RECENT POSTS

Next Up, Locusts

A Strange Fact About Blogs

Why Would a Film Photographer Shoot Color?

What I Bought With My $200

What Would You Do With $200?

Blog Note

Canon R5 Tops List for Second Year in a Row

A Most Honorable Photographer

Football Today (OT)

2017 Open Mike: Why I Like Vinyl

+ SPONSORS

RESOURCES

About Us

The Old Site

Advertising information

Comment Guidelines

Publisher's Statement

Contact

« Lens Trivia Question (15 Points) | Main | One-Day-Only Deal »

Wednesday, 15 February 2012

Myths About Megapixels (...And, Does the D800 Have Too Many?)

By **Ctein**

The recent announcement of the 36-megapixel Nikon D800 has brought forth a certain number of predictable reactions, a few lauding it as the Second Coming and many more dismissing the utility of more megapixels.

Most such opinions are based on mythical (or at least mistaken) beliefs about what pixel counts really mean. Let's see how many of them I can shoot down in one column.

I've written on this subject many times before, so I'm not going to present detailed arguments. I am simply going to assert facts. To keep the number of comments I have to answer to a minimum, please remember to check to see if your doubts have already been addressed in the cited columns and my comments before you take issue with my myth-busting.

Myth #1

The sharpness of your photographs will increase in proportion to the number of pixels.

Reality: Well, technically, the square root of the number of pixels, but that's not really the issue. Quadrupling the number of pixels (doubling the resolution of the sensor) is no more guaranteed to double the sharpness of your photographs than doubling the sharpness of the film you were using did. Image sharpness is a convolution of multiple factors. Improving sensor resolution improves image sharpness, but it won't make a proportional difference unless it is by far the fuzziest link in the chain. For more on this, see my article "Diffraction In Perspective."

Myth #2

Getting more megapixels is just about making bigger prints.

Reality: For a minority, yes, but it's more commonly about making sharper prints at whatever size you're choosing to print. Good printers can render more than 500 PPI of fine detail and human eyes can perceive considerably more than that. Digital cameras are only about 50% efficient in terms of resolution (e.g., a 24-megapixel camera delivers about 12 megapixels of resolvable detail), so you don't have to be printing very large to see a perceivable difference from more megapixels. See "How Sharp Is Your Printer? How Sharp Are Your Eyes?"

Whether you care about that difference, of course, depends upon your needs. But the difference is there.

Myth #3

More megapixels inevitably means noisier photographs and/or poorer high ISO performance.

Reality: That would be true if the camera manufacturer took exactly the same chip technology and exactly the same support electronics and simply crammed more pixels into the same size chip. That never happens! Those pixel-count changes are always accompanied by other improvements in the chips and the support circuitry. If we had reached the physical limits of image quality, those improvements wouldn't be able to compensate for the additional pixels. We haven't; we're several stops away from that. New cameras frequently have higher pixel counts, lower noise, and better ISO performance, all at the same time. See "Photography at the Speed of Light" and "Something Old and Something New."

Myth #4

It's pointless to add more pixels because lenses aren't good enough.

Reality: I have no idea where this one came from, because it's contradicted by decades of lens and camera test data. I'm going to cut through the morass of minutia-based arguments about pixel dimensions, filter geometries, and Airy disks and lay it out in very simple terms. A 16-megapixel 35mm-sized Bayer array sensor is going to resolve around 50 line pairs per millimeter (lp/mm). A 36-megapixel sensor will resolve around 75 lp/mm. Even mediocre 35mm lenses will hit 75 lp/mm at some aperture over some portion of their field of view. This is true of both fixed focal length and zoom lenses.

Decent (not at all exceptional) 35mm-format lenses can hit 75 lp/mm at just about all apertures and will do so over most of the field of view for at least one aperture. They'll show peak resolutions more like twice that. Really good lenses (not necessarily expensive ones) will be able to exceed 75 line pair per millimeter without even trying hard over most/all of the field of view and will have peak resolutions three or more times that.

PORTALS

Support Sustain Contribute via Patreon

SEARCH

Google

WWW
T.O.P.
Google Search

CATEGORIES

Around the Web (220)
Baker's Dozen (50)
Blog Notes (566)
Bon Mots (10)
Book of the Week (15)
Books (521)
Camera Reviews (138)
Cameras, new (779)
Cameras, old (255)
Carl Weese (23)
Collecting (53)
Computers (91)
Ctein (370)
Digital Techniques (72)
Eamon Hickey (2)
Editing and Portfolios (76)
Exhibits (84)
Film and Darkroom (128)
Followups (147)
From the Archives (38)
Geoff Wittig (2)
Gordon Lewis (15)
Interviews (7)
Jim Hughes (31)
John Camp (8)
John Kennerdell (17)
Ken Tanaka (11)
Kirk Tuck (8)
Legal and social issues (112)
Lenses (316)
Mini-Portfolios (5)
Morning Coffee (32)
Music Notes (106)
News and Occasions (475)
Obituaries (82)
Off-topic posts (490)
Open Mike (337)
Oren Grad (1)
Past Blasts (23)
Peter Turnley (66)
Photo equipment (344)
Photo industry (169)
Photo-tech (221)
Photographers, current (240)
Photographers, historical (164)
Photographic aesthetics (219)
Photography businesses (26)
Photojournalism (85)
Polls (16)
Print Offers (262)
Printers and Printing (169)
Quote o' the Day (95)
Random Excellence (246)
Random Snaps (123)
Reader Prints (7)
Recommended Cameras (14)
Reflections (198)
Reruns (24)
Roger Overall (2)

Furthermore, until the lens resolution drops to only half that of the sensor, improving sensor resolution will produce an observable improvement in image resolution.

See the previously cited diffraction column and "Why 80 Megapixels Just Won't Be Enough..."

