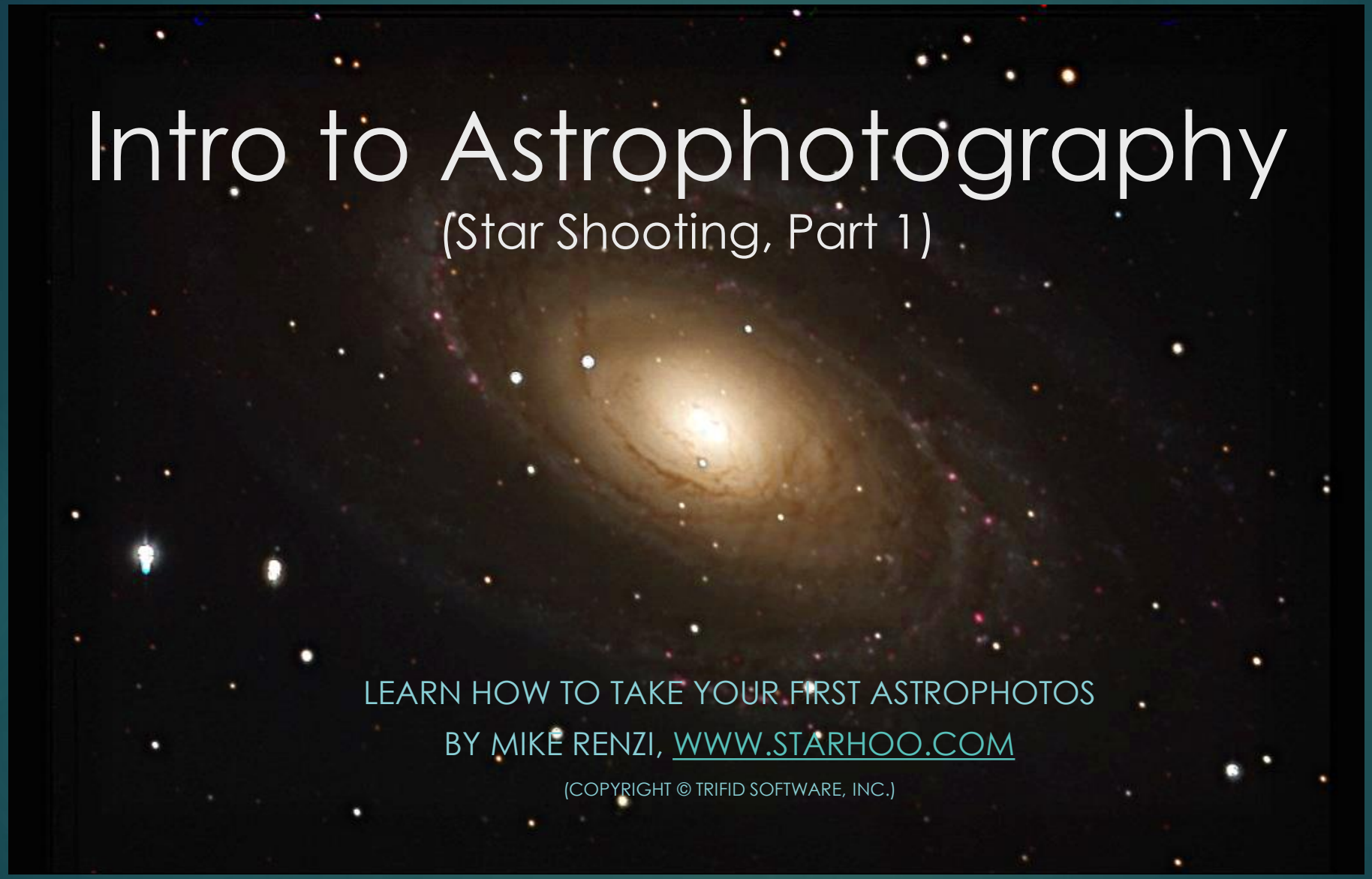

Intro to Astrophotography

(Star Shooting, Part 1)

