Foreword

I must clarify before you continue reading this comparison, that I am not an engineer, mathematician, or scientist. I am a photographer and graphic designer. Therefore, many of the observations I claim are determined through visual analysis and my own subjective interpretation. I will not present numbers besides those corresponding to camera features and exposure specifications.

The comparisons below were taken with the same aperture and ISO settings. Shutter speed varied in order to achieve proper exposure. Each photograph was taken using evaluative metering, at EV 0, and automatic white balance. The photographs in the comparisons were analyzed without any editing.

This document is optimized for electronic viewing. Zoom in on the photographs to view high detail.

Full-Frame D700 versus APS-C D7000

A visual comparison for professionals and amateurs

Section I – Camera Specifications

	 D700 $2,499.95 MSRP	 D7000 $1,179.95 MSRP
Effective Pixels	12.1 million	16.2 million
Image Sensor Format	FX (Full-Frame)	DX (1.5x Crop Frame)
Memory Media	Compact Flash (Type I; w/ UDMA)	SD (HC, XC)
Continuous Shooting @ Highest Resolution	5 fps	6 fps
ISO	200-1600 (3200 – 6400 w/ firmware update) ISO 100 (Lo-1) ISO 12,800 (Hi-1) ISO 25,600 (Hi-2)	ISO 100 – 6400 ISO 12,800 (Hi-1) ISO 25,600 (Hi-2)
Video Quality	--	1080p @ 24 fps 720p @ 30 fps 720 @ 24 fps 424p @30 fps
LCD Screen	3”	3”
Battery	EN-EL3e Li-ion	EN-EL15 Li-ion
Approx. Dimensions	14.7 cm x 12.3 cm x 7.7 cm WIDTH HEIGHT DEPTH	13.2 cm x 10.3 cm x 7.7 cm WIDTH HEIGHT DEPTH
Approx. Weight	~ 0.98 kg	~ 0.69 kg

From the comparison of the two cameras' specifications we can interpret that the D700 will provide a higher dynamic range and better noise tolerance because of the camera's large sensor and lower resolution. However, the D7000 does provide more features, higher resolution for printing, and a faster drive.

Many of my friends, family and colleagues ask me about these two cameras when looking to purchase a faster and beefier SLR. Sure I can talk about the specifications between the two but before this test I was only able to talk about the D700 from experience. The D7000 is lighter, faster, and supports video – perfect features for an amateur or a nature photographer. But will it step up in low noise and dynamic range? This will clear all that up.

From this point onward the *D700* will be coloured red while the *D7000* will be coloured in blue; no one likes to be confused.

Section 2 – High ISO Noise Tolerance

In this section, we will compare photographs taken by both cameras at different ISO settings. For brevity I will compare the photographs where significant differences can be noted; this will occur usually at ISO 800 and higher.

Set 01 (images on pages 4 and 5)
Test variable: ISO 200 to 6400
Constant variable: aperture F5.6
Random variable: shutter speed
Media format: JPEG high

Observations

Both the D700 and D7000 perform well at ISO 800 and below; the D700 is virtually clean. However, both cameras' mid-tones and blacks are affected by noise at 1600. Pushing the ISO further into 6400 produces destructive noise. Blacks and mid-tones become monotonous, blurring into a heavy black littered with grey noise.

Before I began this comparison I would have put my money on the D7000 in a test of noise handling because of the camera's Expeed 2 processor. However, just by looking at these sets of images, never mind the histograms, the D700 stands triumphant – but not by much.

ISO 1600 COMPARISON

D700 - 26mm @ ISO 1600

D7000 - 26mm @ ISO 1600

ISO 6400 COMPARISON

D700 - 26mm @ ISO 6400

D7000 - 26mm @ ISO 6400

I will now compare the noise produced when shooting RAW. Due to the nature of RAW photographs – uncompressed, there will be a significant increase to the amount of visible noise. I expect that with the Expeed 2 processor, the D7000 will handle noise better than the D700 when shooting RAW.

Set 02 (images on pages 7 and 8)
Test variable: ISO 200 to 6400
Constant variable: aperture F5.6
Random variable: shutter speed
Media format: .NEF (Nikon RAW)

Observations

Lo and behold! I lost the bet (this is why I don't gamble). Similar to shooting in JPEG, both cameras handle noise equally well at ISO 800 and below. By shooting RAW there is visible noise at ISO 800, however the D700 maintains tonal depth through mid-tones and blacks.