Myth #5

This is just a useless horsepower race by manufacturers; people don't need all those megapixels.

Reality: Sure, it's a horsepower race, but saying nobody needs it would be like saying nobody needed 120 format over 35mm or sheet film formats over 120 roll film. Most people don't, to be sure. Even more won't be willing to pay the premium. Count me in that group; I may still very well lay out a grand for the 24-megapixel Sony NEX-7, but there's no way I'm laying out $3K for the boat anchor Nikon D800. But that's just me (and, similarly, your priorities are just you).

Let's also remember that not everybody likes to compose uncropped, full frame. Actually, most photographers don't (although many digital photographers have been forced into it). If 50% more pixels affords them the opportunity to do some reasonable cropping without unreasonable sacrifices in sharpness, they will be happy campers.

In other words, it's not about you. It's not even about me.

• • •

It's likely I have missed some myths, but I'm sure I've done enough busting to enrage some of the myth-perpetuators. Can't wait to see what shows up in my e-mail inbox.

Ctein

Physicist, astronomer, photographer and fine printer Ctein has written hundreds of articles for dozens of magazines about the science and technique of photography over four decades. It's no myth that his weekly TOP column appears on Wednesdays.

Posted on Wednesday, 15 February 2012 at 11:09 AM in Ctein, Digital Techniques, Photo-tech | Permalink

Unique contents copyright © 2012 by Ctein and the commenters

Comments

I would have loved this writeup when the A900 showed up, since it got much the same reception the D800 is getting now, except perhaps worse since it is a Sony.

Posted by: Keith I | Wednesday, 15 February 2012 at 11:20 AM

RE: Myth #5

Sure, it's a horsepower race - but horsepower is always fun, occasionally useful and, rarely but it happens, an irreplaceable safety factor.

Posted by: Steve G., Mendocino | Wednesday, 15 February 2012 at 11:27 AM

Myth #3:

True, but just imagine if Nikon had taken those technological advances and incorporated them in to lets say a 16MP sensor (which they probably did with the D4).

We finally may get back to having 10-14 stops of dynamic range, like we did with film negative. I'm pretty tired of being stuck at a slide film like 8-9 stops (usable, not theoretical). The limited DR is one reason why after all of these years digital photography still looks like highres video.

We might have gotten 16bit files with better color resolution.

We might get away from bayer pattern sensors, which less face it are not a very elegant technology.

The megapixel race is mostly driven by marketing. Megapixles is something easy for consumers to latch on to, because most people think bigger is better. That and I'm afraid that the brigades of pixel peepers shooting test charts in their basements are having far too much influence on the direction R&D. Most people actually taking real pictures would be better served by advances in DR than resolution.

Posted by: Harry Lime | Wednesday, 15 February 2012 at 11:29 AM

Dear Ctein,

about Myth #3, should not we compare noise at a given resolution? If I double the number of pixels, I can always average down and recover large part of the extra noise, if I have to. And still have more pixels to play if I need to. Or not?

Posted by: Roberto C. | Wednesday, 15 February 2012 at 11:35 AM

Cropping is what it is all about. When I shot predominantly slides - I relied on zoom lenses as a useful crutch. But once my workflow involved digital (even if the camera was still film) I tend towards primes and sometimes crop out only small percentages of the entire image if that's the shot that I want.

Posted by: Andy K | Wednesday, 15 February 2012 at 11:35 AM

Let me ask a question from a print production standpoint.

For magazine production we are told 8 x 10 x 300 dpi (color) or 600 dpi (B&W) which is
about a 20meg +/- uncompressed tiff file.

Sarge (1)
Satire Alert! (25)
Shooting Skills and Camera Handling (6)
Shooting techniques (157)
Software (75)
Sunday Support Group (73)
TOP contests (6)
TOP's Own Books (10)
Visual Culture (270)
Websites and links (141)
Weekend Exercises (5)
Workshops (19)
Your Turn (9)

ARCHIVES

January 2024
December 2023
November 2023
October 2023
September 2023
August 2023
July 2023
June 2023
May 2023
April 2023

More...

How many megapixels = 20meg Tiff?

-Hudson

Posted by: Hudson | Wednesday, 15 February 2012 at 11:50 AM

Well, I'll simply comment that down-rezzed files tend to look a LOT better than a native resolution file of the same pixel dimensions.

Therefore, if I bought a D800 I'd probably set it for in-camera jpeg around 12-16 mexapixel in the expectation that the files would be simply OUTSTANDING for their dimensions and file size.

Posted by: ILTim | Wednesday, 15 February 2012 at 11:51 AM

It's interesting that somebody who spent most of their career lugging around 6x7 equipment now considers a D800 too large and/or expensive. Then again, you didn't lug around 4x5 equipment.

Is the principle "good enough for your purposes" and "small and light within the limits set by that"?

Posted by: David Dyer-Bennet | Wednesday, 15 February 2012 at 11:51 AM

Very good summation. Most of the people who complain have never used that which they complain about. When I got my 5D2 3 years ago, all the Nikon people scoffed and used all those reasons. Now some are eating crow and jumping the fence.

There was an adjustment period going from 10mp images to 21mp. The main advantages are croppability and the ability to correct and manipulate without degradation.

I don't see the need for 36mp files but, then again, I haven't used such a camera.

Thanks for the post.

Posted by: Mike Spivey | Wednesday, 15 February 2012 at 11:52 AM

Ctein, does this mean you are getting the 24MP NEX-7, after all? :-)

Posted by: Jay | Wednesday, 15 February 2012 at 11:54 AM

"Good printers can render more than 500 PPI of fine detail and human eyes can perceive considerably more than that. Digital cameras are only about 50% efficient in terms of resolution (e.g., a 24-megapixel camera delivers about 12 megapixels of resolvable detail)"

Just wondering where the empirical data might be to support: 1) humans can perceive more than 500ppi, and 2) the 50% efficiency of digital cameras.