LEARN HOW TO TAKE YOUR FIRST ASTROPHOTOS

BY MIKE RENZI, WWW.STARHOO.COM

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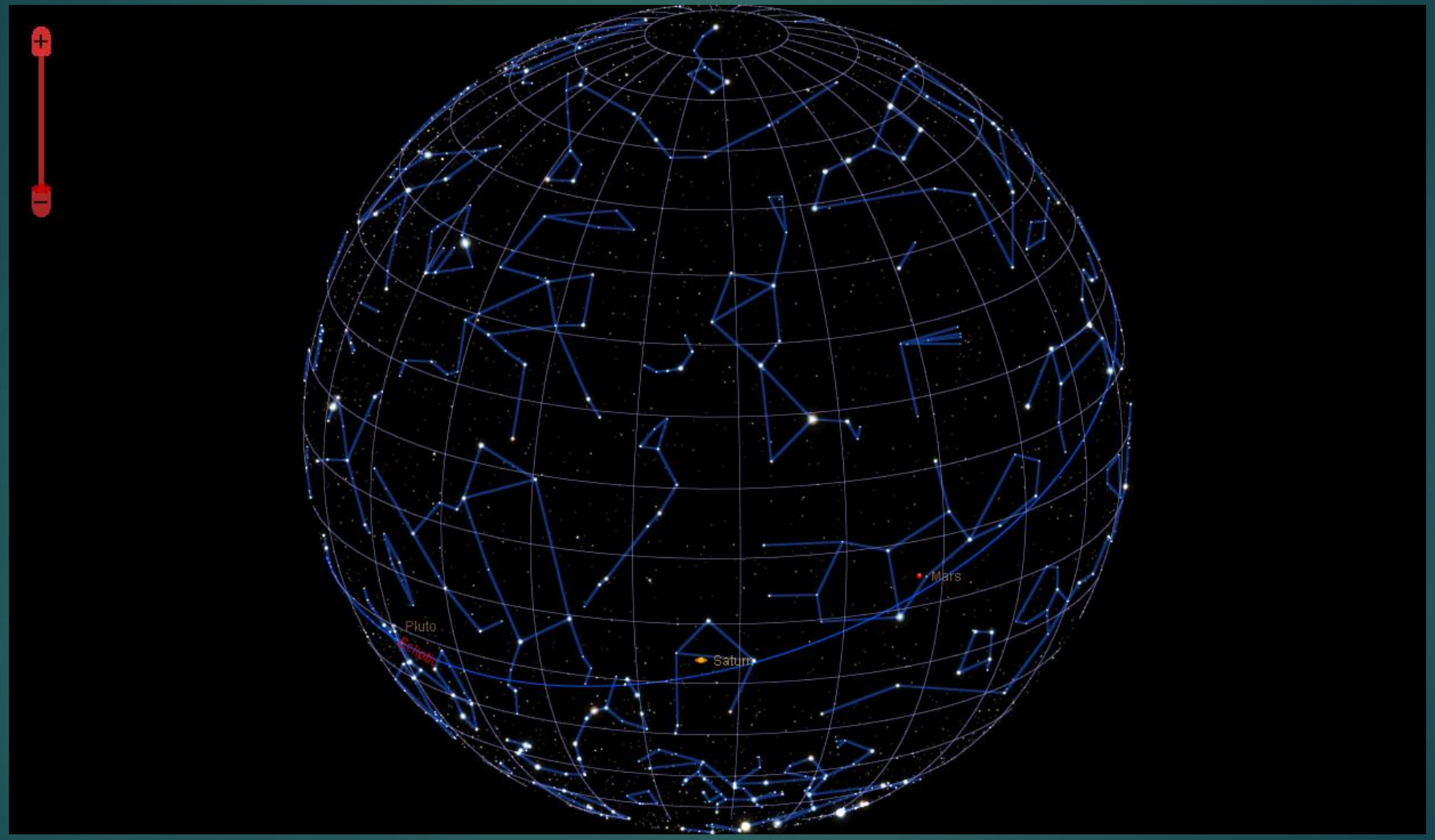
Why it's not so easy…

- The Earth spins on its axis.
- The heavens rise and set like the Moon and the Sun.
- The night sky is a moving target…

The Moving Sky…



- Stars/Constellations, the Moon and planets, rise and set thru the night…

Getting Started…

- The goal of this presentation is to help you take your first astrophotographs using a DSLR camera and a tripod.
- Start out simple and deal with the technicalities as needed.

