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## Pogue's Posts

The Latest in Technology From David Pogue

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NOVEMBER 21, 2006, 9:35 AM

### The Truth About Digital Cameras



As loyal Pogue's Posts readers are no doubt aware, I've spent the last seven weeks in TV land, filming a first batch of six episodes of my new Discovery-network series, "It's All Geek to Me." It was an exhilarating, exhausting, enlightening journey. Someday when we're all together, I'll tell you about it.

Actually, I'll tell you about one thing right now. We did an episode on digital cameras. Part of the fun involved visiting a couple of big electronics stores, posing as somebody who didn't know much about cameras, and, later, commenting on what they told me.

The clerks at one store recognized me. The guy at the other store had no clue that I'm a tech writer. Both of them were

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surprisingly frank, pointing out, for example, that five megapixels is plenty for prints up to smallish poster size.

Now, every time I write that, I hear from furious or baffled readers. "I don't get it," wrote one. "A ten-megapixel camera produces photos about 3640 pixels wide—enough to make a 12-inch print at 300 dpi (dots per inch) on a good printer. Sure, you can go lower, but quality is sacrificed; you can't make an 11x14 print, let alone anything bigger."

I have to say, the math sounds right. But I also have to say that he's wrong.

On the show, we did a test. We blew up a photograph to 16 x 24 inches at a professional photo lab. One print had 13-megapixel resolution; one had 8; the third had 5. Same exact photo, down-rezzed twice, all three printed at the same poster size. I wanted to hang them all on a wall in Times Square and challenge passersby to see if they could tell the difference.

Even the technician at the photo lab told me that I was crazy, that there'd be a huge difference between 5 megapixels and 13. I'm prepared to give away the punch line of this segment, because hey—the show doesn't air till February, and you'll have forgotten all about what you read here today, right?

Anyway, we ran the test for about 45 minutes. Dozens of people stopped to take the test; a little crowd gathered. About 95 percent of the volunteers gave up, announcing that there was no possible way to tell the difference, even when mashing their faces right up against the prints. A handful of them attempted guesses—but were wrong. Only one person correctly ranked the prints in megapixel order, although (a) she was a photography professor, and (b) I believe she just got lucky.

I'm telling you, there was NO DIFFERENCE.

This post is going to get a lot of people riled up, I know, because in THEORY, you should be able to see a difference. But you can't.

And I'm hoping this little test can save you some bucks the next time you're shopping for a camera.

[LINK](#) [E-MAIL THIS](#)

501 comments so far...

1. November 21st,  
2006  
9:45 am

I've long suspected, buying cameras with higher MP numbers is actually not only a waste of money (all other factors being equal, of course), it could be



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#### About Pogue's Posts

David Pogue's technology column has appeared each Thursday in The Times since 2000. Each week, he also writes the Times e-mail column "From the Desk of David Pogue," creates a short, funny Web video for NYTimes.com, and posts entries to his Times blog. In his other life, David is an Emmy-winning correspondent for CBS News, a frequent contributor to NPR's "Morning Edition," creator of the Missing Manual series of computer books, and father of three.

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November 1  
34 comments

#### **The Future of Solar-Powered Homes**

This weekend, at a few minutes past 9 a.m. EST, "CBS News Sunday Morning" will broadcast my report on this year's Solar Decathlon. (This show's stories often get rescheduled at the last moment, but so far it's looking

actively bad — aren't the files significantly larger, taking up more space on the camera's storage and taking longer to upload/email/download?

— Posted by Tracey

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2. November 21st,  
2006  
9:50 am

Dave: Exactly right. The megapixel race means nothing. I have digital cameras ranging from 2MP to 8MP, and the most important contributor to image quality is the photographer behind the camera — not the megapixels. Lens quality helps, and the larger image sensors in digital SLRs create more photo-authentic images (with better depth of field), and so on. But if I need to make a true poster-sized print, I'm going to reach for a 30-year-old SLR camera, load a \$3 roll of 100-speed film in it, and make a photo.

— Posted by Dave Baldo

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3. November 21st,  
2006  
10:07 am

Your results fit with comments I've read elsewhere, such as on Ken Rockwell's site (<http://www.kenrockwell.com>).

I may eventually upgrade to another camera than my current Nikon D70, but the reason won't be for more megapixels. In the meantime, I'm using the money for more vacations and opportunities for taking photos.

— Posted by William Beem

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4. November 21st,  
2006  
10:08 am

David—

That's an interesting test, and a good first step towards a provocative debunking of the megapixel myth.

But can you identify the three cameras involved in the test for us? The reason I ask is that picture quality is also affected by the quality and size of the sensor inside the camera, and better, bigger sensors cost more money.

So though it may be of theoretical interest to debunk the megapixel myth, the practical motivation for using megapixels as a rough marker for picture quality is to correlate with price.

It may be, for example, that the only way a 5 megapixel camera can compete with a 13 megapixel one is if the 13 megapixel camera is on a disposable ultra-compact point & shoot, whereas the 5 megapixel camera is in the dSLR-quality range, with its correspondingly bigger and better image sensor.

If that were the case, then advertising your test as debunking the megapixel myth is a bit disingenuous. To prove otherwise, please let us know about the specific cameras involved in your tests.

Also, I'm sure the photography professor would beg to differ about getting lucky, and perhaps it would be worthwhile to hear her side of the story—what features did she use to distinguish the three photos? Did you try to run repeated tests for her and then measure her performance against chance?

— Posted by EC

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5. November 21st,

October 31  
2 comments

good for Sunday.)

Anyway—yes, I know. The Solar what?

It's a competition, now held every other year (this was [...])

### Jack O' Pogue

O.K., I thought I was O.K. at carving pumpkins, but this is ridiculous.

Check out the Pumpkin Gutter's galleries of super-realistic portraits:

<http://www.pumpkingutter.com/>  
Or these hilariously sicko extreme pumpkins: <http://www.extremepumpkins.com>

And finally, I couldn't resist a reprise of the Pogue O'Lantern carved by the cartoonists responsible for the Joy of Tech online strip. You'll find me halfway down the [...]

October 30  
24 comments

### Sleepless in Switzerland

Highlights of a conference in Switzerland, including a company that puts cable TV on the computer screen for free. You watch 5-second ads when you change channels.

October 25  
69 comments

### More Goodies in Apple's New Operating System

In today's Times, I reviewed Apple's latest operating system, Mac OS X 10.5 "Leopard." I noted that Apple claims to have added over 300 new features.

Trouble is, if I tried to describe them all in my 1,280-word column, I'd have 4.3 words to describe and assess each one. I try to be concise, but that's [...]

October 23  
44 comments

### Cellphones and Brain Cancer: A Doctor Weighs In

From today's mailbag, another response to Pogue's Imponderables. I'm sure some readers still won't be convinced—that's why it's an imponderable—but the two medical studies cited here are pretty darned convincing to me. (p.s... The excerpts from the studies are filled with medical jargon; I added the boldface formatting.)

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One of Pogue's imponderables was, "Do cell phones [...]"

2006  
10:12 am

At what point can you notice a difference? 32"x48"? 64"x96"?