Posted by: Andy Christopher | Wednesday, 15 February 2012 at 12:11 PM

Thank you Ctein. More signal and less noise when it comes to the megapixel debates is exactly what is needed.

Posted by: Paddy C | Wednesday, 15 February 2012 at 12:20 PM

Sincere question:

If what you say about lenses, resolution and sensors is true, why do people pay, say, $4,000 for a Leica prime lens when a top-end Nikon or Canon prime lens might cost one-fifth that? What quality are they getting for the money, that shows up in the digital file?

Posted by: John Camp | Wednesday, 15 February 2012 at 12:21 PM

Ok - that's the myths busted from a theoretical perspective. Anyone want to chime in with practical experiences?

Posted by: Richard | Wednesday, 15 February 2012 at 12:45 PM

A 36mp Nikon FX has about the same pixel pitch as at 15mp DX Nikon. If you want to see whether it is "too many pixels" for a lens, just put your FX lens on a DX camera and see. People have been doing this for about four years now (since the D90 of 2008), and we know the answer: Nikon's FX glass can deliver at this pixel pitch. People have put Leica glass on the NEX-7 (equivalent to about 56mp full-frame) and found that the lens can indeed deliver information at that pixel pitch, at least at the center of the image.

Today's 16mp m4/3 sensors are equivalent to 61mp on FX. They don't have the high ISO capability of the FX sensors, but they are pretty good nevertheless, especially at ISOs below 1600.

The only thing holding back camera makers from 50mp, 60mp or more on FX is the data-processing involved. A 72mp FX sensor would only be able to do about 1 frame per second, which most people would think is too slow. And, the high-ISO wouldn't be so hot. But hey, maybe they'll do a D800L for the landscape guys. We have to wait for the data processing to catch up. I think Nikon's best glass -- the recent f/1.4 primes -- are fully capable of delivering with a 72mp sensor, at least in the center of the frame.

Posted by: Nathan Lewis | Wednesday, 15 February 2012 at 12:59 PM

"Anyone want to chime in with practical experiences?"

Of...what? There's never been a 36-mp FF sensor DSLR before, and the D800 isn't out yet.

For some posts you might find relevant, though, try this one or this one.

Mike

Posted by: Mike Johnston | Wednesday, 15 February 2012 at 01:04 PM

So. In your opinion, "does the D800 have too many?"

Posted by: MarcosV | Wednesday, 15 February 2012 at 01:15 PM

Mike - well the myths being busted are generic, not restricted to 36-mp FF.

Posted by: Richard | Wednesday, 15 February 2012 at 01:22 PM

Where is the Like button ?

Posted by: Terence Hogben | Wednesday, 15 February 2012 at 01:38 PM

Dear Harry (and Roberto C),

This might be true if cameras were operating near the theoretical limits, but they're not yet (as I explained in the "Photography at the Speed of Light" and follow-up columns). Currently, there is only a weak correlation between pixel size and noise between camera makes and models and there seems to be no correlation at all between exposure range and pixel size. You can look at the summary data at DxOMark to confirm this for yourselves.

I understand where you guys are coming from theoretically--physically larger pixels can hold more photoelectrons, and that should improve noise and exposure range. Except that doesn't seem to be the factor limiting both. For example, the new Sony NEX-7 has three stops more exposure range than my Olympus EP1, although it has somewhat smaller pixels. True, it's a three-year-newer design. But my older Fuji S100, which had MUCH smaller pixels than the Olympus and was a two-year older design, had a stop more exposure range than the Olympus does.

And those exposure range numbers, which *are* usable ones not theoretical ones, are a bit over 10 stops for the Olympus, a bit over 11 stops for the Fuji, and 13 stops for the Sony. Harry, if you're really only getting 8 to 9 stops of usable range, either you're photographing in JPEG mode (in which case you can blame the conversion algorithms in the camera being set to what most users find attractive, not the sensor) or you're doing something wrong in your RAW conversions.

Or, you're using a REALLY crappy camera.

Similarly, binning pixels does reduce noise, but the noise numbers are so variable from camera to camera that it's not clear you're better off buying more pixels and binning than just buying a camera with fewer pixels.

pax \ Ctein
[Please excuse any word-salad. MacSpeech in training!]
==========
-- Ctein's Online Gallery http://ctein.com
-- Digital Restorations http://photo-repair.com
==========

Posted by: ctein | Wednesday, 15 February 2012 at 02:08 PM

Harry Lime wrote: We finally may get back to having 10-14 stops of dynamic range, like we did with film negative. I'm pretty tired of being stuck at a slide film like 8-9 stops (usable, not theoretical).

Regarding dynamic range, since the D800 sensor is made of the same stuff as the Nikon D7000 sensor (Sony IMX071) you can expect pretty much the same noise performance and dynamic range performance - about 9 to 11 stops depending on the settings.

That is pretty good if you ask me, 11 stops is easily within your range for film negatives.

Posted by: Diego | Wednesday, 15 February 2012 at 02:19 PM

By the way,

This will stop much of the racket I guess....jawdropping.....and yes I'm one of those guys that use 120mm and a decent scanner....jawdropping none the less.

http://www.letsgodigital.org/nl/31871/nikon-d800-test/

Greetings, Ed

Posted by: Ed | Wednesday, 15 February 2012 at 02:28 PM

Yes, I agree with every point you make Ctein, even though my personal needs would be much better met with a D700mk2 with the D4 sensor, since I shoot mostly gigs with it and seldom print anything bigger than a magazine size spread. 16MP is plenty. I just need a clean file, lots of DR and exposure headroom and good colour at high ISO. The D700's headroom is not that good.