- **Regardless of the equipment you have, the most important "ingredient" is patience.**

Three Good Intro Targets

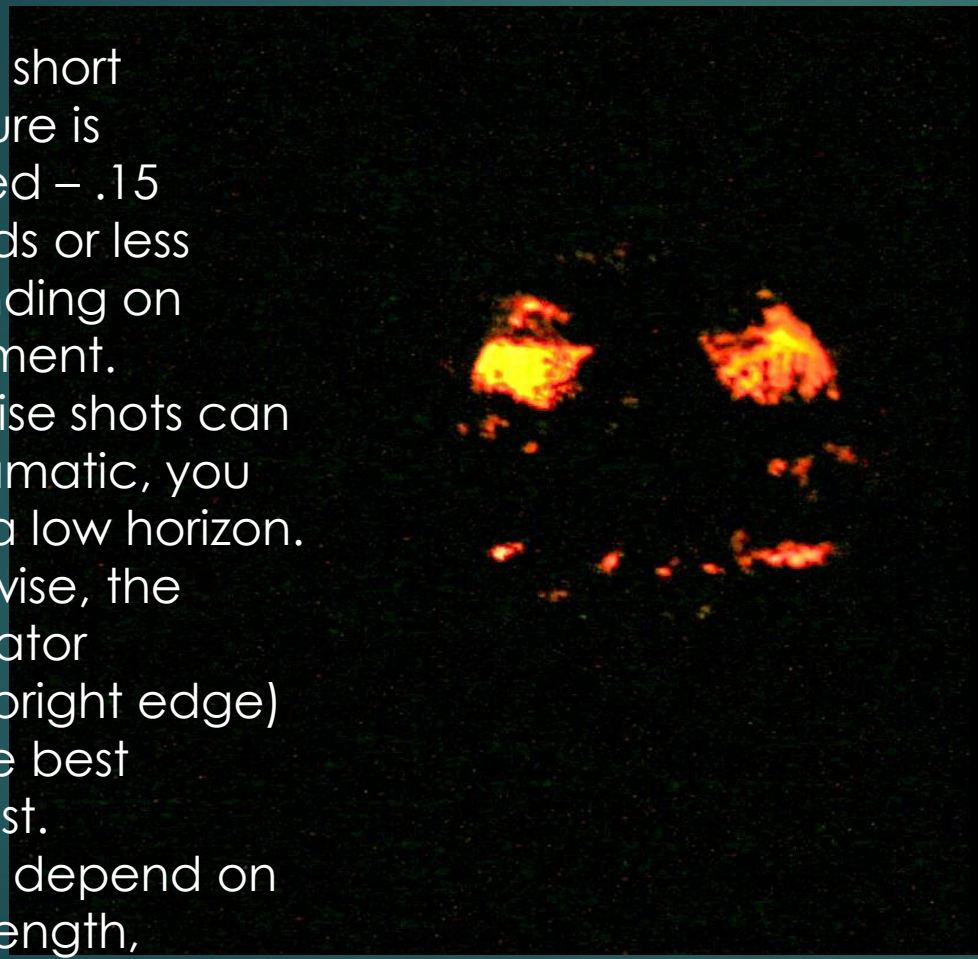
- 1. Star Trails

1. Set your camera to the M (or D) setting to allow the shutter to remain open.
2. Focus on one or more stars and take test shots to make sure the focus is right.
3. Aim the camera at Polaris, take a picture with a shutter release cable for about 1 hour.

Three Good Intro Targets, cont.

- 2. The Moon

1. Only a short exposure is required – .15 seconds or less depending on equipment.
2. Moonrise shots can be dramatic, you need a low horizon.
3. Otherwise, the terminator (dark/bright edge) has the best contrast.
4. Results depend on focal length, stability of tripod.



Three Good Intro Targets, cont.