At ISO 1600 (page 7), the D700 handles noise much better than the D7000 around blacks and high lights. Take a look at the barrel of the Super 8. The D700 has visible noise but the D7000 is more aversely affected by larger groups of pixels.

I never really understood why some photographers push their equipment to ISO 6400 and above. He or she may be able to take still photographs in dangerously dark environments, but the amount of noise cannot be removed without destroying textures and tonal depth. Both cameras produce photograph destroyed by noise (page 8). Textures and tones are blurred into a mass of black and white film grain. Regardless of near total chaos, the D700 still beats the D7000 is noise tolerance. At ISO 6400, the difference is nearly undetectable. The advantage the D700 has is in its preservation of mid-tones and blacks.

ISO 1600, RAW COMPARISON

D700 - 26mm @ISO 1600, RAW

D7000 - 26mm @ISO 1600, RAW

ISO 6400, RAW COMPARISON

Section 3 – Dynamic Range

Dynamic range is the range of colours and shades of grey the camera's image sensor can capture. Traditional CCD sensors in low-end cameras do not have the ability to capture diverse tones, resulting in basic tones and shades. Newer CMOS sensors can capture more light resulting in a greater abundance of RGB information provided to the image – more tones and shades. The type of the sensor only takes you so far. In this industry, size matters.

The D7000 is equipped with an APS-C size (DX) sensor that is 1.5 times *smaller* than 35mm film. The D700 uses a full frame size (FX) sensor that is 1:1 with 35mm film. When film was the contemporary medium for photography, the bigger the slide, the better. It's about surface area: the greater the area, the more light receptors can be used to capture light. The more light there is, tonal depth or dynamic range will be greater. Therefore, by design the D700 will capture a greater range of tones in high lights, mid tones, and blacks as opposed to the D7000 with a smaller image sensor.

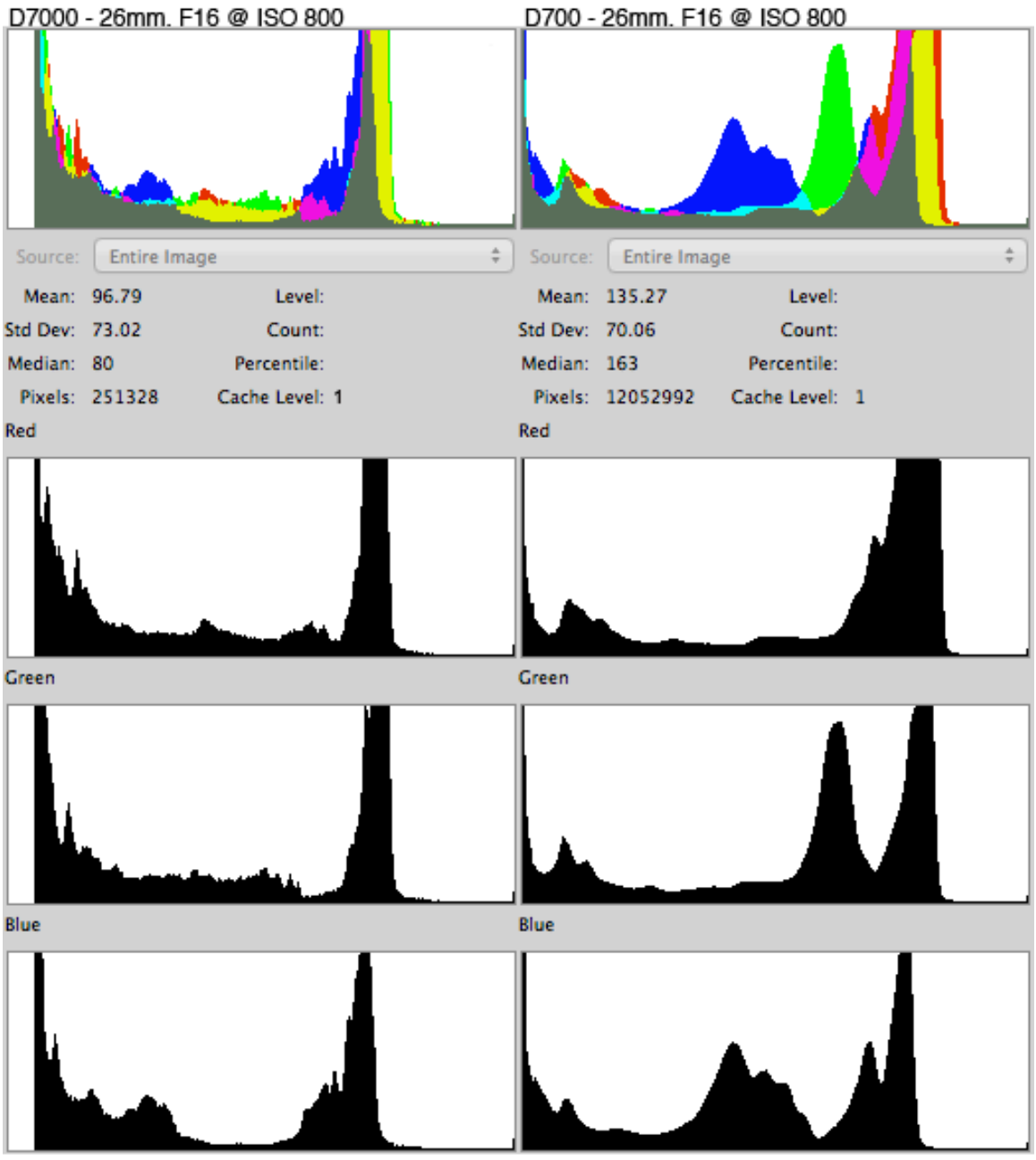
Set 03 (images on pages 10 and 11)
Test variable: highlights, mid tones, and blacks
Constant variable: ISO 800 and F16
Random variable: shutter speed
Media format: .NEF (Nikon RAW)