I'm sure the D800 will be sublime for those that want it. But there is room for the low pixel count option too. For me the best aspect of the D800 I can think of is that my 70-200 F2.8 lens can become a 70-300 F2.8 lens and I still get 16MP at 300mm.

But I can already do that with a D7000!

Posted by: Steve Jacob | Wednesday, 15 February 2012 at 02:37 PM

Head gleefully spinning from all this discussion of pixel-pitch (oddly resonant of "ring toss" or "pie throwing"). Except for the constant itch to upgrade, I have I confess I have liked our headlong techno-rush. You watch. Some time in the next 10 years a technology will emerge that makes all of this discussion into the background-hiss of buggy-whip comparison around the woodstove.

Posted by: Benjamin Marks | Wednesday, 15 February 2012 at 02:42 PM

Dear Ctein,

The fact that the noise depends a lot on sensor technology and not only on mere pixel size goes without saying.
What I tried to say is that, in comparing 2 specific sensors, I would find correct to say "sensor A, 36MP, binned down to 12MP is more (or less) noisy than sensor B, 12MP".

Posted by: Roberto C. | Wednesday, 15 February 2012 at 03:07 PM

Dear Harry,

Oh, a P.S. -- if you're working at high ISO's you'll lose exposure range. For example, the NEX-7 is down to 10 stops at ISO 1000.

So, if multi-thousand ISOs are your thing, you're right-- you'll have trouble getting an exposure range of more than 8-9 stops.

pax / Ctein

Posted by: ctein | Wednesday, 15 February 2012 at 03:25 PM

Dear Hudson,

I'm not sure why they're telling you a different dpi for black and white than for color, but let's go with the color one:

It's simple multiplication. 300 ppi times 8 inches times 10 inches equals 2400 pixels times 3000 pixels equals about 7 megapixels. At 3 bytes (24 bits) per pixel for color, that's about 20 MB.

Note by the way that this is some arbitrary number that's been carried over from long ago technology. I'm not saying to fight with your art director or editor, but if you've got a really clean photograph that is only 240 PPI in an 8 x 10 size, just upsample it to 300 PPI in Photoshop and send that to them. Trust me, they will never know the difference.

~~~~~~

Dear DDB,

Just because I was willing to didn't mean I WANTED to [smile]. The quality I demanded didn't leave me much choice. Now I have a choice.

And, ironically, as my discretionary income has improved over the past few years, I seem to have become more of a cheapskate (relative to my spending cash). Go figure.

~~~~~~

Dear Jay,

I've never been known for my ability to play coy. “May very well” doesn't mean anything more than it did a month ago. Just means that I might, not that I'm going to but being too cute to admit it.

Before someone else asks, yes I am waiting for the DxO test results on the new Olympus OM-D, but I'm not getting my hopes up. I think it will only be a minimal improvement in image quality over my EP1. Love to be proven wrong on that prediction.

~~~~~~

Dear Andy,

Not sure exactly what kind of information you're looking for. The resolution efficiency is easy: just look at recent test reports that give resolution numbers for digital cameras and multiply them up and you'll see what I'm talking about. For example, if a 12 megapixel camera has a 1:1.5 aspect ratio and the test reports 2000 lines of resolution (on the short axis), its total resolution is 2000x2000x1.5 equals 6 million pixels. So that would be 50% efficient. If you do that for a bunch of recent cameras, you'll find they all cluster around that, with a sigma of 5-6%. That is, on rare occasions, you'll find ones that are his poor as 40% efficiency and others that are as good as 60% efficiency. But as a talking point, saying 50% is going to be close enough for jazz.

As for online data about what humans can perceive, I don't have any sources for that. That's all stuff I researched long before the Web became the dominant way to collect information. Note that perception is not the same as resolution: see my column "How Sharp Is Your Printer? How Sharp Are Your Eyes?" cited above.

For a detailed explication on what human beings can see in photographs, download the free copy of my book, POST EXPOSURE and read chapter 1:

http://ctein.com/booksmpl.htm

If you have further technical questions on these subjects, you should probably e-mail them to me, as Mike doesn't want this to turn into a technical discussion board.

pax \ Ctein
[Please excuse any word-salad. MacSpeech in training!]
==========
-- Ctein's Online Gallery http://ctein.com
-- Digital Restorations http://photo-repair.com
==========

Posted by: ctein | Wednesday, 15 February 2012 at 03:43 PM

Hello gents

No, I am not shooting jpeg, nor am I shooting with a 'crappy' camera. But like you I have been shooting both film and digital for a very long time and have made a good living with high end digital image processing for about 20 years.So, I'm not exactly new at this.

The only camera I have ever seen that matches the DR performance of film is the Arri Alexa, which is a motion picture camera that turns out a solid 14 stops of range, and it does this without any gimmicks like RED's HDRx double exposure gag. Apparently the upcoming Sony F65 will match that performance once it ships.
~~~~~~

I have yet to see a still camera, with the exception of a few Fuji models, that delivers more than 8 or 9 stops in jpeg or maybe 10 in RAW.
For a lack of a better example, the DR test charts on a site like dpreview will bear this out.

I would love to see a step chart that shows that the NEX-7 gets 13 fully usable stops of range in the real world and not just on paper.

Posted by: Harry Lime | Wednesday, 15 February 2012 at 03:44 PM

Dear Richard,

No!