- 3. Constellations, the Milky Way, Large Nebulae

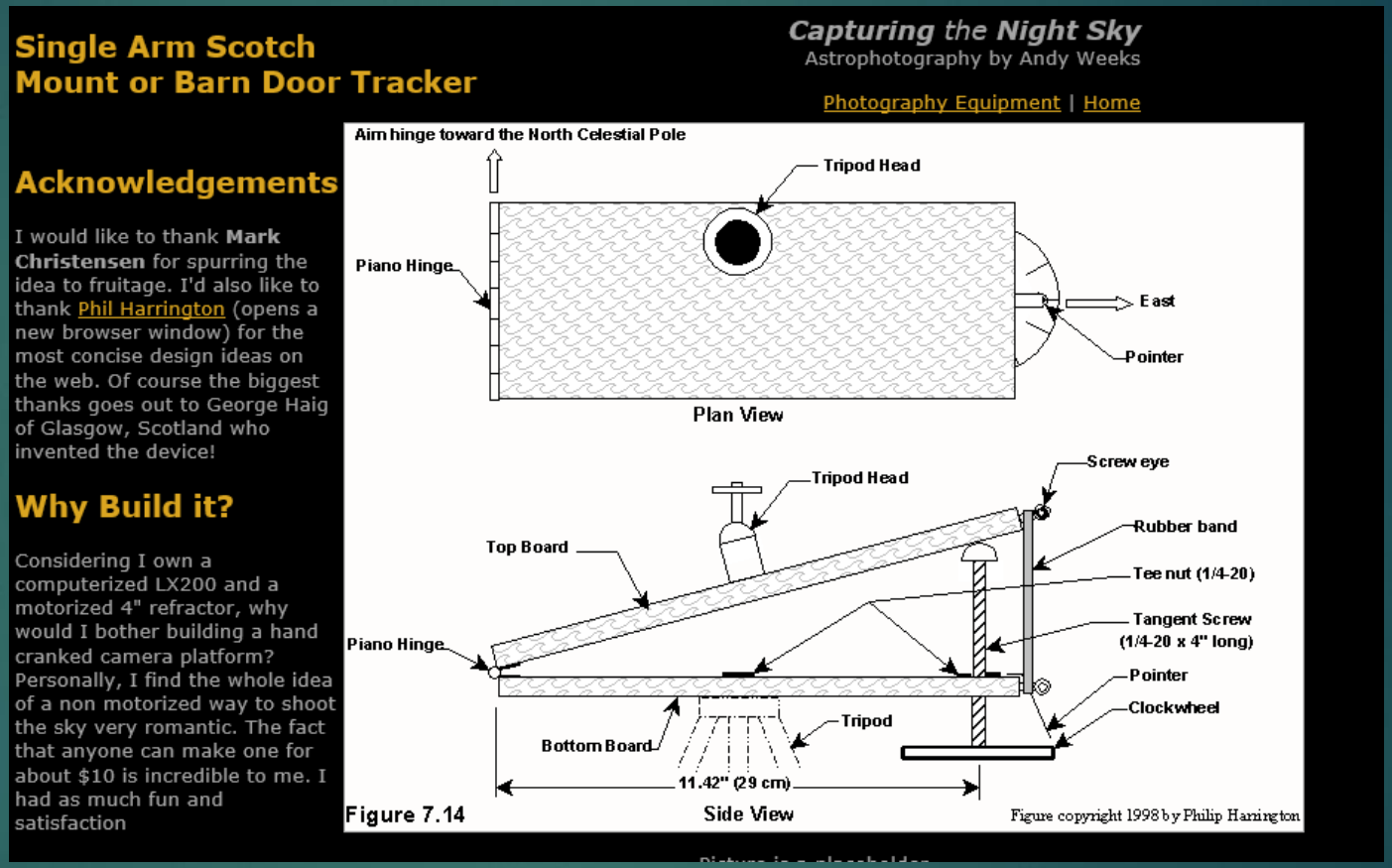
For best results, first become familiar with the constellations from season to season.

Summer Months: Milky Way, Cygnus right overhead; to the south, Sagittarius – the center of the Milky Way.

Winter Months: Orion and Orion Nebula (M42) – excellent target.

Tracking the Stars

For exposures longer than 30 seconds, your camera needs to move at the same rate as the stars.
This is known as sidereal tracking – it is the rate at which the Earth rotates.