— Posted by CK

6. November 21st,  
2006  
10:12 am

Thank you for this info. I have long suspected it but never had the means to test it myself! I don't do much digital photography but I have worked in a science lab where digital image analysis was important so know a thing or two about digital pictures. One big issue no never ever brings up is sensor size. Obviously more pixels/area of the sensor will give you better pictures. Another thing, It should be easy to do the math to be able to tell what the limit of blowing up a picture is. The human eye can see down to about 250 microns, maybe a very good eye acan get a little smaller than that(pretty astonishing really, that very very small). Thus as long as any individual pixel is smaller than half that size, the human eye will not be able to tell the difference in the pixels. Assuming I worked out the math right, and the the pixels are about squares, for the five megapixel camera, on a 16 by 24 inch camera each pixel comes out to be about 222 microns, so just about at the point where a good eye can see the individual pixels. The 13 megapixel image comes about to be about 138 microns, this is just below the the point where most people will not be able to see the pixels. Of course the 8 megapixel image is about half way between. So you see the math shows that only the very keenest of eyes will tell the difference.

— Posted by superdave

7. November 21st,  
2006  
10:14 am

Amen. I recently replaced my circa 2002 Canon Powershot S110 Digital Elph (2.5 megapixels) with a 6 megapixel Leica C-Lux 1. Big mistake. Not only could I have saved money by buying the cheaper Panasonic model that is identical to the Leica, but in fact the quality of the photos I got from the Canon is better than any I've gotten from the Leica, despite the Leica's much higher resolution. And when I print out anything smaller than 8x10 it's impossible to see any difference in the photos.

I think another lesson is that there's really not much difference in photo quality among good point-and-shoot digital cameras, so there's not much point in trading up within that category. If you want to see a significant difference you have to jump to digital SLRs.

— Posted by Brad

8. November 21st,  
2006  
10:14 am

While I believe that your experiment went as you say, I also think that the experiment is somewhat flawed in that you start with a nearly perfect image that is downsampled.

What would happen if you took 3 pictures of the same subject with three cameras of the different resolutions? Say a 5MP Canon A530, an 8MP Canon PowerShot S80, and a Canon EOS 5D?

I have to think that the bigger the lense the better the picture?

— Posted by Skeptic

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necessary, by something like a factor of half: your experiment proves the point.

— Posted by Juan Jaime de Zengotita

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10. November 21st,  
2006  
10:19 am

I double checked my biology, I found a paper online saying the human eye at most can resolve about 100 microns, thus my estimates were conservative. Since none of those images were below this number There would be no dead giveaway to tell which image has the best resolution. If one crossed the threshold and another didn't, it would be easy, but since none of them do, the only way to tell would be to correctly discern the difference between 220 microns and 137 microns without the aid of a microscope, really hard (but I am sure some very highly trained people out there can do it)

— Posted by superdave

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11. November 21st,  
2006  
10:24 am

One aspect of the test is flawed: There is a difference between taking a photo with a 13 megapixel camera and derezzing it to 5 megapixels than taking a picture with a 5 megapixel camera. In the former case, the enhanced information is there and incorporated through the derezzing algorithm while in the latter case, the information simply isn't there.

— Posted by Steve Tufte

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12. November 21st,  
2006  
10:32 am

Two comments: I understand that you can get away with fewer pixels on a bigger prints because people view them from farther away, and the brain "smooths" pixelation. And fewer pixels is not a problem if all your images are perfectly cropped and composed full frame. But if you need to do any cropping or enlarging, that's where having more meat to the image will make a difference.

— Posted by Chris Altwegg

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13. November 21st,  
2006  
10:40 am

I'd be interested to know what cameras were used here? Digital SLRs? If so, what lenses were being used? Obviously, at a certain point the glass in front of the sensor starts to play a bigger role than the sensor itself...

5mp is probably the limit of point-and-shoot camera lens resolving power, but go ahead and compare a high-end digital back like the phase one P45 vs. a 6.3 megapixel dSLR—both using good glass—and extra pixels will be apparent.

— Posted by patrick

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14. November 21st,  
2006  
10:50 am

I find the difference in resolution or pixel amount relates to how I want to process the image. An image on a wall is one thing, but I can zoom into a high

pixel image in an interactive format unlike a wall print. Your test limits the use of pixel content and that makes it difficult to judge but I'm quite sure the content of large pixel formats has much to recommend itself when needed.  
thanks,  
Doyle

— Posted by Doyle Saylor

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15. November 21st,  
2006  
10:51 am

Thank you for exposing this myth!!

I have been saying this so long now I'm blue in the face. The example I give was the centrepage spread in Sports Illustrated which was a single photo from a Nikon Coolpix 990 - which only collected a 2.1mega pixel JPEG!

If this article riles people up, as you say, they need to do some more research.

— Posted by Jonny T

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16. November 21st,  
2006  
10:56 am

I am in the market to find a 'starter' camera for my daughters ages 7 & 4. For their needs I'd like to find a camera that is at least 1.3MP because I think we'll view most of them on the computer and maybe some 4x6 prints. I've not been able to find much out there though? Kid's cameras are junk and the adult cameras are more than they really need. I am giving some thought to just buying an unlocked GSM phone to get the camera. What do you think? Any suggestions?

— Posted by Jim L

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17. November 21st,  
2006  
10:56 am

I go a step further— since most people I know never get anything larger than a 5x7, I tell them that 3 megapixels is fine, and it won't clog up their hard drive as fast. That's especially good for people with older computers, as in addition to the short hard drive space, the image processing software included with most cameras runs faster processing 2-3 megapixel files than 5-10 megapixel files.

Frankly, I have a bunch of friends and family who print off photos from my web galleries who think they look just fine, at web resolution printed on a crappy inkjet printer on plain paper. Why confuse things when their expectations are so low?

I got my first digicam in 1998 and have not bought a roll of film since. When I look back at some of the 1 megapixel photos I took with my Nikon Coolpix (my 2nd digicam), I am still impressed at how nice they look. They print out 4x6 with a little unsharp masking quite well. The average person does not need more than 2 or three MP. Good point, and great idea for a segment!

— Posted by Rotgut

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18. November 21st,  
2006  
10:59 am

hey i hope you didn't buy your camera yet.

Happy thanksgiving!

farrah

— Posted by Farrah

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19. November 21st,

2006

11:05 am

Yeah, now crop that same batch of photos to about one-fourth their original area, then blow them up again to poster size.

Guess which one's gonna come out pretty?

More megapixels means more liberty to crop.

— Posted by Shaun G

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20. November 21st,

2006

11:06 am

You need to be more specific about your methodology before anyone can really comment on this.

In digital prints that I make from scanned negatives (very good scans) I can easily see the difference between 180 pixels per inch and 360; in some cases but not all I can see the difference between 360 ppi and 720.

360 pixels per inch at 11×14 corresponds to close to 20 megapixels, so if you can't see differences between this sampling frequency and one that's a fraction of it, then the quality of the optical system is likely limiting everything you're looking at.

This might be the lesson—decent optics are more important than too many pixels. But without knowing exactly how you did your tests, we can't even be sure that this is what you were (or weren't) seeing.

— Posted by Paul R

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21. November 21st,

2006

11:11 am

I love when people get proven wrong, especially when there is a valid test to back it up.

Kudos to you David.

I wonder what other wonderful things you will be de-bunking in the future.

— Posted by Michael Gregov

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22. November 21st,

2006

11:18 am

It's good to hear that you got sensible advice from the salesman. I would agree that megapixels are not the most important feature of a digital camera these days. My experience has been that I'd gladly give up a bit of resolution — on a P&S or DSLR — for faster, more accurate focus and lower shutter lag. These are two features that, in my opinion, make for better photos regardless of resolution.