This is the perspective of four decades of real-world practical and scientific testing of equipment, backed by a deep understanding of the theoretical underpinnings of those results. In other words, this is experiment informed by theoretical knowledge. It is NOT theoretical speculation, it is the way the real-world equipment actually works.

~~~~~~

Dear John Camp,

Well, there's the Veblen economics that Mike has talked about with regards to Leica equipment. Any discussion of Leica pricing versus anybody else's has to take that into account.

But that aside, there's a hell of a lot more to a lens than peak resolving capability. There is its performance, resolution-wise, over the entire field, at all apertures. There's its freedom from other aberrations like flare and distortion, the micro-contrast of the fine detail, the build quality and consistency from unit to unit, and so on.

But if one is looking purely at resolution, there are some very inexpensive lenses with excellent resolution. My Pentax-M 50mm f/1.7 K-mount lens was widely considered by connoisseurs of that kind of thing (I'm not one of them) to belong in the group of very best 50 mm lenses made. Reports were that the image quality was just plain sweet. As I said, I'm not sensitive to that so I can't speak to its truthiness, but this was the lens I used for all my film tests, because at f/4.7 it was very close to diffraction-limited on axis and could still deliver over 200 line pair per millimeter at the corners of the field. These days, you can buy this lens for well under $50, in fact here's one of them up for auction on eBay:

http://www.ebay.com/itm/SMC-Pentax-M-50mm-F1-7-lens-nice-and-clean-well-taken-care-of-/250992630461?pt=Camera_Lenses&hash=item3a70539abd

If you've got a camera that can take K-mount lenses and don't mind manual aperture/manual focus, there are likely few better bargains in terms of overall image quality out there.

(And in case anyone's wondering, the peak resolution I was ever able to record on film with this lens was 165-180 line pair per millimeter. Which is just bloody amazing, when you think about all the sources of blur that compound in a film image.)

~~~~~~

Dear Nathan,

Exactly so: there are so many simple “sanity” tests that people can run to figure out if more megapixels are really going to benefit. And all of them say that the “too many megapixels to use” school of thought just doesn't match up with reality.

pax \ Ctein
[Please excuse any word-salad. MacSpeech in training!]
==========
-- Ctein's Online Gallery http://ctein.com
-- Digital Restorations http://photo-repair.com
==========

Posted by: ctein | Wednesday, 15 February 2012 at 03:45 PM

Ctein,

This never seems to get mentioned in these discussions of resolution but to me resolution isn't just about print size.

One thing I miss from the film days is the subtleness of tone. I used medium and large format and never really enlarged very much. But I grew to enjoy that wonderful tonality gained from not 'over' enlarging.

With digital we started with that horrible plastic look which does seem to be slowly disappearing as resolutions increase. So I'm hoping that my pre-ordered D800E will return me to that subtle tonality I enjoy. It does seem to be missing even from the D3.

Dave.

Posted by: Dave | Wednesday, 15 February 2012 at 03:48 PM

Briefly wondered if the title was asking if the D800 had too many myths! Need for more coffee I guess.

Posted by: robert c | Wednesday, 15 February 2012 at 04:14 PM

While I don't disagree, it would help your argument if you didn't conflate sharpness with resolution.

A3 at 360ppi (my printers resolve more) is only 24MP so I don't see how it can be considered overkill.

Posted by: Stephen Best | Wednesday, 15 February 2012 at 04:16 PM

But can full frame sensors produce files as good as medium format sensors?

Posted by: raizans | Wednesday, 15 February 2012 at 04:22 PM

Dear Roberto C.,

I understand the question you're asking. I'm saying there is not a general answer; you have to talk about two specific cameras whose characteristics you know.

~~~~~~

Dear Dave,

I detest that plastic look also. But I believe it's more a result of aggressive noise reduction algorithms than resolution. In other words, I think the improvements you're seeing are because the native image noise is going down and less aggressive reduction is needed, not because pixel counts are going up.

But I could be entirely wrong about that.

pax \ Ctein
[Please excuse any word-salad. MacSpeech in training!]
==========
-- Ctein's Online Gallery http://ctein.com
-- Digital Restorations http://photo-repair.com
==========

Posted by: ctein | Wednesday, 15 February 2012 at 05:23 PM

Dear Harry,

I'm hoping Mike will indulge me one more comment on this, because this is normally the point at which he would say, “Take this private, please.” But there's something important I've been wanting to say for a while about the dpreview exposure range tests. I don't think they work very well for long exposure ranges. The problem is that photographing a step wedge in a single exposure starts to fail when the brightness range becomes extreme, because there is always some amount of light scattering and flare within the optical system. This messes up your data at the extrema. When you start to get above 10 stops range, these effects start to become noticeable. It's a function of the entire optical system, lens and camera body, and it's a problem with running exposure range tests both with film and digital sensors.

When running such tests myself, I found that I simply could not get an accurate measure of exposure ranges on the order of 12 stops, regardless of the recording medium, in a single wedge exposure. I believe that's the method dpreview is using. You can do a workaround by making 3 exposures at -4 stops, on exposure, and +4 stops and merging the data. That lets you throw away the outlier portions and ought to be good up to at least 14 stops before being degraded by light scattering.

A better way is to photograph a uniform target and bracket exposures. You're limited there by the total exposure range your camera system allows reasonably, and you have to run some sort of calibration on each exposure step to make sure the aperture/exposure time is reasonably accurate, but that eliminates the confounding factor of light scattering and can plausibly be used up to 14-15 stops. That's the method I use.

The very best method is to hold aperture and exposure time constant and vary the intensity of the luminance in a uniform field. Requires control and calibration equipment I don't have.

I do not know the method DxOMark is using, but on the handful of cameras I have tested, their results agree with mine to within half a stop. Neither of us get results that matches dpreview's. My test results also correspond well to actually what happens in real-world photography.

As I said, if you wish to pursue this further, please feel free to e-mail me-- ctein@pobox.com

pax \ Ctein
[Please excuse any word-salad. MacSpeech in training!]
==========
-- Ctein's Online Gallery http://ctein.com
-- Digital Restorations http://photo-repair.com
==========

Posted by: ctein | Wednesday, 15 February 2012 at 05:38 PM

OK Myths busted. So why do the Nikon 800 and 800E photos look so mushy then? Too much or not enough of something.

Posted by: Me | Wednesday, 15 February 2012 at 05:56 PM
~~~~~~

Dave - thats the ticket! I took the sample image of the model and ocelot that Nikon put online, sized it to 720 dpi and output it on an Epson 9900 SpecroProofer with a EFI front end. Showed it to the top color retouchers I work wth that look at 5D images from our studio/Phase1 stuff from outside studios etc, all day long and everyone was impressed with the tonality and the discrete visual differences of the fabrics, skin and feline fur! Sometimes you got to forget the specs and measurbating and print!

