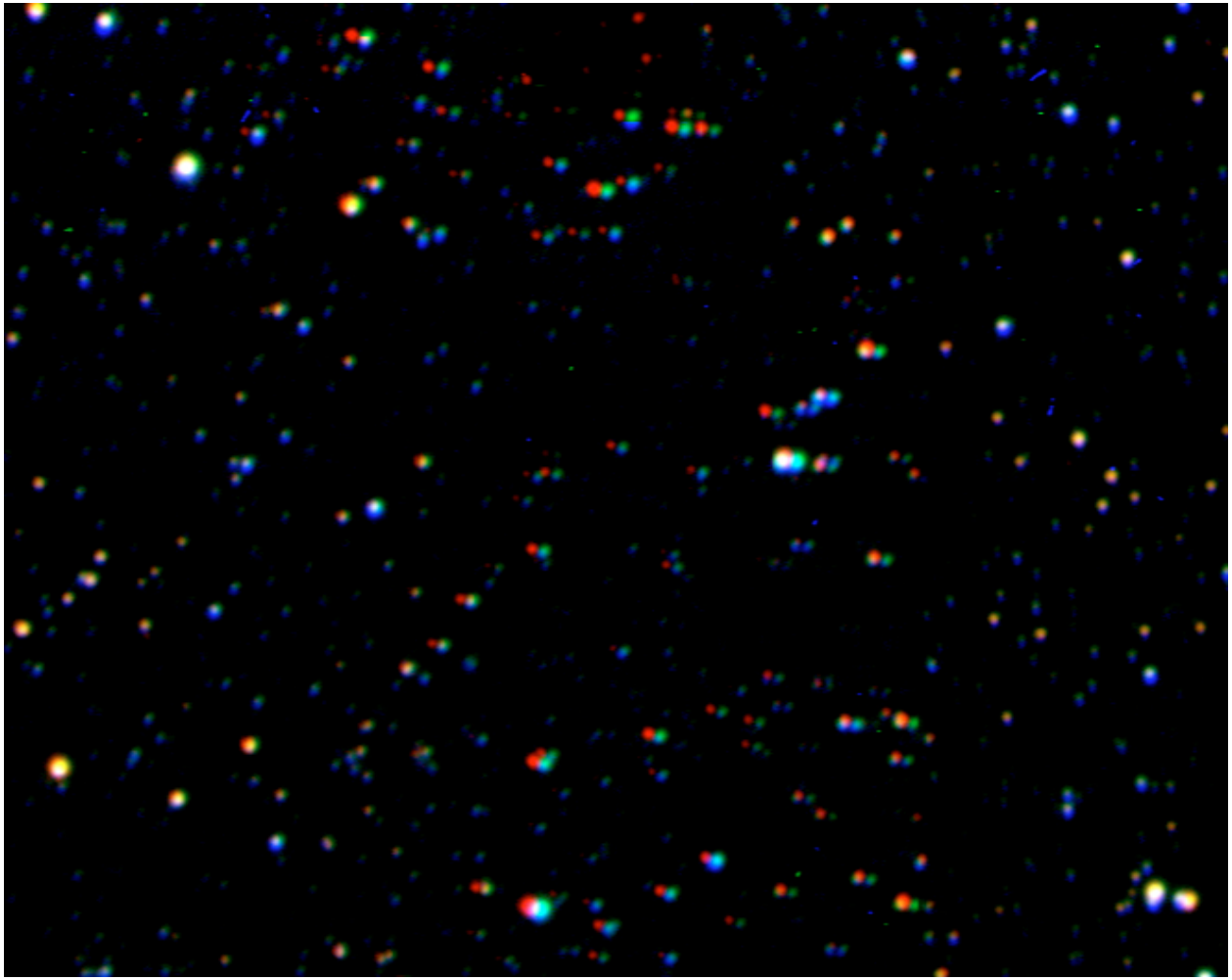
No nice pics

Please do:

- Extensive (excessive) dithering:
  Defects, defringing, inter-chip gaps, astrometry, photometry
- Blank fields for extended targets, not only in the near-IR:
  Defringing, sky modelling

This holds in particular for multi-chip cameras.