— Posted by Terry

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23. November 21st,  
2006  
[11:20 am](#)

We techies need to figure out how to talk to arties. The printer is the limiting factor in this scenrio. You can take, scan, and save pictures with oodles and oodles of gigabytes (or googol if you want) of storage space but unless you have a printer that can print teeny tiny color dots incredibly close together (i.e. dots per inch) your printed pictures are going to look the same.

— Posted by John Littlefield

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24. November 21st,  
2006  
[11:21 am](#)

I've seen more gawd awful blown up pictures from low rez cameras than I ever wanted - pixelated out like a bad mosaic - so there is a significant difference somewhere - !!!!

— Posted by jim caldwell

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25. November 21st,  
2006  
[11:22 am](#)

No reason to challenge your basic premise: 5 megapixels worth of data makes for a very nice image, assuming little or no cropping.

But that doesn't mean that a 13MP camera will take the same quality picture as a 5MP one. More likely than not, the 13MP model will have less noise, more range, better quality at high ISO equivalents, etc.

Well-lit settings with cute kids who don't squirm too quickly are important to most of us, but they're not very challenging to cameras. You don't have to worry about purple fringing because the soft-focus look minimizes contrasts. You can use a nice, low ISO rating & get a good exposure. Etc.

Not to mention all the other features that manufacturers feel obliged to toss in when building a premium camera.

So: partial agreement only. It's not really clear (unless all you care about is blowups of the kids) that a 5MP camera is the functional equivalent of the 13MP monster.

— Posted by Walt French

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26. November 21st,  
2006  
[11:23 am](#)

Of course, more megapixels gives you more cropping possibilities while still maintaining enough pixels for your prints.

— Posted by Eric

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27. November 21st,  
2006  
11:29 am

Many thanks Mr P for the reassurance. My decision - early this year - was: should I choose the Sony DSC-W15? or DSC-W17? Now I know I was right to stop at 5.1 megapixels and I don't have to feel mean about spending more and going for 7.

Cheers.

— Posted by Uncle Tooke

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28. November 21st,  
2006  
11:35 am

The article assumes that the only difference in digital cameras is the megapixels. This, certainly, is one of the things the media is constantly putting forward, as well as the camera companies and the suppliers to the camera companies (they make more money on higher-priced, latest technology products).

The truth, of course, is that the number of megapixels is only one difference that shows up in the result. Other differences include plastic vs. glass lens, a cheap glass lens vs. a high quality, multicoated lens, the speed of the camera, the way the aperture opens and closes, the quality and size of the CCD, the firmware inside the camera, etc.

As a result, a camera with 8 megapixels may produce poorer images than a better camera with only 6 megapixels. And that difference would be observable by anyone.

— Posted by Don

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29. November 21st,  
2006  
11:36 am

Sounds like an interesting test... I would have loved to have been there, watching people try to figure it out.

I suppose it will be broadcast soon enough, but will there be ways for those of us without cable subscriptions to see it? (iTunes, Google Video, etc...)

— Posted by Brad

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30. November 21st,  
2006  
11:41 am

HA!

Dave, your "test" seems to simple and silly... just blow up those pictures and see if anyone notices the differences. but that's exactly what i would expect from a tech-writer (not to diminish your work but i haven't seen such a simple test anywhere else) and i so appreciate you for that type of work.

people get so caught up with the mega-whatever (bits, bytes, pixels...) that they seem to forget that nobody will ever notice.

a heartfelt thanks!

— Posted by pirco

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31. November 21st,  
2006

11:46 am

#25 and others write: "No reason to challenge your basic premise: 5 megapixels worth of data makes for a very nice image, assuming little or no cropping. But that doesn't mean that a 13MP camera will take the same quality picture as a 5MP one. More likely than not, the 13MP model will have less noise, more range, better quality at high ISO equivalents, etc."

**BUT THIS IS EXACTLY MY POINT!**

That the quality of the photo is determined by lens, circuitry, lighting, and the photographer's knowledge. NOT megapixels, which is actually barely relevant at all.

You are right: expensive cameras TEND to have more resolution AND better optics/electronics/sensitivity. But that's just coincidence. 😊

–Pogue

– Posted by David Pogue

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32. November 21st,

2006

11:51 am

The extra megapixels matter when you want to crop a photo. Say you are at your son's graduation, and you get a great shot of him receiving his diploma. The problem is, your seat is far in the back of the stadium. The top of your photo has your son in it, and the bottom half is just the back of people's heads. If you have a 10 megapixel camera, you can delete the bottom half of the picture and still blow the remaining 5 megapixel photo up to 11×17 with good quality. If you have only a 5 megapixel camera, once you delete the unwanted stuff you are left with only a 2.5 megapixel image ... not enough to print large.

– Posted by Dan

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33. November 21st,

2006

11:59 am

I have gotten away printing 11×14 family snapshots using a 5 mp camera before so I agree but it really depends on the printer and subject matter. If the image contains any text, detailed patterns or thin lines running diagonally, you can tell right away. The same debate I've heard years ago between the quality of an image taken with a medium format (2 1/4") and a large format 4×5 or 8×10 view cameras.

– Posted by virtuedesign

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34. November 21st,

2006

12:10 pm

Mr Pogue: It would be interesting to confront the PR dept. of the company Hasselblad [26 MP minimum] with this information. You'd have to look up the price of their products yourself, though. I can't remember if they're more or less than \$10,000

– Posted by djones

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35. November 21st,

2006

12:50 pm

You are absolutely right that you are unable that see the difference. What however matters is that with higher res cams you will be able to make a smaller

cut out of the photo without losing the details. More important is the bit value 24 against 32 bit e.g color resolution. Another very important factor is the lens/optics. That you most of the time only find on hi-res camaras. Also hi res camaras work better in lesser liggt circumstances as stipulated before..

— Posted by Robert

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36. November 21st,  
2006  
[12:51 pm](#)

I agree with David.

And to further explain the reason- Assuming all other things being equal... If the image sensor's PHYSICAL DIMENSIONS are identical for the 5, 8, and 13 megapixels, then noise and interference between actual sensors has important impact on the image. That is, lower megapixel count will have less noise/interference, and thus, result in a better photo.

Perfect example- I own an old 2.3 megapixel Canon Powershot 100.

The choices of upgrade go all the way to 10 megapixel versions.

I chose the 700 ('only' 6 mp), because the picture quality is best... go read the reviews!

— Posted by Bob

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37. November 21st,  
2006  
[12:55 pm](#)

Note that the dots per inch (dpi) rating for a printer does not match up to pixel per inch (ppi) rating. On an inkjet printer, a single pixel can be made up of hundreds of individual dots of ink.

— Posted by Julian Y. Koh

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38. November 21st,  
2006  
[12:55 pm](#)

But, David, WHY?

There's a physical limit to the data that a camera acquires, and the number of pixels is one axis to that limit (another would be the number of bits/pixel, and the fidelity), and maybe more.

But why isn't it more relevant? It's a great geek "shopping tip", certainly. I'd sure like to know why - is it the printer resolution? Is there a perceptual factor? One might look at a 5MP image at 16 x 24" and figure out the size that each pixel in the original image is printed - and then it would be great to know WHY the limit isn't what one would expect.

— Posted by K. M. Peterson

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39. November 21st,  
2006  
[12:55 pm](#)

This was a great idea, and it reminds me a little of the MP3 compression test versus AAC or OGG and which is actually "better" than the other, and it comes down to personal preference.