Posted by: Sean Murphy | Wednesday, 15 February 2012 at 06:36 PM

Dear Stephen,

I didn't. In those six places where I said "sharpness" I really meant sharpness, not merely resolution.

~~~~~~

Dear Me,

So, how did you manage to get your hands on a D800 already and make test photos?

If you didn't, why in the world would you assume that photos of entirely unknown parentage represent good test photos with the camera? Most people, even most reviewers, do not know how to make good test photos. Even many camera manufacturers put up crappy photos-- horrifying but true.

Treat online images you find as seductive eye candy and nothing more. Most certainly, if what should be a good camera appears to making bad photos, assume the photo is in error.

pax / Ctein
==========
-- Ctein's Online Gallery http://ctein.com
-- Digital Restorations http://photo-repair.com
==========

Posted by: ctein | Wednesday, 15 February 2012 at 06:49 PM

Boat anchor?

Really, why would anyone call a D800 that? It's not out yet, not tested yet and it's already called a dead weight?

Seems like a very passive aggressive statement. Why?

If the floods in Thailand has not disrupted the NEX-7 production I would already have one until I noticed the one lacking feature that "I" need - remote control. I'm hopeful that Sony will fix this in the next update.

Boat anchor? What is that about?

cheers,

Robert

Posted by: robert harshman | Wednesday, 15 February 2012 at 07:14 PM

Ctein wrote: "These days, you can buy this lens [Pentax-M 50mm f/1.7] for well under $50"

I have a feeling the price will shoot up pretty soon.

Posted by: toto | Wednesday, 15 February 2012 at 07:27 PM

I don't mind having more megapixels as an option. But, oh, the increase in digital baggage to carry around. I hope other makers adopt something similar to Canon's very clever sRAW and mRAW in the near future. For me, that's very nearly a killer feature.

Posted by: Matthew Miller | Wednesday, 15 February 2012 at 08:10 PM

One extra myth (related to number 2) that I see around a bit: more megapixels changes Depth of Field. NO! More megapixels = greater enlargement factor = less DoF.

(Oh, and small sensors don't have large DoF, the very short focal length lenses they use do.)

Posted by: Martin Doonan | Wednesday, 15 February 2012 at 09:45 PM

Do more pixels help, even at "reasonable" output sizes? Maybe.

My film scanner (Epson 4490) has an optical resolution of 4800dpi but in practice doesn't deliver any visible additional detail beyond about 2400dpi.

However...

I get visibly better results if I scan at 4800dpi, downsize and sharpen appropriately, than when I scan directly to the size I want. So apparently there is some extra detail in there after all, it just takes some work to get to it. 100% view pixel-peepers would likely die of fright looking at the unprocessed 4800dpi original scans and had these files emerged from a new digital camera the internet would be ablaze with commentary on how useless the sensor is.

Posted by: Paul Glover | Wednesday, 15 February 2012 at 11:54 PM

It's no myth that his weekly TOP column appears on Wednesdays.

Except when it's on Thursday!

Posted by: Steve Smith | Thursday, 16 February 2012 at 01:51 AM

"Except when it's on Thursday!"

That's just a myth.

Mike

Posted by: Mike Johnston | Thursday, 16 February 2012 at 01:53 AM
~~~~~~

Myth No. 4

I shoot with a D7000 which is supposed to have a similar pixel pitch to the D800 and generally don't find the lens the limiting factor. And my lens collection isn't that special - mostly kit and cheap third party lenses.

In regard to this myth the weakest link in the chain is me, the photographer.

Posted by: Chris Crowe | Thursday, 16 February 2012 at 04:16 AM

Myth #2 - I think the truth / falsehood of this is relevant to anyone who has a printer of a particular sixe and wants to know if a "bigger" camera will give "better" pictures. You're suggesting it probably will. However, an article on the luminous landscape (http://www.luminous-landscape.com/reviews/kidding.shtml) suggests that it won't for anything other than very large printers. We seem to have two experts saying contradictory things and I'm confused about where that leaves us. To put this another way, Ctein and Mark Dubovoy (http://www.luminous-landscape.com/understanding-series/everything_matters__it_is_all_about_the_small_details.s) are both saying (I think) that you'll get better prints from (say) an A3+ printer if you buy (say) a medium format digital instead of (say) an APS-C or other smaller sensor camera, while Michael Reichmann suggests the opposite.
Anthony

Posted by: Anthony Shaughnessy | Thursday, 16 February 2012 at 06:16 AM

The 5D2 printed @ 300 DPI gives a 18.7" x 12.5" print.
the new Nikon printed @ 300 DPI gives a 24.5" x 16.4" print.
So your gaining roughly 6x4 on final print size.
Just saying.

Posted by: Shaun O'Boyle | Thursday, 16 February 2012 at 08:28 AM

I'm curious to see the math on the 75 lp/mm on the D800.

Posted by: David Luttmann | Thursday, 16 February 2012 at 09:56 AM

<<"Except when it's on Thursday!"

That's just a myth.>>

One of the main points about a myth is that it's endlessly re-tellable with variations....