2.1 Guidelines – Astrometry



(C) ESO, Capodimonte Deep Field, WFI

2.2 Guidelines – Sky subtraction

Colour pictures are excellent indicators of data reduction quality

M 83, near-IR

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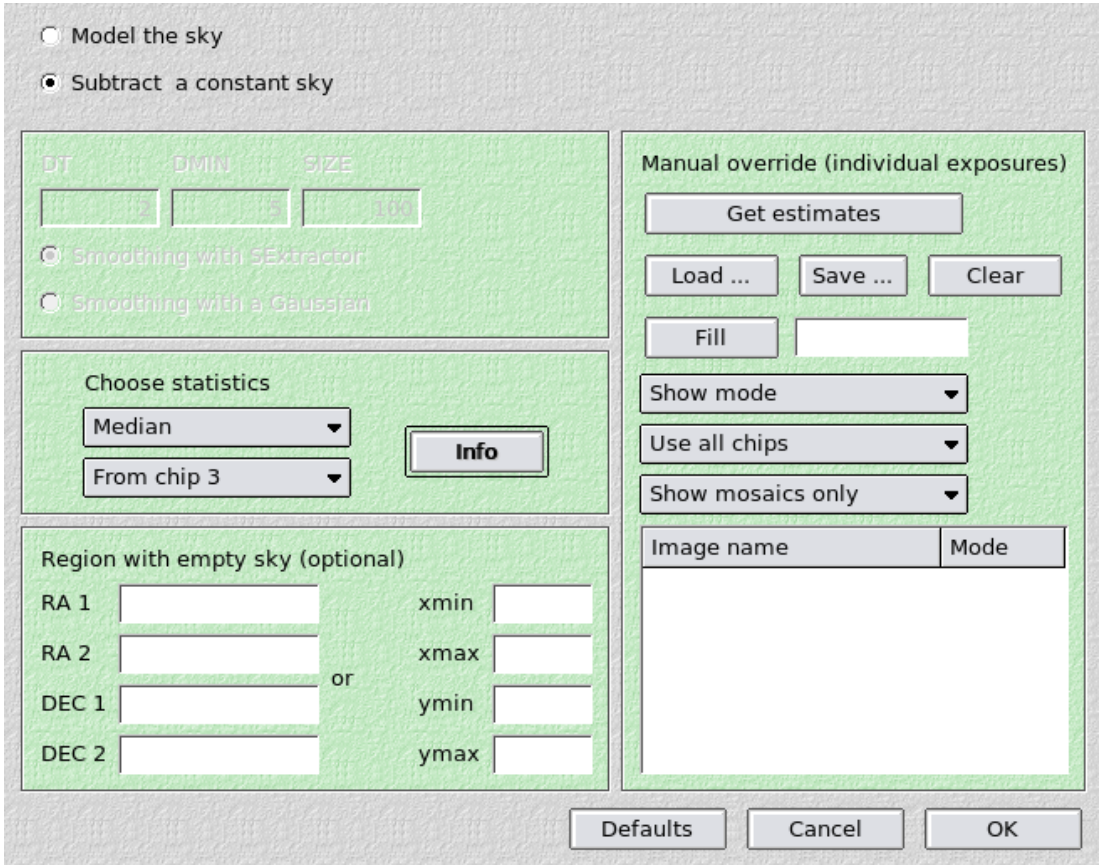
Colour pictures are excellent indicators of data reduction quality

M 83 (showing sub-percent residuals in sky background)



