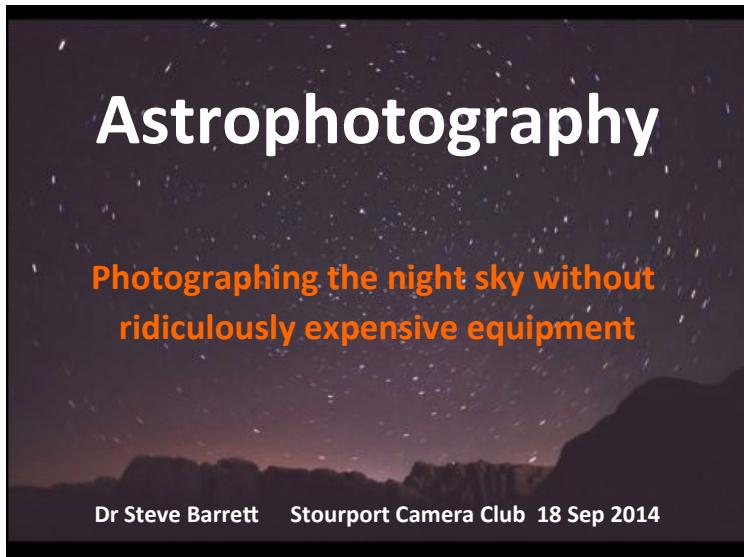


Astrophotography



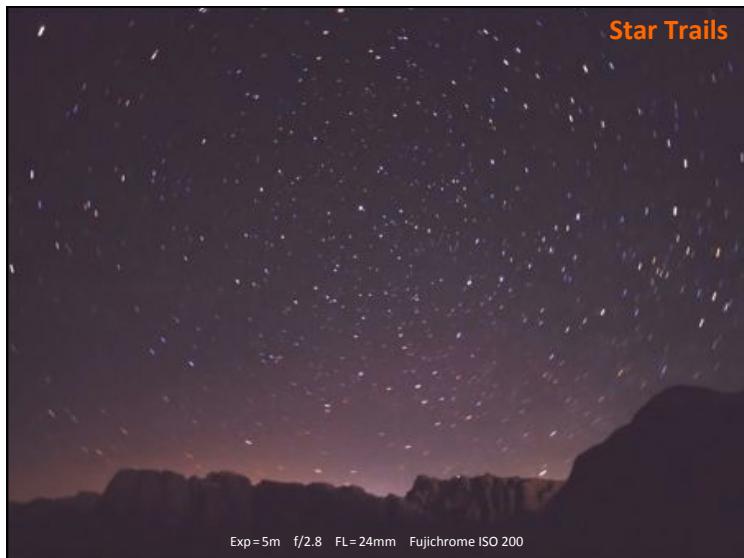
Astrophotography

What can be done with a camera and ...

- ... nothing else?
- ... a DIY star tracker?
- ... an amateur telescope?

Astrophotography / Introduction

2



Exp = 5m f/2.8 FL = 24mm Fujichrome ISO 200



Exp = 30s f/4 FL = 300mm Nikon D200

Astrophotography

Aurora Borealis



Astrophotography / Fixed / Aurora Borealis

Exp=5m f/2.8 FL=24mm Fujichrome ISO 200

5

Aurora Borealis

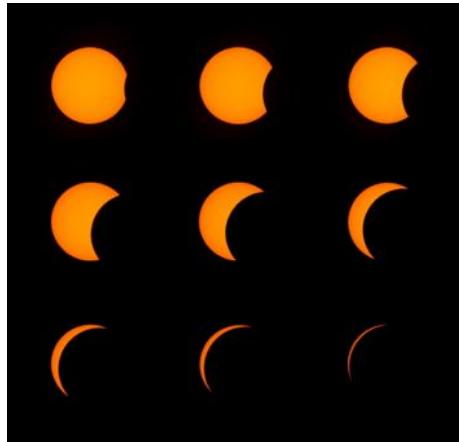


Astrophotography / Fixed / Aurora Borealis

Exp=5m f/2.8 FL=24mm Fujichrome ISO 200

6

Solar Eclipse



Astrophotography / Fixed / Solar Eclipse

Exp=1/100s f/4 FL=300mm Nikon D200

7



Exp = 1/4 – 1/250s f/4 FL=300mm Nikon D200

Astrophotography

Star Trails



Astrophotography / Fixed / Star Trails

Exp = 2m f/2.8 FL = 18mm Nikon D70

9

Tracking the Stars

How can the sky be photographed without the stars trailing?

Build a device to compensate for the Earth's rotation — a star tracker.