The problem is that what sounded good to me at 128kbps 8 years ago doesn't sound so good to me now. What looked fine printed from a 3.3MP camera 5 years ago doesn't look so great to me now. My ears have been re-trained to higher audio bitrates and my eyes have been re-trained to higher MP prints.

It's such a subjective thing, and a lot depends on what the content of the picture is (are there a lot of gradients, are there fine details like hair or grass blades or tree branches, etc.) and what each user expects in terms of quality. It doesn't surprise me that the photo prof picked them out in the right order, and I doubt it was because she was lucky.

That said, for the ever-quoted "average user" it's an interesting test nonetheless. And it does reinforce that MP aren't everything. A high quality 5MP compact camera with great optics will give you some great quality shots, whereas a 5MP camera with inferior optics might output shots that are no better than a 2 or 3 MP camera.

— Posted by Gregg

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40. November 21st,  
2006  
1:09 pm

What about that other form of cropping -digital zoom?

— Posted by Tom

---

41. November 21st,  
2006  
1:11 pm

"But that doesn't mean that a 13MP camera will take the same quality picture as a 5MP one. More likely than not, the 13MP model will have less noise, more range, better quality at high ISO equivalents, etc."

That's true if the 13MP camera is a professional-quality digital SLR with a larger sensor. But if both cameras are in the same market category (i.e., both consumer P&S cameras), the result might be reversed. If you compared a 5MP point-and-shoot to a 13MP point-and-shoot, the 5MP would probably produce a photo with less noise than the 13MP camera because the P&S cameras cram more and more pixels into tiny P&S-sized sensors, with the result that the pixels themselves (or, more accurately, the photosites on the sensor) are getting smaller and smaller which leads to more noise. (On the other hand, a digital SLR typically has a much larger sensor than the P&S cameras, so that they can have lots of megapixels without making the photosites so small that the S/N is problematic.)

I wish the manufacturers would label the cameras with both the number of megapixels AND the size of each photosite - if I were choosing between two different 8MP cameras, I would want the one with the larger photosites to produce images with less noise.

— Posted by Mitch

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42. November 21st,  
2006  
1:16 pm

I agree with the 'megapixel myth' to a point, but starting with the same 13MP image and 'down-rezzing' it is a flawed test (as another poster pointed out). It should be done with pictures taken at different native resolutions.

#25 and Dave... more pixels in the same size sensor actually causes MORE noise.

— Posted by dk

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43. November 21st,  
2006

1:22 pm

Good stuff

— Posted by vin

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44. November 21st,

2006

1:39 pm

I came to the same conclusion. I have been scanning old “traditional” 4X6 photos. I initially get a 30-40 meg-ish file. When I compress to 5 meg, I can still see the original film grain just fine. Thus; the EFFECTIVE resolution of 4X6 photos has got to be in the 5 meg range.

I have a 3 megapixel Canon A70. It takes pictures that look great on my 17 inch monitor, but I'd like something a LITTLE bigger.

I don't need to crop that often (you can delete in-camera bad shots in this digital age); nor, do I need to make make billboards.

So, my new camera, for Xmas, is a 6 Megapixel Canon Powershot 3S 1L. I shouldn't need nor pixels than that.

— Posted by Tom B

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45. November 21st,

2006

2:08 pm

Thanks for doing this. I've had this thought for years also but people don't seem to want to hear it.

I think the most important thing is to have one you'll take with you. Those sweet shots often show up by surprise when you are walking the dog or something. I hope to get a DSLR one day, but I doubt I'll carry it around routinely. In the interim, I want something compact, with a good EVF, good low light and dynamic range, image stabilization, good lens and simple operation. That's the camera I'll use most. I'll get the good shots with it because I'll have it when they appear.

— Posted by dyspeptic

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46. November 21st,

2006

2:28 pm

The other thing I haven't seen anyone mention, except tangentially, is the effect of halftoning on the back-of-the-envelope calculations like the '3640 pixels wide' figure cited in the original post. When you print with most current print technologies, like color inkjet and color laser, you're producing different shades of color by combining different patterns of dots in the basic colors the printer can produce - three primary colors plus black in most printers I know of, with two intermediate colors added on in some specialty photo inkjet printers. Thus, the effective resolution of the printer is reduced, because each 'pixel' of a given color will actually be represented by a grouping of smaller dots in the printer's primary colors. The actual effective resolution will vary depending on the pattern a printer uses to create halftones, but it's almost guaranteed to be less than the official 'rated' resolution of a printer.

To add my own agreement to other posts, I believe that the quality of the optics and sensor is absolutely more important than the megapixel rating of the camera, and this is only becoming more true as the megapixel rating of inexpensive cameras continues to rise. Even if upgrading the resolution of a camera's sensor actually improves the quality of the image it produces (certainly not a guarantee - if the sensor stays about the same size, for example, each pixel in the sensor will have to shrink, and that means it will have less

area to gather light, which means improving the sensitivity, and then you have to deal with an increased chance of noise, and on and on...), it will not improve the quality of the final picture one bit if the lens can't focus enough light on that sensor, or shows chromatic aberration, or any of the other links in the chain between incoming light and the sensor are not up to snuff.

— Posted by Travis Butler

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47. November 21st,  
2006  
3:09 pm

I have been using a digital camera for the last seven years. I almost never print a picture. I keep them on my laptop computer that I carry with me most of the time, so I can pester family and friends by showing them. As the screen resolution cannot show more than 640×480 pixels picture, I don't see the point of buying a camera with more than 0.4MP! This is the size I keep the pictures on my computer, so that they don't eat too much space on my hard drive.

— Posted by Olivier Goldschmidt

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48. November 21st,  
2006  
3:23 pm

I kindly disagree - it does make a difference.

I bought a 7.1 mp camera for one very good reason. Quite often I'll want to take a picture of something far away but with a 3x optical zoom can't really crop the image the way I'd want without going to digital zoom - but that shot would suffer from any movement of the hand (lacking a tripod).

I take the pic at 3x zoom, then crop the unwanted part of the image on the desktop. At 7mp, I get a high quality print from the cropped image (now possibly a 3-5 mp image).

Can't do that with a 3 mp camera 😞

— Posted by Chad Patel

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49. November 21st,  
2006  
3:37 pm

Not that I entirely disagree with your premis, but I have two problems with your test: 1) why would you reduce the resolution of the image before printing? Sort of defeats the purpose. 2) A baby picture is not an image that requires much resolution, how 'bout some landscape photography?

— Posted by Carey

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50. November 21st,  
2006  
3:47 pm

Knowing the technical spec's of the cameras involved would help a lot to measure the significance of your results.

And perhaps all you've demonstrated is that the "professional photo lab" printer that was used is useless above 5MP. Any specs on that ?

— Posted by Eliot

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51. November 21st,  
2006

3:50 pm

Your basic premise is that a 5 mp camera is no different than a 13 mp camera. But in your test you didn't compare a 5 mp camera vs. a 13 mp camera — you compared resized images from the same 13 mp camera. This proves that a 13 mp camera captures a lot of information that won't be lost as you down-rez. In reality, it says nothing about making a large print from a 5 mp camera. Repeat the test, but this time use different cameras with different resolutions.

— Posted by Steve Barry

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52. November 21st,  
2006  
4:27 pm

#51 wrote: "Repeat the test, but this time use different cameras with different resolutions."