THELI sky background configuration

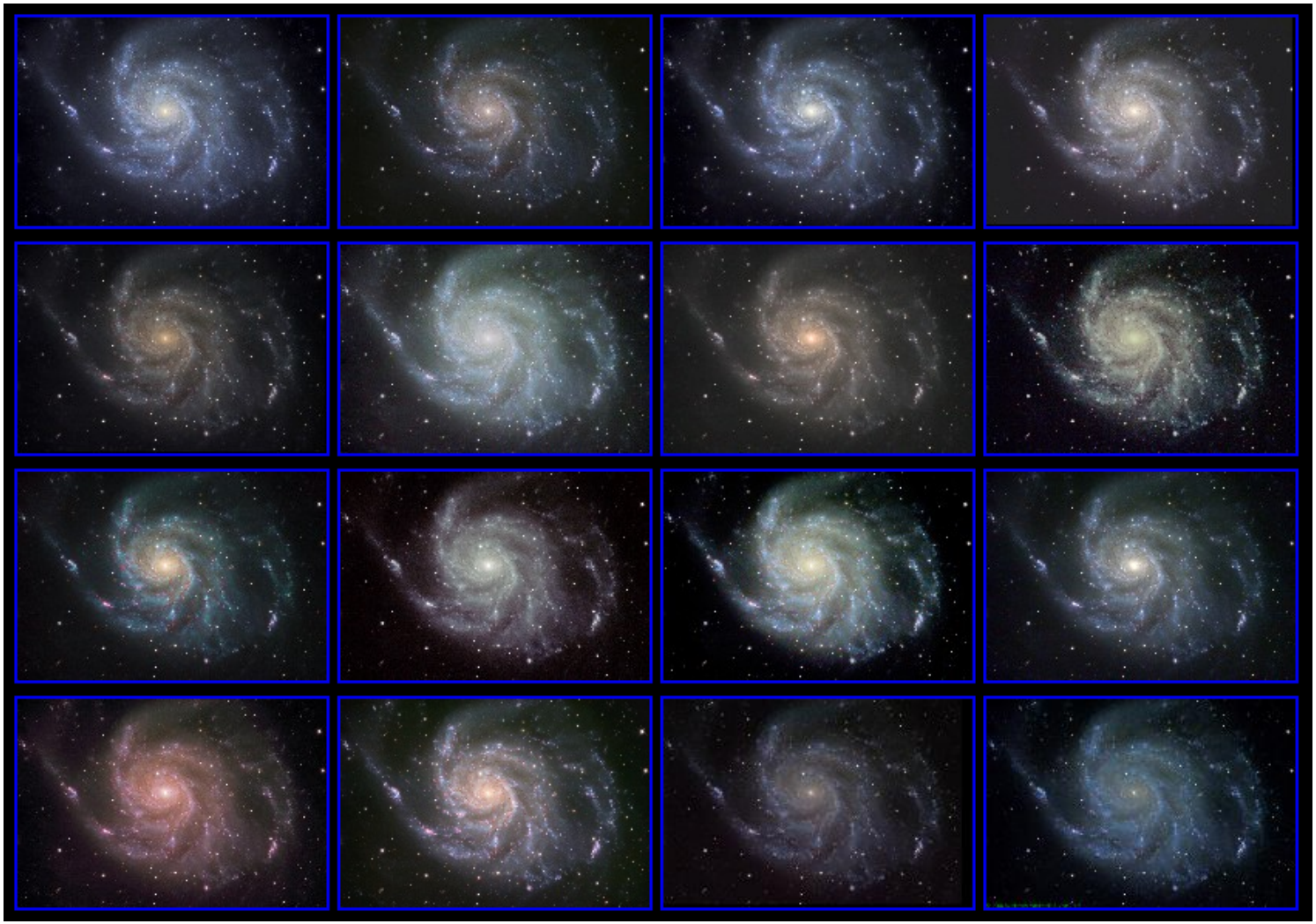
2.3 Guidelines – Colour calibration

(C) M 31, Jim Misti

2.3 Guidelines – Colour calibration

(C) Melotte 15, Jim Misti

2.3 Guidelines – Colour calibration



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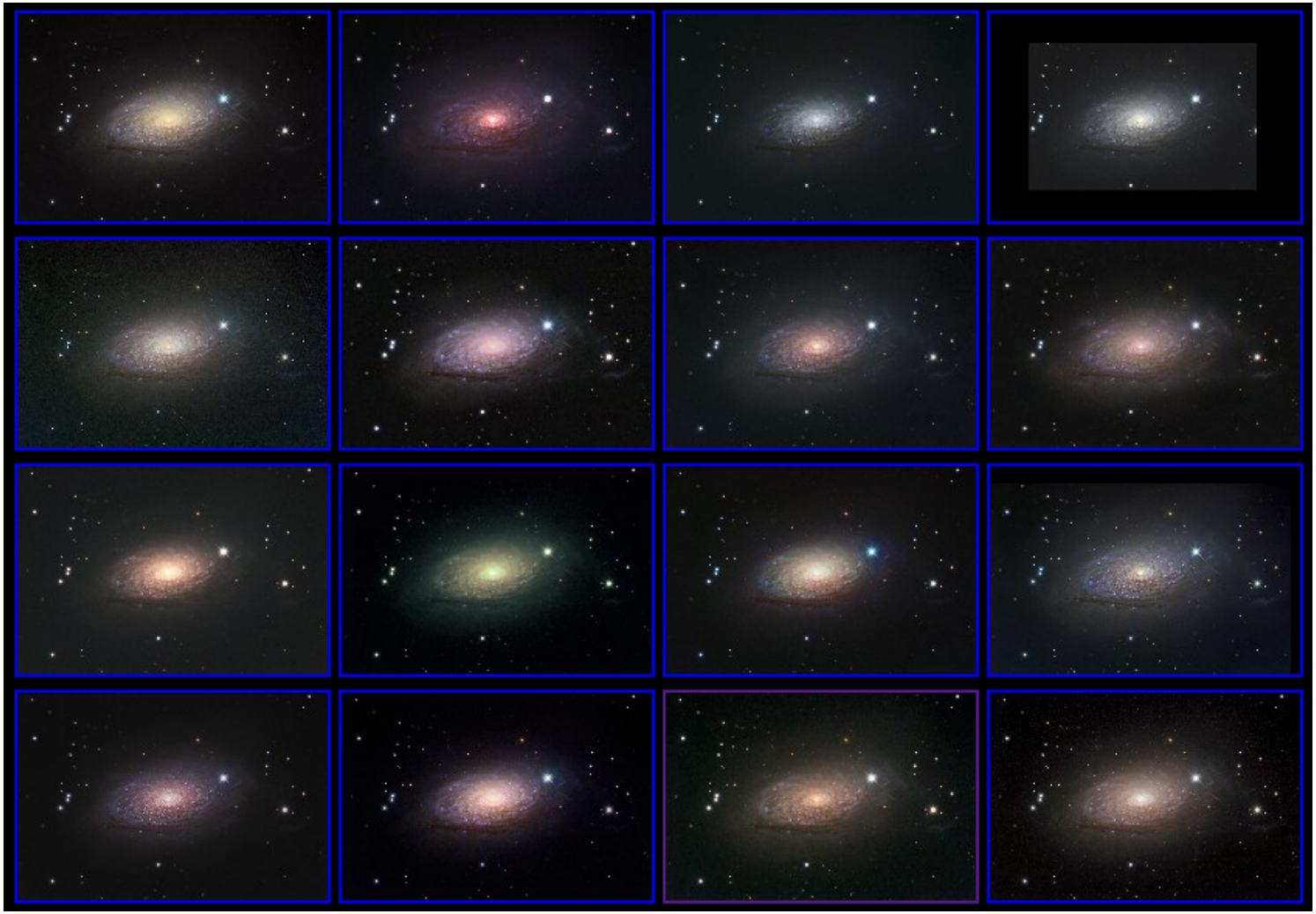
2.3 Guidelines – Colour calibration



(C) M 63, Jim Misti

2.3 Guidelines – Colour calibration

M 63 with SDSS calibration

2.3 Colour calibration – G2V stars

Requirement: an absolute white point

Observations of a G2V solar-type standard star.