Single Arm Scotch Mount or Barn Door Tracker

Capturing the Night Sky
Astrophotography by Andy Weeks

Photography Equipment | Home

Acknowledgements

I would like to thank **Mark Christensen** for spurring the idea to fruitage. I'd also like to thank Phil Harrington (opens a new browser window) for the most concise design ideas on the web. Of course the biggest thanks goes out to George Haig of Glasgow, Scotland who invented the device!

Why Build it?

Considering I own a computerized LX200 and a motorized 4" refractor, why would I bother building a hand cranked camera platform? Personally, I find the whole idea of a non motorized way to shoot the sky very romantic. The fact that anyone can make one for about $10 is incredible to me. I had as much fun and satisfaction

The tracker mounts onto your tripod. The camera is mounted onto the top board of the tracker. You rotate the drive screw at the sidereal rate – ideally about one revolution per minute. Main ingredient: patience.

Tracking the Stars, cont.

Barn Door Tracker
Parts List

Materials List

(click for pictures of individual items)

Description	Size (Imperial)	Size (Metric)	Quantity
Wood	(4" or 6") x 13" x 5/4*	(101.6 cm) x (330 cm)	2
Tee nut, 1/4-20 internal thread	NA	NA	2
Lock washer & nut	1/4"-20		1 each
Circular Wood (opens a new browser window) for a handle. Should have a flat on it.	2 1/2" or 3" diameter	63.5 cm or 76 cm	1
Piano Hinge** (Match Board Width)	4" or 6"	NA	1
Carriage Bolt	1/4"-20, 6" long	NA	1
Cap Nut	1/4"-20	NA	1
Round Wood (Obtain from hobby store. Used for puppet heads.	2-3/4" diameter	~70 cm	1
Wood Spacer- about the size of the Round Wood	1-2" square		1
Hangar Bolt (get a shorter length if you can.)	1/4"-20 x 2"		1
Rubber Plumbing adapter, 2" to 1 1/2". Made by Fernco®, part number P22U-139.	NA	NA	1
Wood	1-1/2" x 5" x 5/4" thick	38 cm x 127 cm x 32 cm thick	1
White Paint	NA	NA	Not much
Construction Adhesive or Liquid Nails™			1
Optional Hardware			
Bicycle Spoke			1

Links

http://www.astropix.com/BGDA/BGDA.HTM
http://www.astropix.com/BGDA/SAMPLE2/SAMPLE2.HTM

My First Barn Door Tracker

Next Week: Details…

- Focal Length and Focal Ratio
- Magnification
- Attaching a DSLR to a small telescope and shooting at prime focus.
- Noise
- The IR filter
- Dark frames
- Flats