But that test, alas, would be meaningless. It would be fuddled by the lenses, electronics, light sensitivity, etc.

I wanted to ISOLATE the megapixels as the SOLE difference.

dp

— Posted by David Pogue

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53. November 21st,  
2006  
4:49 pm

Okay, now I'm confused. The basic conclusion that most people are going to draw from your blog entry is that you don't have to spend the extra dollars for resolution to get good enlargements. Yet it seems to me (based on your responses to reader comments) that you are admitting that a 13 mp camera will give better results than a 5 mp camera (due to reasons other than pixel count). So therefore, even if it's true that a 5 mp sensor will give you as good results as a 13 mp sensor (which I still doubt) the rest of the camera (electronics, lenses, etc.) won't allow similar results (which I believe you are admitting). Thus, the conclusion being drawn by your readers (that they can get as good results with a 5 mp camera as a 13 mp camera) is simply wrong — truth is, they cannot buy a 5 mp camera and expect to get as good results as with a 13 mp camera. Now if you can find an actual 5 mp camera that will give results as good as a 13 mp camera, then you've got something. (I, on the other hand, will admit that for 8x10s or smaller, there is no visual difference between a 5 mp camera and a 13 mp camera).

— Posted by Steve Barry

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54. November 21st,  
2006  
4:51 pm

#51 wrote: "Repeat the test, but this time use different cameras with different resolutions."

#52 wrote: "But that test, alas, would be meaningless. It would be fuddled by the lenses, electronics, light sensitivity, etc."

I wanted to ISOLATE the megapixels as the SOLE difference."

That doesn't invalidate the argument. The software used to rez down the image is specifically designed to interpolate and reproduce detail provided by the larger image, even if there isn't enough resolution in the resized image to capture it on a 1 to 1 basis. You're still physically representing data that a 5mp camera simply would never have captured. You're testing the software and the printer, not the camera.

The only way you could simulate what you want using a single camera is to take matching photos from a mathematically proportionate distance from the photographic subject, which will no doubt screw up your focus, lighting and lense specifications anyway.

— Posted by MonkeyT

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55. November 21st,  
2006

[4:55 pm](#)

I am betting that if dave had tested two different cameras you would all be saying how the test was in-valid and that he should have used one camera and rezzed the images....

— Posted by superdave

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56. November 21st,  
2006

[4:58 pm](#)

One person alluded to this, but you haven't really looked at the effect of the capabilities of the printer. Ink jet printers, even professional grade, have a certain amount of spreading in the ink upon application. This lessens the pixel crispness and blends the colors in a manner that simulates how things look in real life. At that point, the MP feeding it don't matter. The trained eye can try to find the types of features that would differentiate in that circumstance, but even then, past a physical limit it's luck.

— Posted by Steve

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57. November 21st,  
2006

[5:06 pm](#)

So Sunday night I was looking through a book on Japanese architecture/design, drooling over the aesthetics. Not even 8X10 sized photos, in this sub-coffee-table book, but I can't imagine that half of them would've looked good from a 5MP camera.

Lots of fine lines, rich textures, glowing colors. A low-light bar image stuck in my mind, with its woven textures, reflections and refractions from the glasses, real eye candy. A fine job of printing that was necessary because the image would've looked amateurish without the headroom of the extra resolution. (And low noise, etc.)

You just used the least critical example for your test. Fine if that's what people care about, but every now and then we want — and our eye expects to see — those extra quality details.

— Posted by Walt French

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58. November 21st,  
2006  
5:09 pm

A few years ago I decided to upgrade my digicam. I chose a Canon Powershot SD200. It only has a 3 megapixel sensor, but then so did its predecessor, the S230. Why would I choose a camera with only 3 megapixels? On my wall at home are 4 pictures blown up to 11x14. 3 of them came from a 2 megapixel camera. They are landscape photos. People have not been able to tell the difference without getting oil from their noses onto the glass covering the photos.

— Posted by Dave

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59. November 21st,  
2006  
5:31 pm

OK, I've been doing this for a long time. And have always told customers and proven it on a variety of printers (I am a Color Management consultant) That photo prints only require 150-200 dpi anything more and you are just throwing more data around than necessary.

Photo printers (optical or laser printers that use a photographic process to develop the prints) are typically 150-200dpi printers. dye sub printers are 200-300dpi, and inkjet and laser printers use multiple inks and change dot sizes etc, so you can't really even make any qualified statement as to the dpi (the 2880 dpi that epson and others refer to is virtually meaningless when compared to the resolution of an image)

Now the advantage of a higher resolution camera is that you have much more versatility when it come to manipulating the image - ie with a 13MP camera you can make a poster size print from a CROP of a portion of an image. Though I must say I have made 20x30 prints from my Canon 20d 8MP camera and I would say the results are better than prints made from my medium format (6x4.5) slides. So I can't imagin needing much more.

— Posted by Jason

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60. November 21st,  
2006  
5:37 pm

Just to muddy up the waters, check out this website:

<http://www.gigapxl.org/gallery.htm>

While these photos were taken with a very specialized camera, at the scale of GIGApixels versus megapixels, there is little doubt that far more image data and quality is the result. (And it is a really cool website...)

— Posted by Justine

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61. November 21st,  
2006  
6:02 pm

The reason you are not seeing a difference is that you are printing all the photos at the same dpi(300). If you wanted to print at a larger dpi, 600 for instance, then the 5 megapixel camera would not produce an image of high enough resolution. The 12 mp camera would however have you more than covered. It all depends oon teh dpi you what the final product.

— Posted by Will Leonard

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62. November 21st,

2006  
6:18 pm

Megapixels means nothing without knowing how the resolving power of the optics relates to the pixel size of the sensor. If the number of pixels in a sensor is increased without increasing the sensor size, a point will be reached at which the pixel size becomes smaller than the resolving power of the optics. At this point, all you will gain from increasing the number of sensor pixels is a bigger blur. Given the marketing advantage of megapixel ratings, it would not be hard to believe that a manufacturer would indeed use a sensor with a uselessly high number of megapixels just for bragging rights. The cost of a semiconductor device is strongly driven by its area, so the manufacturer has a strong incentive to make it as small as possible. Moore's Law means that today's 10-megapixel chip costs no more to manufacture than yesterday's 3.2-megapixel chip. Back when the earth was still cooling, and transistor radii first became available, there soon developed a race in transistor count in a radio. Manufacturers would cram in superfluous transistors by using some of them as diodes, simply to be able to claim a higher transistor count than their competitors.

— Posted by Jody Hudson

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63. November 21st,  
2006  
9:47 pm

As a first statement, I think the way the test is arranged is biased towards a certain result.

I agree with Steve Barry's comment - this is only to prove that the program that you use to downsize a originally 13MP is fairly looseless and that's an excellent result all in itself. All it tells me is that I can spent less disk space storing the photo. Excellent.

I am a true believe that it is not the MP that makes the difference, it is the signal processor, the sensor and other smarts in the camera that make a photo technically great. with the advancement in MP, all these other electronics "improves" thus the pictures are normally better in newer camera.

The photographer is what makes the picture.

Yes, agree with you - do not choose based solely on MP, choose it in combination of other non-MP based parameters.