But:

- G2 stars are rare
- If in field of view, then most likely saturated
- Nightly observations required to match atmosphere
- OPC/TAC and you won't like that waste of time
- Simply not available for archival data

2.3 Colour calibration – SDSS ugr calibration

Solution: Select G2V stars photometrically

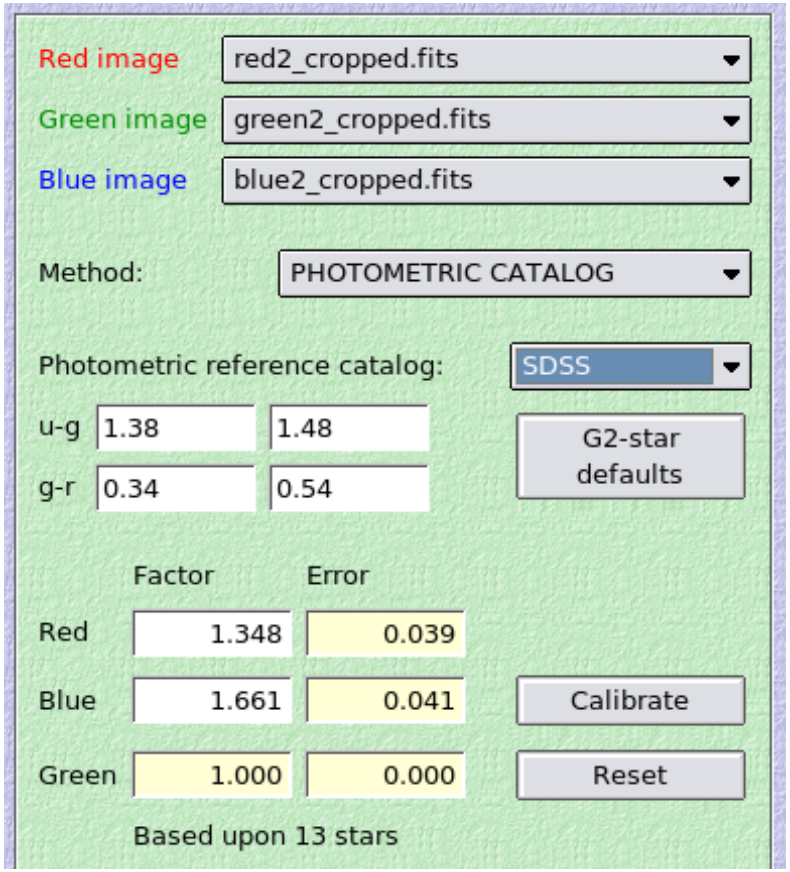
SDSS			NOMAD		
1.38	$< u-g <$	1.48	0.62	$< B-V <$	0.68
0.34	$< g-r <$	0.54	0.30	$< V-R <$	0.70

Advantages:

- Internal calibration
- Almost always in the field of view
- Comes for free, no extra time

2.3 Colour calibration – SDSS ugr calibration

The corresponding dialogue in THELI



Fall-back solution: all stars white on average

This works nicely in the near-IR :-)

(C) ESO, M83 spiral arm, VLT/FORS2

M83 spiral arm, VLT/HAWK-I (JHKs, 0.4″ seeing)

(C) Yuri Beletsky, Mischa Schirmer, Mark Gieles

M83 core, HAWK-I

(C) Yuri Beletsky, Mischa Schirmer, Mark Gieles

2.4 Guidelines – Photoshop science

Typical post-processing tasks

- Dynamic range compression (e.g. through FitsLiberator)
- False-colour composition (e.g. more than 3 filters)
- Noise filtering
- Sharpening (wavelet, deconvolution)
- Background flattening

Last, but not least

- **Less is more, don't overdo it**
- **Give your eyes a rest**

Thank you