Intro to Astrophotography, Part 2

by Mike Renzi

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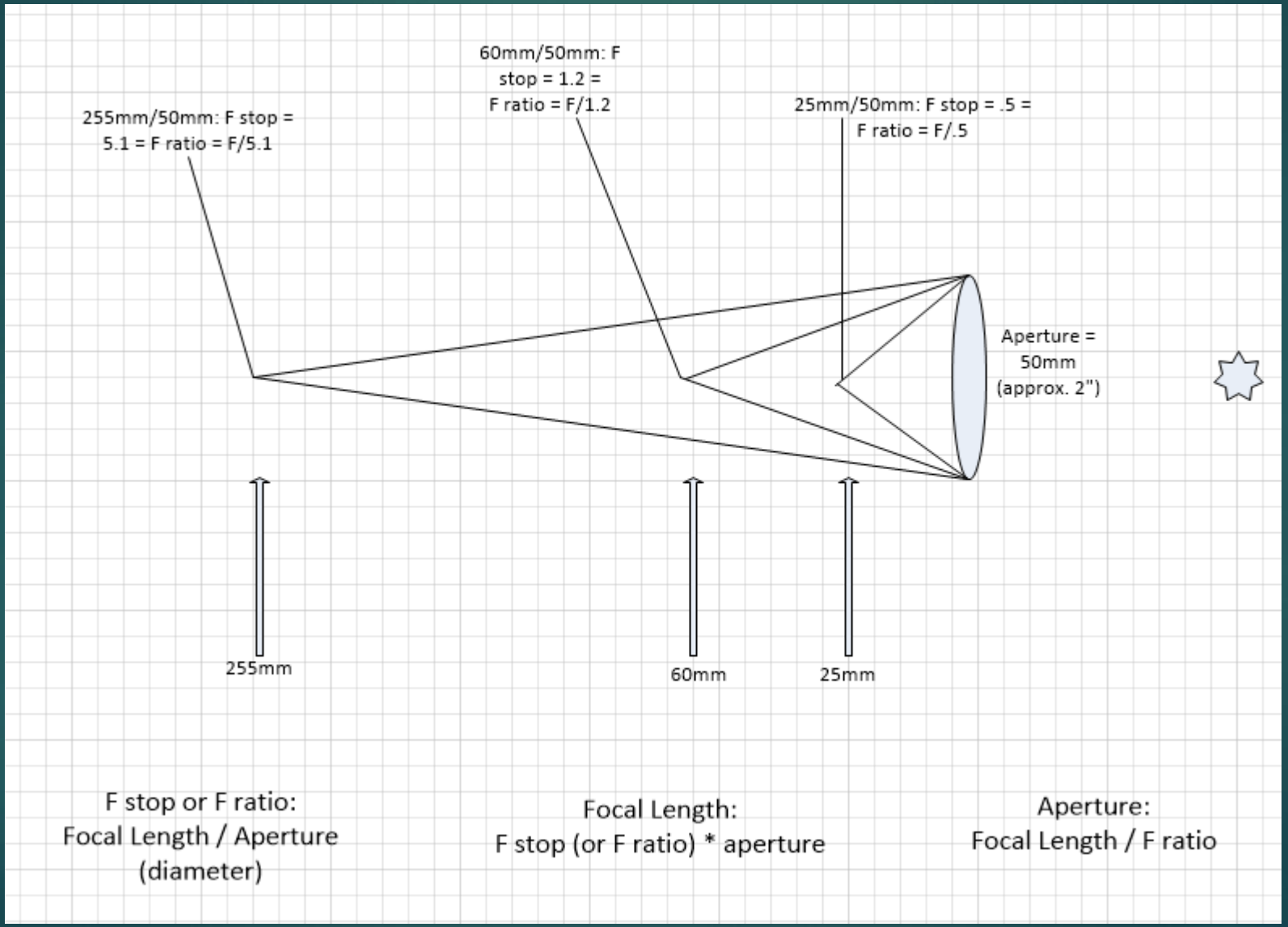
Tips, Tools, Techniques

- Camera Settings
  - ISO – Chip Sensitivity
    - Standard ISO settings:100 – 1600 – graininess increases with higher ISO (some cameras can go much higher, see Nikon D3, D700…)
    - For the Moon – try 400 – 800 or higher
    - For star trails – use Bulb mode, open shutter for exposure duration, try lower ISO (100-200)
    - For constellation, Milky Way areas, Messier objects (galaxies, globular clusters, etc.) your exposures will be 30 secs or more so faster ISO may be desirable (800 – 1600)
  - F Stops (a.k.a., F/ratio)
    - F/ratio = focal length/diameter (aperture); in an 8" telescope with a focal length of 56", the focal ratio = 56/8 = F/7
    - In a DSLR, the F Stop = F/ratio = focal length of lens / aperture. Example:

      255mm lens = 10"; aperture = 1.6", F/ratio = 10/1.6 = 6.25 = approx. F/6.
    - My F/16 shot of moon: 10" (focal length) / .625" (aperture) = F/16.