Ideally... For K2 this means...

| | |
|-------------------|-------------------------------|
| Compact | Footprint no larger than A4 |
| Light | Less than 1 kg |
| Strong | Able to support a digital SLR |
| Accurate | Exposures of up to 15 minutes |
| Battery operated | AA batteries |
| Low power | Run for ~ 6 hours |
| Cheap | Cost < £50 for all components |
| Easy to construct | Manual tools (no workshop) |

Astrophotography / Star Tracker

10

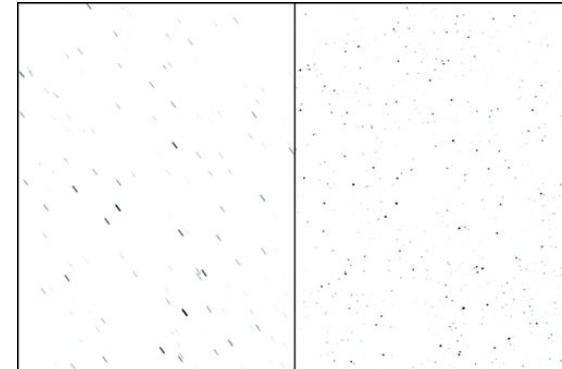
K2 Star Tracker



Astrophotography / Star Tracker

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K2 Star Tracker



K2 off

K2 on

Astrophotography / Star Tracker

Exp = 30s FL = 100mm

12

Astrophotography



Tracking the Stars



Astrophotography / Star Tracker / Antares

Exp=4m f/1.8 FL=85mm Nikon D7100

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Star Trackers



Astrophotography / Star Trackers

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Telescopes



Astrophotography / Telescopes

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Astrophotography



[Saturn Video](#)



Exp=1/25s f/38 FL=2000mm Canon XM2 camcorder

18

[Orion Nebula](#)



Exp=4 x 5m f/10 FL=2000mm Nikon D70

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[Pleiades Cluster](#)



Exp=3 x 5m f/4 FL=300mm D70

20

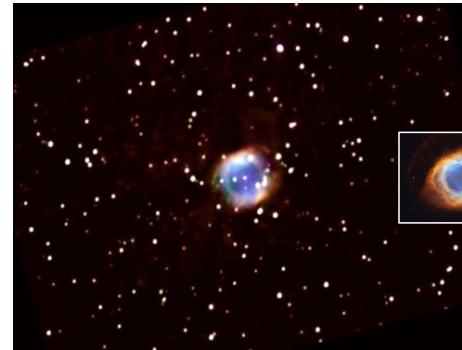
Astrophotography

Andromeda Galaxy



Astrophotography / Telescopes / Piggy-Backing / M31 Andromeda Galaxy Exp = 2 x 10m f/4 FL=300mm D70 21

Helix Nebula



Astrophotography / Telescopes / Piggy-Backing / C63 Helix Nebula Exp = 20 x 2m f/4 FL=300mm D70 22

NGC7000 North America Nebula



Single raw image 20 images stacked in *Image SXM* Colours enhanced in *GraphicConverter*

Taken with a Nikon D200 DSLR with a Sigma 100–300mm lens. Each exposure is 120s at f/4. © Steve Barrett 2012

Markarian's Chain



Exp = 10 x 2m f/4 FL=300mm Nikon D200

Astrophotography

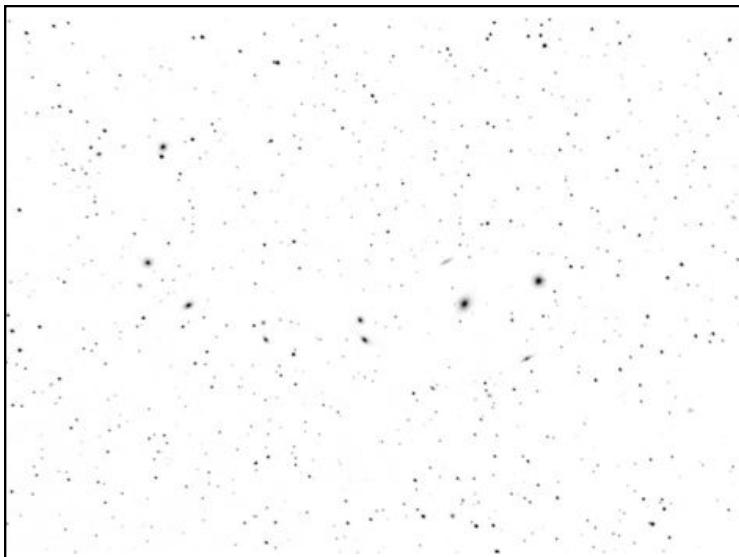


Image Processing

The diagram shows four panels labeled 'Dark', 'Flat', 'Raw', and 'Processed'. The 'Dark' panel is black. The 'Flat' panel is grey. The 'Raw' panel is orange. The 'Processed' panel is a dark image of a star field with many small white dots representing stars.

Astrography / Image Processing / Markarian's Chain

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Astrography

nothing else?
... a DIY star tracker?
... an amateur telescope?

Astrography / Summary

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Astrography

Photographing the night sky without
ridiculously expensive equipment

<http://www.liv.ac.uk/~sdb/Talks>

A dark night sky with a silhouette of mountains at the bottom.