Posted by: Richard | Thursday, 16 February 2012 at 09:56 AM

Dear Robert,

"Boat anchor" (as slang) simply means any piece of equipment heavy enough to use as a boat anchor. It doesn't mean you *have* to, only that you could.

(It got used a lot to describe the early "portable/laptop" computers.)

So, it's only a diss on the bulk of the D800, not its performance.

~~~~~~~~

Dear David,

See my previous answer to Andy and work the math the other way for the D800. It's an easy and reliable calculation (give or take 10-20%).

~~~~~~~~

Dear Anthony,

I am not going to attempt to analyze the methodology of the myriad other experiments on the web, especially since they don't give consistent answers.

This column says nothing about the total size of the sensor. Do not draw any conclusions about that based on what I wrote, because I will disagree with them.

~~~~~~

Dear Martin,

The first part of your myth-busting is correct, and it would have been a good 6th Myth.

The second part is much more complicated than that. And since Mike and I have done Depth of Field to death in a marathon series of columns, I am NOT going to reopen the subject here. Run away, run away!

pax / Ctein

Posted by: ctein | Thursday, 16 February 2012 at 11:09 AM

David Luttmann: "I'm curious to see the math on the 75 lp/mm on the D800."

7360 x 4912 on a 35.9 x 24 mm sensor is 205 sensels per mm.

So 102 pixels per mm (either in 4 sensel Bayer blocks or the "50% resolution" argument above).

The upper bound on resolution is the "doubled" green channel which should be able to resolve luma details with perhaps 70% (diagonal lines with sqrt(2)*pixel width spacing) giving resolution of 145 per mm.

That's just about 75 lp/mm.

Posted by: Kevin Purcell | Thursday, 16 February 2012 at 12:43 PM

~~~~~~

Maybe I missed this in cruising through the comments without careful reading, but I tend to think a big part of more megapixels is about moiré, anti-aliasing, image rotation, and barrel/pincushion correction.

Unlike film grain is more-or-less random and on which most of the theory of camera performance still seems to loiter, pixels have a regular pattern which can cause all sorts of image problems, but most especially those (or in the situations) mentioned above.

In the lower pixel-count cameras I have used, increasing pixel count has mattered in these areas.

Have these problems already been overcome by 24-megapixels, so 36-megapixels contributes nothing more?

Posted by: Alan Winston | Thursday, 16 February 2012 at 06:58 PM

CTEIN, thank you for the great thread.

I was so sick of carrying my heavy and "showy" D3x with Zeiss 50MP lens that I tried M43, Fuji X100, NEX, and a K-5 (pancake lenses). But all have been lacking in either the file-quality, the viewfinder, the buffering, and/or manual focus. I considered MFD, but it is worse than a D3x for bulk, and less flexible in many ways.

The D800E is 100g lighter than the D700, so I am hoping that the D800E with the Zeiss 50 MP will be better than carrying a D3x and will have even better file quality.

An iPhone and a D800E will be my new "kit." Maybe someday there will be a smaller DSLR like the old Pentax MX.

Posted by: Ceeelia | Thursday, 16 February 2012 at 08:01 PM

Dear Alan,

You don't see any discussion of these because those are all outside the scope of the article. This is not a general discussion of megapixel performance, it's busting some myths.

Image rotation and distortion have nothing to do with pixel counts. As for moire, how much you can tolerate is a personal decision-- there's no general opinion nor rule on the matter. So only you can decide if X megapixels gets them under control for you.

Be that as it may, no generally-promulgated myths about high megapixel counts are involved.

pax / Ctein

Posted by: ctein | Friday, 17 February 2012 at 03:25 AM

I happen to work with a person who used to work in Israeli branch of Leaf (or some other medium format digital manufacturer). Few days ago this guy brought in a calendar that demoed work of Leaf digital back. The print is marvelous and the size is A2 (I reckon it is 40x60 cm or thereabouts). It just looks gorgeous.

Personally to me the ultimate test is in the final print which in a sense test the whole process end-to-end - be it shooting technique (hand-held vs tripod), the lens, the processing, the printing, the materials involved, etc.

While I think that what Ctein wrote is essentially correct, in my eyes, the ultimate test is print and if one comes up with the print from 12 MP APS-C sensor that is visually better (of course it may differ from viewer to viewer) than that from Nikon D800 or Pentax 645D or whatever, then all the technical and/or theoretical advantages in question kind of disappear...

Posted by: Boris Liberman | Friday, 17 February 2012 at 06:02 AM

This is very interesting. Is 36.3 MP too much or enough? I wonder if D800/D800E would produce excellent image quality to compete with Leica S2 or Medium Formats with digital backs like Hasselblads, Mamiyas/Phase One or Pentax 645D. I have no experience with Medium Formats with digital backs. I believe some professionals spend thousands of dollars on those Digital Medium Formats. I love shooting B&W portraits on my Rollei. I am NOT an expert and do not have any scientific knowledge nor any professional experience. I just love photography. My first dSLR was the Nikon D300 which I love. Obviously, I am tempted to buy this D800E to use my Leica R lenses. Big question is: why do we always want more MEGApixels? Maybe that's why I shoot more film these days.

Thanks Ctein and Mike.

Posted by: Armand | Friday, 17 February 2012 at 07:11 AM

In all these discussions I'm reminded of the great photos -- visually -- taken in the 20s and 30s on what we'd consider pretty marginal equipment: screwmount Leica's with no rangefinder, classic 1 & 2 Contaxes, Rolleiflexes and Voigtlanders, etc.
I don't see a great many standout pictures from the modern Tech era, probably because most photographs, however technically accurate, aren't really that interesting to Look At.

Posted by: the other ian | Friday, 17 February 2012 at 09:10 AM

Ctein,

The more common use of boat anchor includes not just heavy, but useless.