Observations

I used the histograms for this comparison to see a more accurate representation of blacks, midtones, and highlights. At a glance the D700 (right) provides a smoother slope between tones. This generates smooth gradation between colours and a wider range of tones in the photograph. The D7000 on the other hand does show higher amplitude in the red, green, and blue mid tones. This means the colours captured by the D7000 will be brighter and fuller without getting that annoying colour bleed.

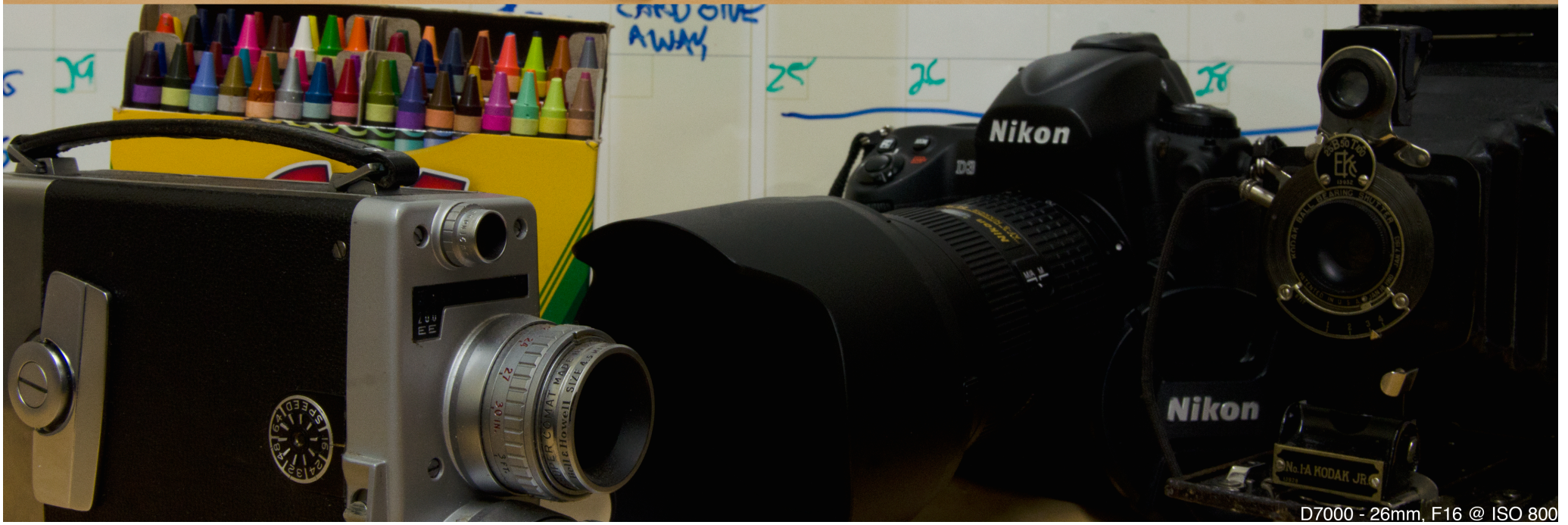
Taking a look at the photographic comparison, the D700 draws the eye with the depth in its tones across all levels. This is where the decision for photographers gets a big complicated: do you want a camera that will capture bright and full colours without running into problems like colour bleed? Or do you want a camera that can capture more neutral-level tones?