Focal Length, Aperture, F Stops, F Ratios



Focal Length, Aperture, F Stops, F Ratios, ad nauseum…

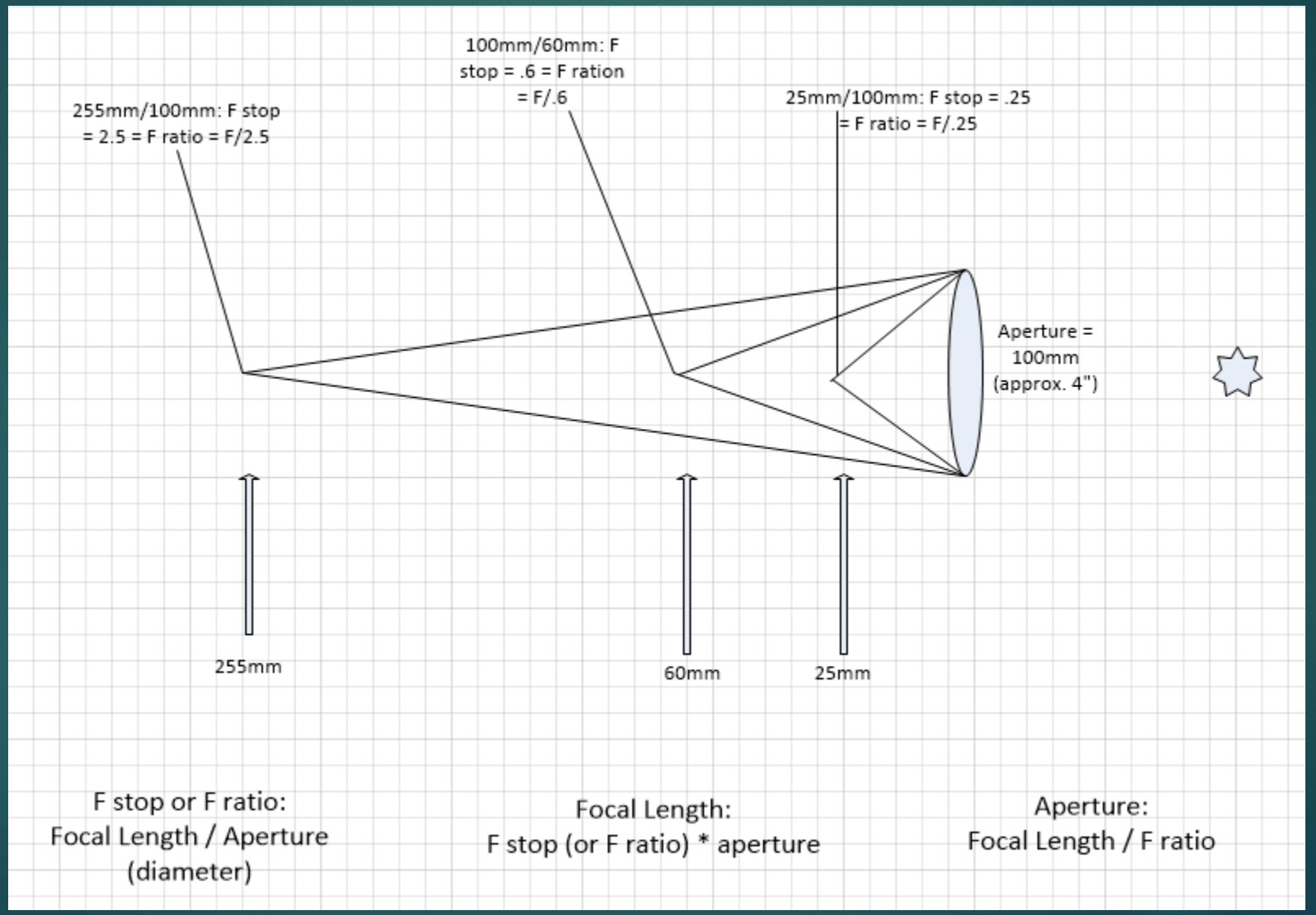


Image Processing

- Using software to adjust the image histogram, sharpness, contrast, color, hue, saturation, etc.
- Adobe Photoshop, Gimp, MaximDL, PixInsight, Corel…

10 sec Image
F/16
ISO 1600

Levels and Curves
Adjustment with Gimp

Moonshots Through a Telescope

Camera: Planetary CCD
700mm Refractor Telescope

Camera: Planetary CCD
3000mm (120") focal length, F/10
SCT Telescope

Tools

- Image Processing
  - Gimp – free Photoshop-Like software
    - http://www.gimp.org/downloads/
  - Stellarium – free Planetarium software
    - http://www.stellarium.org/
  - MaximDL – for advanced astrophotography, telescope mount control and automation
  - http://www.cyanogen.com/
  - A PDF of this presentation:
    - http://www.starhoo.com/info/IntrotoAstrophotography.pdf