— Posted by Steve Barry

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64. November 21st,  
2006  
10:08 pm

You say you wanted to "ISOLATE the megapixels as the SOLE difference." There are flows in your test set-up as others pointed out, but even if you were correct about the megapixels, that doesn't give you the license to extrapolate the finding to selecting a CAMERA, which, besides megapixels, incorporates a matrix of other variables in the form of optics, light sensitivity, sampling effectivity, noise reduction, etc. After all, two cameras having the same megapixels can produce perceptively different results. You eliminated that fact from your test.

Ziya

— Posted by Ziya Oz

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65. November 21st,  
2006  
10:37 pm

what about taking "similar" pictures.

3 pictures back to back.  
same camera but with 3 different resolution settings?? (manual iso, manual focus, etc..)  
6mp, 8mp, 13mp  
tripod and about 30 seconds to take the shots and change the settings in the menus.  
This way you would have the same camera, with same sensor, and same lens.  
— Posted by bigdave

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66. November 21st,  
2006  
10:38 pm

Do a real world test with actual cameras, anything else is meaningless twaddle - if this is representative of your usual approach I won't be bothering to come back.  
— Posted by ST

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67. November 21st,  
2006  
10:38 pm

are the images online to see?  
what was the max size you could take each image to, before it started to loose it's quality?  
What printer was used?  
What cameras 5,8,13 were used? - were they using the same lens?  
thanks  
michael  
— Posted by michael

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68. November 21st,  
2006  
10:42 pm

I did not read all the posts so maybe this has already been said and I am probably preaching to the choir.  
Nothing, at all, beats lighting. period.  
James  
— Posted by James

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69. November 21st,  
2006  
10:58 pm

Unfortunately, this article, and a person in your position needs to spoonfeed these things better in my opinion.  
I know plenty of tech-unsavvy people who would read this article (and never even consider to read through all of the comments) and take away, "Megapixels don't matter."  
A complete article (or show) would show the same test done with 24" prints (where you'd see a difference) and also explain the cropping issue so many people have pointed out here.  
It's all fun and games until you get that call from the relative you helped: "I have this gorgeous picture I took at the lake over the summer and I want a big print of it for my office. What!? You told me megapixels didn't matter!!!"

— Posted by Jeff Blaine

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70. November 21st,  
2006  
11:12 pm

Because you used the same image from a 13 mp camera, your study is flawed for reasons having to do with vision and printing and software stated above. Instead, try this...

Use a three different cameras (5, 8, and 13 mp) to shoot the same image. As suggested, use a digital SLR such as Canon or Nikon that offers the three differing resolutions. Use the same lens with each and the same software to process each. Make sure the settings in the camera are as similar as possible (e.g., all jpg, all with no sharpening, etc., all at max resolution for the camera).

Then, select the same size portion of each image... for instance, if you photograph a brick wall, make sure that you use the same 10 bricks across and 10 bricks down out of the 50 X 50 brick image.

Then, print that portion of the image from each camera at an 11 X 14 image size.

Now, which one is better? Can you tell the difference, etc.?

— Posted by Bob

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71. November 21st,  
2006  
11:20 pm

I was able to duplicate this test for myself very easily in Photoshop. I took a nice 10 megapixel image, resized it down to 5 megapixels and then resized it back up to the original dimension.

I then looked at a part of the image with decent detail and switched back and forth between the two image states (original and the round-trip resize) in the history pallet. You can see exactly how much loss of detail you lose through the resizing. It's all in the the fine texture and edge sharpness. It's pretty much what I would expect based on moving from the 5 megapixel Olympus E-1 to the 10 megapixel D80 last month. You pick up some finer detail and texture that may or may not be important.

Personally, I think we're always drawn to the higher resolution images at a subliminal level. It's why 110 film, disc film and APS cameras weren't successful. The higher resolution formats have better optical quality.

— Posted by James Vornov

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72. November 21st,  
2006  
11:36 pm

After considering this for a little while, I think that the test was not flawed, but rather many people aren't literate to the visual differences that result from anti-aliasing methods (aka. up-sizing a 5MP image to 16"x24" print with soft extrapolation of the original pixels), and it was dishonest not to use a consumer photo ink jet printer in the mix.

From my own experience, a professional photo lab will use software that does a fine job at scaling art to print at a good resolution for their printer, usually calling it a RIP job, because of the software used to communicate the image to the printer. Most people haven't ever done such things at home. Consumer printer technology, especially with consumer grade applications like iPhoto or Picasa, make the pixels-per-inch (image file)translation into dots-per-inch (printer file) more problematic than the pro stuff. It suddenly gets easier to see

the difference with a 5MP image and a 13MP image, because the anti-aliasing isn't as good. It will tend to look softer.

Are you going to do the test again?

— Posted by Michael Gaudet

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73. November 21st,  
2006  
11:36 pm

"But that test, alas, would be meaningless. It would be fuddled by the lenses, electronics, light sensitivity, etc.

I wanted to ISOLATE the megapixels as the SOLE difference."

You can do this pretty easily. Use a Canon line or Nikon line of DSLR's and use a basic 50mm prime lens and shoot the exact same shot(from a tripod), with the exact same lens, on the exact same settings, with the different resolution bodies/sensors from one manufactures lineup. I think this would be a slightly more fair comparison.

Using an algorithm to render down a 13mp pic to 5mp means nothing, except for how good your algorithm is!!!

— Posted by Cory Bruckner

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74. November 21st,  
2006  
11:42 pm

2 factors Pogue ignores: viewing distance and cropping.

Closer viewing distances require more DPI to maintain perceived image quality. A 6 MP camera can do bill-board sized images as long as it's viewed from far enough distance to hide the individual pixels from human perception. If Pogue's test used a long enough viewing distance, people will not notice a difference.

Second, enlarge an image just by even 2x to frame a subject more tightly by cropping, and you lose substantial numbers of pixels. If you intend to crop your images to any significant degree, you need more megapixels than when not cropping in order to maintain the same perception of image quality. This is why "digital zoom" features yield less image quality than optical zoom... the digital zoom features simply enlarge and crop; they don't project a larger image on the image sensor in the camera.

— Posted by David Heller

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75. November 21st,  
2006  
11:49 pm

This is actually apples to oranges.

You don't seem to be comparing three different camera resolutions - you're comparing taking a high quality image and down-rezzing the pixels without any manipulation. Given that even the 13MP image is a blow-up, all of them would be softened to a degree that many of us wouldn't notice because we're used to enlargements being soft. No obvious pixellation would occur unless it was sharpened in post production which, presumably, it wasn't. (BTW, if you did try to sharpen the three different images, you would immediately see the difference that a higher pixel count would make).

A real test - and the only test that would matter - is to take three cameras with different pixel counts and equivalent electronics and lenses and shoot the same image and print them.

I know this makes me sound like the naysayers you reference, but, truly, this is a meaningless test if you're trying to judge buying a lower vs. higher MP camera for anyone but a mainstream consumer.

I'm not saying the average consumer won't be happy with a 5MP and won't care about the differences, but this test does NOT demonstrate the result of shooting three original images at different resolutions. If you start with a higher quality image (with millions more pixels that can see more subtly) and lower the quality, you will always end up with a better image than if you started with a lower rez image (which couldn't see much of the subtlety to begin with). This is one of the first things any pro experiences when working with digital photos.

Also, Megapixels matter a great deal when you are manipulating an image in post-production. Try adjusting levels on a 5MP image with near-blowouts and near-black shadows compared to a 13MP and you will immediately see a difference.