Histogram Comparison – F16 @ ISO 800, RAW



F16 @ ISO 800, RAW

D700 - 26mm, F16 @ ISO 800



D7000 - 26mm, F16 @ ISO 800

Section 4 – Focal Length Magnification

As we discussed before, the difference in size between an FX sensor and DX sensor affects everything. This includes the focal length of your lens. This will explain why the focal length on the compared photographs is the same yet the image looks totally different.

I shot this comparison with the Nikon 24-70 F2.8 lens set to 26mm. All SLR lenses are tailored to the FX size sensor so for the D700 26mm is 26mm. For the D7000 with its DX (APS-C) size sensor, 26mm is 39mm (26 x 1.5). As a landscape and editorial photographer the crop is just too much. I need my wide angle!

This is no small difference. The D700 (top) captures more of the scene compared to the D7000 at the same focal length.

Section 5 – Depth of Field Distortion

Sensor size also affects how shallow the depth of field can be in a photograph - the *smaller* the sensor, the shallower the depth of field. So the D7000 should have a noticeable difference in depth of field compared to the D700 at similar apertures.

Set 01 (images on pages 14-16)
Test variable: depth of field via aperture f2.8-22
Constant variable: ISO 800
Random variable: shutter speed
Media format: .NEF (Nikon RAW)

Observations

Depth of field is affected by focal length as much as it is affected by the aperture. The wider the focal length the deeper the depth of field becomes. Even at f2.8 the depth of field is still deep compared to a 85mm lens at f2.8. If I had shot this portion of the comparison at 70mm the differences between the two cameras would be more significant. But I'm not performing an extreme stress test. This comparison is to detect the slightest differences between the cameras. If the depth of field is deeper at 26mm as opposed to 70mm, then the slight differences will be magnified at higher focal lengths.

At a glance, there's no difference. Though it is difficult to really say for sure because of the magnification difference. However, it is that difference in magnification that is essential. The D700 defocuses the background beautifully at f2.8. The D7000 does as well. What I'm seeing here is the D700's depth of field at 26mm while I'm seeing the D7000 at 39mm due to the crop sensor. This means at 26mm the D7000 would capture a shallower depth of field because of its smaller sensor. That's really useful for portrait photographers.

F2.8 @ ISO 800 COMPARISON
D700 (left) - D7000 (right)

F8 @ ISO 800 COMPARISON
D7000 (left) – D700 (right)

F22 @ ISO 800 COMPARISON
D7000 (left) – D700 (right)

The Bottom Line

Before I ran this test I had just played with the D7000. I thought it would be better in noise tolerance, colour saturation, and would capture a shallower depth of field. Not to mention the video quality is stunning. So I considered giving up my D700 for something a little more manageable on my student budget and provides me with a video feature. After this comparison, I see enough differences to stick with my D700. Yet for photographers getting into the game I will actually recommend the D7000.

Why? Many photographers are not terribly picky about the technical aspects of their images so the differences this test revealed are insignificant or even null! Which makes the D7000 faster, lighter, and cheaper by more than $1000. The crop sensor makes the camera especially handy for capturing sports, wildlife or anything else in the distance.

If you are a landscape or commercial photographer I still recommend the D700 for its dynamic range.

Break Down

Aspect	**Winner**
High ISO Noise Tolerance	D700
Dynamic Range	D700
Telephoto Range	D7000
Wide-Angle Range	D700
Depth of Field	D7000

Thank you for reading. I hope it helped you make a decision as much as it helped me.

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