

## Digital SLR Astroimaging

Oregon Star Party 2005



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## DSLR: Digital Single-Lens Reflex Camera

Effective observing tool

- ☉ Affordable: less than \$1,000
- ☉ Lower noise compared to fix lens cameras
- ☉ Long exposures 4 to 8 minutes
- ☉ Wide range of optical configurations
  - ☉ Lens & telescopes
- ☉ 12-bit raw image files
- ☉ Lots of pixels: greater than 6,000,000
- ☉ Fun to use

## Canon

Entry Digital Single Lens Reflex Cameras

EOS Digital Rebel 300D	6.3 MP 3072x2048	\$660
EOS Digital Rebel XT 350D	8 MP 3456x2304	\$800
EOS 20D	8.2 MP 3504x2336	\$1330
EOS 20Da Astronomy Version	8.2 MP 3504x2336	\$2200

Body Prices: B&H Photo 7/22/2005; OPT 20Da

## Nikon

Entry Digital Single Lens Reflex Cameras

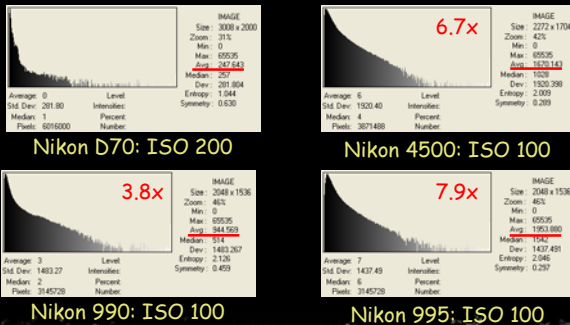


D50	6.1 MP 3008x2000	\$750
D70 out of production	6.1 MP 3008x2000	\$780
D70s	6.1 MP 3008x2000	\$900
D100	6.1 MP 3008x2000	\$1000

Body Prices: B&H Photo 7/22/2005

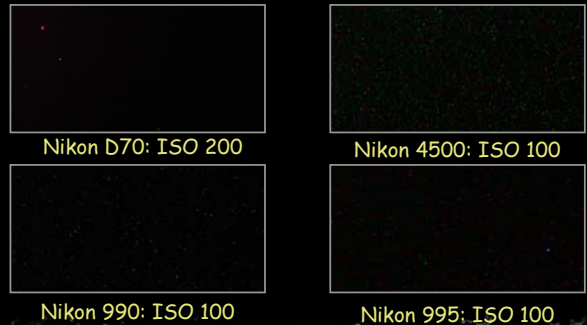
## DSLR Less Noise than Digitals

1 minute exposure



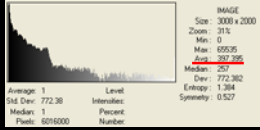
## DSLR Less Noise than Digitals

1 minute exposure, top left corner cropped

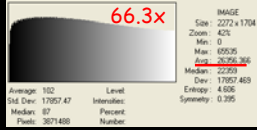
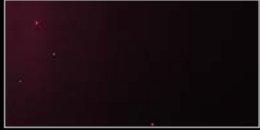


## DSLR Less Noise than Digitals

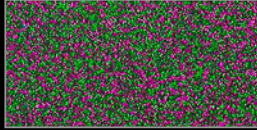
4 minute exposure



Nikon D70: ISO 200



Nikon 4500: ISO 100



## DSLR: Digital Single-Lens Reflex Camera

Interchangeable lens & prime focus imaging



180mmED lens



T-ring & eye piece adapter

## DSLR

Easy to mount on telescope



Tele Vue TV-60: 60mm, 360mm focal length at f/6

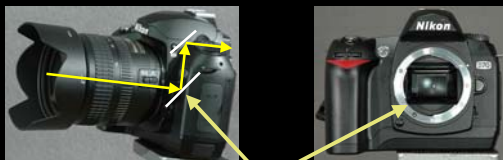
## Fun to Use

D70 fast & quick setup



## DSLR

Focusing through the lens



Mirror

## DSLR

Focusing through the lens

Mirror is down when focusing



Light hits the mirror

Mirror swings up when taking an image



Light hits the CCD

### Nikon D70 CCD

Charge Coupled Device

CCD is at the focal plane

CCD converts light into electrical signals



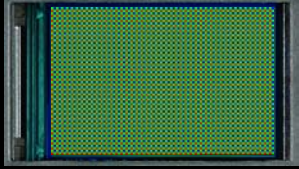
Camera converts the electrical signals into image data

### Nikon D70 CCD

6.1 million 7 μm square pixels

Hybrid Nikon-Sony CCD Design

Filters  
Bayer  
Anti-aliasing  
Infrared



2000 pixels high  
15.6 mm high

3008 pixels wide  
23.7 mm wide

### D70 versus 35 mm Film

D70 CCD


F3HP 35 mm



### D70 versus 35 mm Film

D70 CCD DX-Format

F3HP 35 mm



Smaller field-of-view

35 mm is 1.5x larger

Both 2:3 aspect ratio


### D70 versus 35 mm Film

CCD

Feedback at the telescope

Film

Need to develop film



### DSLR versus Astro CCD

D70 larger CCD, larger FOV

Nikon D70 CCD

SBIG ST-237 CCD



3008 x 2000

640 x 480

### DSLR versus Astro CCD

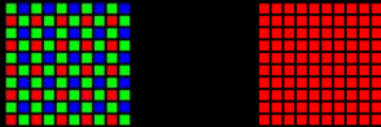
D70 single image for color  
Nikon D70 CCD      SBIG ST-237 + color filters