Finally, I don't think the photo professor was lucky. For anyone who looks at this stuff all the time, I think more pros would get it right than wrong - but that's just me being a little snobby.

— Posted by Jef

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76. November 21st,  
2006  
11:56 pm

BTW, I do agree that, without a doubt, sensor and lens quality matter MORE than Megapixels by themselves. I just disagree that differences in Megapixels DON'T matter.

— Posted by Jef

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77. November  
22nd,  
2006  
12:00 am

The test should not have been downsize, but UPSIZE! It look great if you downsize but gets real ugly fast when you go the other way. THAT should have been you test not the other way around.

Being that most pro-labs will print with a laser based output onto c-paper your are only looking at 200 dpi. It's inkjets that need 300 dpi and up. The lasers defuse a little and so you don't need as much dpi and it smooth over the areas that fall apart.

You can get away with 200dpi even on most inkjet printers without seeing a difference form a short distance.

I work for a Pro-Lab and see this all the time. We have tricks to make it look right but it still never looks as sharp or has as much color detail.

Maybe try it again with a low end SLR and a high end one from the same company so that you can use the same lenses on each. That way it's only the chip that is a factor.

Try printing it at 16x20. Things start to break down at that size for small cameras.

All the best.

R~

— Posted by Ryan Speth

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78. November  
22nd,  
2006  
12:07 am

Glad you posted this and will be going on air with it. As a professional

photographer, we always get asked 'how many megapixels is that?' and it's really not important. I often still shoot with my old Canon 1D which is just 4-megapixels and the images are fine for most uses.

— Posted by gene x

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79. November  
22nd,  
2006  
12:18 am

Great idea but the test is wrong!

The test is to up-size an image not downsize it. Images always look good when you go down in size but never the other way around.

Try this.

Shot with a 13mp SLR and an 8mp SLR from the same company and use the same lens on both. Nikon would work great as the chip size is not a factor with the lens like it is with Canon. Blow up the 8mp .jpg file to 16x20 and see if it holds up to the 13mp .jpg. I'd like to see the results.

R~

— Posted by Ryan Speth

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80. November  
22nd,  
2006  
12:28 am

Can't tell 5MP from 13MP on a 24" x 16" poster?

this is a little hard to believe. 5MP is ~ 2560 x 1920, or just barely over 100 pixels per inch for a 24" x 16" poster. That's not a whole lot of pixels.

If you use the same math, a 2MP 1600x1200 camera should easily print 16" x 12", and for a 8x10 you'd only need a 800x1000 photo, or 0.8MP. That's obviously not correct and his methods are flawed.

— Posted by james

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81. November  
22nd,  
2006  
12:29 am

One more potential problem with the test—the phrase "professional photo lab" sets off a red flag. My guess is that a photo lab is going to do some upsampling on a 5 Mp image that's headed for poster size. That this upsampled image looked no worse than the 13 Mp version does prove that the optics of the camera that took the original image can't resolve detail beyond 5 Mp, but that doesn't prove that there is no difference between a 5 Mp and 13 Mp file. I suspect that if some form of upsampling did not occur (and it may happen automatically, in the printing device or something) that one would have no trouble seeing actual pixelation on a poster-size print of a 5 Mp image. But I didn't see the actual images, so I don't know for sure.

— Posted by jonah

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82. November  
22nd,  
2006  
12:48 am

Repeat the test using the SAME camera with different resolutions. (My D70 will let me select from several.) That way you'll eliminate the differences in lenses,

electronics, light sensitivity, etc. I'm not sure how different your results would be, but I think that's a better methodology than 'de-rezzing' a high-res photo.

— Posted by Rod Schaffran

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83. November  
22nd,  
2006  
12:58 am

My old Olympus C2100UZ, 2MP, will turn out fine 8X10 prints all day long, if I do my job. The limit only shows up if I need to do much cropping. I use a Panasonic FZ20 for most field work, 5MP, and don't want anything bigger. The newer, high MP cameras are prone to turn out "noisy" images, or over soften to correct the noise. I've talked to a lot of disappointed people, who wish they'd kept their older camera.

— Posted by Bob Honiker

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84. November  
22nd,  
2006  
1:16 am

Try cropping a detail from each picture and then print them on the same size large paper. You will immediately see that the less pix camera's picture is blurry and not detailed. The real difference between a high pix camera and a low pix camera can only be seen when you crop the pictures. Other than that, anything larger than 3 mpxl will absolutely enough.

— Posted by Kuby

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85. November  
22nd,  
2006  
1:19 am

Your conclusion is very FLAWED!!! David, be careful with misleading your readers as much as marketing may mislead about higher pixel count. If you ever do any photo editing, whether it be for a fancy magazine layout, a texture for a 3D model, video editing, etc., ...the more pixels you have gives you more more design opportunities. This is very important in my career. So please change your article a little bit and consider all kinds of uses for digital cameras. Thanks.

— Posted by Guru

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86. November  
22nd,  
2006  
1:31 am

Your conclusion is correct, but I agree with #11, your technique was flawed. If you had 2 identical cameras, except that one had a 13mp CCD and other other was a 5mp CCD. Let's say the 13mp camera has an option to save as a 5mp photo, and you use that option. The 5mp photo from the 13mp camera will be higher quality than the one from the 5mp camera.

— Posted by Bucky

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87. November  
22nd,  
2006  
1:31 am

Ok. In post 52, you suggest the test would be meaningless. If equipment is a concern, do the test with dSLR bodies from the same vendor. Canon uses very similar components/technologies in their dSLR line. Shoot your test images in RAW and either process or don't before you print.

By downsizing your image, you are "fuddling" it anyway. Right?

— Posted by Ian

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88. November  
22nd,  
2006  
1:32 am

Another possible explanation is that the "professional photo lab", not exactly an ISO standard measure, has equipment that is a couple years old. Top of the range back then might have been 5 megapixels. "Who would notice the difference, and hey, it isn't fully depreciated yet?" QED?

— Posted by David Ranson

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89. November  
22nd,  
2006  
1:44 am

Print bigger and I guarantee that you will run out of steam sooner with a camera with lower maximum resolution.

48×60in prints from 6×7cm at around 150dpi look pretty decent, due in large part to the viewing distance required for a print of that size. Less than that sort of output dpi will start to show up fairly quickly as the output resolution goes down. Some random jackass at a Calumet here in Los Angeles told me that he could print 24×36in from a 10D (3072×2048 maximum). The print he showed me to back this claim up was a handful of notches below pathetic.

Setting aside the various other parameters (like pixel density, etc.), it is true that in the case where the print size is such that the lowest resolution file is assured to print at a reasonable resolution (according to the math, with a little subjectivity thrown in), no one will likely be able to tell the difference with increasing resolution. However, put the same three files in a situation where the smallest of them is past the lower limit for what is advisable, and I promise that almost anyone will see it.

Maximum resolution DOES MATTER, but it must be established first what the (maximum) required output size is to be. It is really no different than knowing when to quit going bigger with 35mm film; there is a point at which you simply have no choice but to stop with the foolishness and get a real camera.

Having said that, my very own father once took about two-hundred pixels out of the middle of one of his digital camera pictures and blew it right on up to 8×10in. This is where subjectivity and your own personal standards come in.

Me: 'You know that looks like shit, right?'

Him: 'Yeah, but we don't care.'