And I guess we will just have to disagree about when a camera becomes heavy. I find models like the D800 or Canon 5D2 to be not heavy or large at all. Models like the NEX-7 seem too small to me.

Cheers,

Robert

Posted by: robert harshman | Friday, 17 February 2012 at 12:16 PM

As usual, the answer is really in the formulation of the question. It's not hard to set up straw men in order to shoot them down.

"Myth #3

More megapixels inevitably means noisier photographs and/or poorer high ISO performance"

Becomes more or less true if you reformulate it as "ALL THINGS BEING EQUAL and with the current state of technology, more megapixel density means noisier photographs and/or poorer high ISO performance".

"Myth #4

It's pointless to add more pixels because lenses aren't good enough."

starts to become closer to the truth if you reformulate it along the lines: "in day to day usage and across most of the frame, there usually isn't much point in adding more pixels because lenses aren't good enough to take advantage of the higher resolutions except perhaps under optimal conditions (use of tripod, use of best performing aperture, etc.)."

"Myth #2

Getting more megapixels is just about making bigger prints."

becomes true if you reformulate is as "getting more megapixels us usually about making bigger prints". Given that 300 dpi is the most common standard for printing, most print outlets will require you to resize your prints to that resolution, or downsize the prints to that resolution (or sometimes eg. 400 dpi for some printers). So the main point of more pixels is, at the moment at least, to allow larger print sizes at normal print resolutions.

Or of course, you might like to regard it as future proofing your images. There are after all rarely absolute answers to such questions, and so much depends on how you use the camera.

Posted by: Simon | Friday, 17 February 2012 at 06:08 PM

Dear Simon,

I am not shooting down straw men, I am shooting down commonly-repeated nonsense that pops up with regularity every time some new higher-pixel camera is released. That said, some of your recasting is wrong.

Regarding #3, as I have gone to some length to explain, here and in the referenced columns, things are currently never equal. Your qualifying of #3 is, in fact, a myth that does not apply in the real world to cameras one currently can buy. Someday, maybe. Not yesterday and not today. Data trumps theory.

Your recasting of #2 is not the way most serious photographers work (and cameras of this type and price largely eliminate the frivolous). Most decide on a print size they want and adapt files accordingly.

pax / Ctein
==========
-- Ctein's Online Gallery http://ctein.com
-- Digital Restorations http://photo-repair.com
==========

Posted by: ctein | Friday, 17 February 2012 at 07:39 PM

I think we will just have to agree to disagree! :)

Simon

Posted by: Simon Crofts | Tuesday, 21 February 2012 at 03:08 PM

Ctein, I read your article that explored the limits of human visual acuity and how that might define "perfect" resolution. One of your commentators for that article referenced a work that claims maximum human visual resolution is 50 cycles/degree. You suggested that edge acuity is significantly greater. Could this be an issue of transient perception (one sharp edge) being more powerful than its equivalent frequency? If that's the case, the that might explain why some subject material lends itself to approaching your maximum discernible resolution of 30 line pairs/mm, while sufficiently fine patterns lines at a much lower frequency still appear to be a single gray mass even at nose-to-print distances. If so, transient edge enhancement (i.e., sharpening) at sub-resolvable frequencies might be an interesting thing to try, if the printer can deliver it (which apparently they can't at the moment). But perhaps confusion is resulting from using frequency to describe equivalent transients.

As to the value of having 80 MP, just ask anyone who has scanned large-format sheet film in a drum scanner what their miniscule 16x20 prints look like.

I've argued that 36MP is too much in other forums based on lenses just not being good enough. You've disassembled that argument pretty effectively. But I stand by my belief that the vast majority of photographs for which 36MP is considered by the photographer "essential" will never explore what those pixels can provide. That's a fine effect when most photographers miss gross effects: focus accuracy, appropriate depth of field, and the somewhat finer consequence of adequate depth of field, diffraction. All that's mixed in your mythbusting, I think.

Thank you for this and all its supporting articles--a most compelling evening's read.

Posted by: Rick Denney | Friday, 02 March 2012 at 09:04 PM

I'm always curious about real vs theoretical effects of diffraction. Going back and reading your 2008 article, you seem to argue that the loss of resolution isn't that big of a deal on a practical level. Yet you can clearly see the resolution going down as aperture increases as a result of diffraction. Rather than trying to subjectively assess whether this matters, I would be curious to know the effective resolution in megapixels at each aperture. To me that would be more helpful to understand.

If I like to shoot landscapes at f/22, how much extra resolution would I be getting with a D800 vs a 5D Mark III? The delta would presumably be smaller than if I liked to shoot portraits wide open, right? If so, it's not a question of "too many" megapixels; it's a matter of weighing the trade offs and understanding at what point "x" megapixels is no longer "x" megapixels. If I'm shooting at f/22 and really only getting (x-y) megapixels, is it worth giving up low light sensitivity to do so?

This brings me to myth #3, which seeks to compare a current higher megapixel model to an older, lower megapixel model. It seems more relevant to me to compare current models, as in my previous D800 vs 5D Mark III example. Even assuming Nikon has an edge in noise reduction tech, it does seem pretty safe to assume that Myth #3 is correct when comparing these two contemporaries. Their maximum ISO's suggest as much.

Posted by: Tim L | Friday, 02 March 2012 at 09:06 PM

Ok, I'm so lost and need help and advice. I am uprading my D3100 to a full frame and I can't make my mind up which to have, the D700 or D800. For me it only a hobby and I am not interested in Video. I am thinking of getting the 24 - 120mm f/4 as a good walk round lens. Also will ACR be able to handle the D800 raw files. Why am I so confused, simple laymans terms is all I want.

Posted by: Martin Hollingworth | Saturday, 03 March 2012 at 03:00 AM

The comments to this entry are closed.