ST-237 three images (red, green & blue) for color

### DSLR versus Astro CCD

ST-237 better color resolution  
Nikon D70 CCD      SBIG ST-237 CCD



1 image with Bayer array that interpolates pixels      3 images with 3 filters red, green & blue

### DSLR versus Astro CCD

ST-237 lower noise  
Nikon D70      SBIG ST-237



No cooling      Electronic & fan cooled

### DSLR versus Astro CCD

D70 less electrical power  
D70 & Monitor      SBIG ST-237



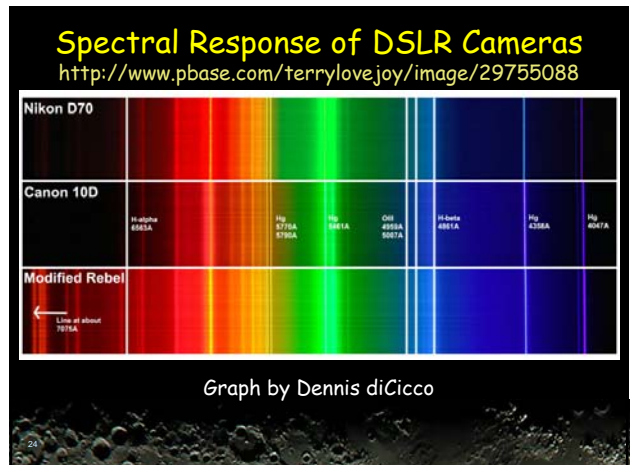
Small batteries      120 Vac or 12 Vdc car battery

### DSLR versus Astro CCD

D70 faster setup  
D70 & Monitor      SBIG ST-237 & Laptop



Monitor attaches to telescope mount      Need laptop table



## Hutech/Canon Enhance DSLR

**Hutech Astronomical Products**  
**Hutech/Canon Spectrum-Enhanced Digital DSLR Cameras**

Hutech now offers Canon digital DSLR cameras which have been specially enhanced to make full use of the bandwidth of the Canon DIGITAL sensor through the use of custom designed filters. These include the consumer level E-mount digital filter (DSLR) and Professional Digital Filter (DF) (DSLR), as well as the professional level E-mount 20D Standard Canon camera, the most modern digital camera, incorporate 30-stop filters which also cut off the deep end and end of the visible spectrum, greatly reducing response to a scientifically important part of the visible and IR spectrum.

These enhanced cameras are brand new units, specially enhanced for scientific/imaging applications such as astrophotography or general low-light photography - a 12-month warranty covers the original camera and enhanced for 12 months.

**Canon EOS 20D**

**Canon EOS 20Da**

Canon EOS 20D body with standard accessories

**Enhancement Options**

Two basic options are available at the time of order:

- Canon 30-stop enhanced compatibility
- Enhanced filter sets included

## Canon Astronomy version EOS 20Da

First introduced in Japan this year



## Canon Astronomy version EOS 20Da

[www.canon.co.jp/Imaging/eos20da/index.html](http://www.canon.co.jp/Imaging/eos20da/index.html)

**EOS 20Da**  
 The choice of passionate astrophotographers

Canon proudly introduced the EOS 20Da - a special version EOS 20D with enhanced low-light performance for deep space and night shooting modes.

**Product Summary** | **Basic specs** | **Key features** | **E-mount requirements** | **Official store in US**

**Product images**

**Features**

- Latest CMOS sensor with effective 8.8 megapixel resolution
- High speed DIGITAL imaging engine delivers high ISO sensitivity
- Canon 30-stop enhanced compatibility
- Canon 30-stop enhanced compatibility
- Canon 30-stop enhanced compatibility
- Canon 30-stop enhanced compatibility

## Deep-space Imaging with the Canon EOS 20Da

[www.lrgb.com/20da.html](http://www.lrgb.com/20da.html)

**Deep-space Imaging with the Canon EOS 20Da**

This web page is about using the new Canon 20Da Digital Single Lens Reflex (DSLR) camera to take images of deep-space objects. (Excuse the generosity of Canon and OPT. I've had a unique opportunity to use the 20Da before it's planned availability in the United States.)

The images and exposures described here occurred between June 16, and July 2, 2005. June 17 was cloudy and gave me the time to do some dark frame analysis. The images from June 18 were taken at Lick Blue 1.4m in the California Area Storage-shed under dark skies and after the Moon had set. All other images were taken in my back yard where there was no light pollution and within 1000' of the horizon.

## Canon Astrophotography

[web.canon.jp/Imaging/astro/index-e.html](http://web.canon.jp/Imaging/astro/index-e.html)

**Canon**  
**EOS DIGITAL**  
 Astrophotography Guide for EOS DIGITAL

EOS 20Da

## Mega Pixels versus \$