— Posted by Matt

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90. November  
22nd,  
2006  
1:55 am

Thats great

— Posted by hiimajit

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91. November  
22nd,  
2006  
2:03 am

It really works

— Posted by sfgr

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92. November  
22nd,  
2006  
2:08 am

I made a similar test, in my case with a Konica Minolta Dimage 7D (6 MP) and a Sony Alpha 100 (10 MP), same lens, same perspective. The pictures were printed in A3+ (20" wide)

My findings were essentially:

- 1) There was little visible difference in sharpness.
- 2) When checking the prints with a low power loupe the difference was large.
- 3) I could identify details that were not resolved by the 6MP camera but resolved by the 10 MP camera.

My normal method of comparison is that I upsample both pictures to 200 PPI for the biggest size print I plan to make and compare in Photoshop at "actual pixels", in this case the difference was huge.

What I found essentially says that: Mpixels do count, but count less than you would imagine. This test also was done under "landscape photography rules".

- Camera on steady tripod
- Low ISO setting
- Medium aperture
- Mirror lockup
- One of the better lenses (KM 28-75/2.8 made by Tamron).

Best regards

Erik

— Posted by Erik Kaffehr

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93. November  
22nd,  
2006  
2:56 am

There's a very good and useful reason for going for a high number of mega pixels. If you were to take a photo of a big landscape scene, and later you notice a rare bird in your photo, you can then crop the area around the bird and 'blow it up' to full size without as much loss in quality.

Apart from that, yes, I totally agree. People should focus (excuse the pun) on the quality of the lens of the camera and it's CCD.

— Posted by John Hunt

in the corner store..

So I would like to take your results with a pinch of salt.

— Posted by Crackhammer

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95. November  
22nd,  
2006  
3:07 am

The threshold is perceptual: The average human doesn't see much difference above 240 DPI printed in color, so:

My 5-megapixel camera (Nikon Coolpix 5000 from 2001) makes an image that is 1920 x 2560 pixels would make a really nice print at 8" x 10.6", but 16" x 24"? That's more than twice the size, and would be about 120 DPI resolution.

The new 13-megapixel Canon EOS 5D with a 2912 x 4368 image size would, at 240DPI, make a print 12" x 18", and at 16x24 would be about 180 DPI.

So the test in this article is comparing 120 DPI with 180 DPI, and maybe there is not that much difference between them at that resolution.

Interestingly, in black and white images the resolution needs to be higher before no difference is perceived.

— Posted by Richard Ginn

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96. November  
22nd,  
2006  
3:26 am

If you are not careful, I believe you will end up giving people the wrong idea... or, at best, the right idea for the wrong reason.

Reading your recent comments, I realize you are NOT saying, "there's no difference between the various cameras out there, go ahead and buy any of them, they'll all print out just as well". However, the careless reader might reach this conclusion based on your test.

Rather, you are saying "megapixels are irrelevant... other more important things should be guiding a purchase". I hope your show is able to spend some time on these other things: camera responsiveness, quality of lens, overall price, optical image stabilization (anti-shake, etc), high ISO performance, etc.

Anyway, I agree with you. We have overzealous marketing efforts to thank for the megapixel obsession.

— Posted by pog

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97. November  
22nd,  
2006  
3:37 am

I'm sure that people of low intelligence will feel vindicated by the results of your flawed testing.

— Posted by Nathaniel Ilvuoto

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98. November  
22nd,  
2006  
3:41 am

WoW, I never knew there was so many "experts". >

— Posted by glitchbit

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99. November  
22nd,  
2006  
4:07 am

I wanted to ISOLATE the megapixels as the SOLE difference.

dp

— Posted by David Pogue>>

Fine, but you tested the variations in FILE SIZE which you sent to the printer. This is interesting stuff, but it has NOTHING to do with cameras.

Yet the whole premise of your piece (and your conclusions) had to do with purchasing cameras with high vs low MP sensors. If this isn't apples and oranges, I don't know what is.

Have a chat with an engineer or scientist prior to your next "test" please.

Bob

— Posted by Robert Walters

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100. November  
22nd,  
2006  
5:03 am

The problem is that a 13mp camera is most likely going to be a \*much\* nicer camera than a 5mp camera. You are giving people the impression that a 5mp digital camera is capable of taking pictures equivalent to those that would come out of a 13mp camera, which is false, as that 13mp camera surely has much finer optics and processing capabilities.

I have a 5mp camera myself, and have taken some very nice photos with it. 8x10's look pretty good, but anything above that and the quality starts going downhill pretty quickly.

— Posted by Tina

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101. November  
22nd,  
2006  
5:05 am

I haven't read through all the posts, but the main reason I use a larger mega pixel is for cropping the image.

— Posted by Mick Hyde

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102. November  
22nd,  
2006  
6:12 am

Ok...I do a lot of cropping in my work with digital...and framing in various parts of the original picture. Pixels do count in this approach. I really don't make poster size of any of these pictures...mostly 8x10...and I want these cropped pictures to be as good as possible. Ted Nielsen

— Posted by Ted Nielsen

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103. November

22nd,  
2006  
6:24 am

David,

We find that we always take pictures of at least 2-3 times the final resolution target size. This is because taking a high resolution pictures, which includes noise and color artifacts, looks much better when carefully scaled down. Scaling down tends to average out noisy pixels, color fringes on bright edges, etc.

So, it's not clear that your test is actually representative of real-world results.

Also, I go for a higher res camera so that I can crop the picture down to the part I want to print... I sometimes throw away more than half a picture, depending on "how fast I whipped the camera out to get the shot" etc etc...

Regards,  
William Donelson  
London, UK

— Posted by William Donelson

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104. November  
22nd,  
2006  
6:30 am

There are 2 options:

1. you edited/printed the picture bad enough in the first place to make the hi-res look no better than the low-res
2. you didn't know where to look for difference

I personally opt to #2. As a photographer I have sometimes to argue with people about why digital is worse than film - yet. Nobody who are not photographers can understand the difference in dynamic range, tones, and what the smaller sensor means until I point it out to them with a picture and a finger. You could argue that the difference is thereby not essential, still, if you hung up two photos in your living room, after some time you'll like one better than the other, and it'll be the film that's better.

One thing is perfectly true here - megapixels do not define quality. It's the dynamic range, glass, and size of the sensor that impacts most, after you've got over 5Mp. So far only Canon D5 has 35mm sensor, and even Leica M8 has about 32, and none of them approach negative in dynamic range. So we film photographers are still waiting.

— Posted by Alexander Nekrasov

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105. November  
22nd,  
2006  
6:31 am

I'm not sure how exactly the math worked. A 300 dpi printout has less information than 300 pixels per inch because of halftoning (and I see belatedly that Travis mentions it above), so I agree that 5 MP is probably no better than 13 MP when printing directly.

I do prefer the larger number of megapixels though because you can't deny that there's more information there. More information means you can do better noise reduction, better sampling, better cropping and have less weird compression artifacts. So if you really like to tweak your photos with filters and optical tricks like I do, more pixels are better. (That said, better dynamic range would be even better, but no one seems to do that.)

— Posted by C W

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107. November  
22nd,  
2006  
6:45 am

..basically, a street passer-by won't probably read the difference between the guitar sir McCartney uses and a children' toy worth \$100. Less still if they are both recorder in MP3 format. Still, a difference there is indeed.

I don't mean to sound snobby, but the test is completely inadequate. You can't judge professional instruments not being a professional in that area. And the area of photo cameras is photography, not electronics, even if they are digital.

BR,  
Alex

— Posted by Alexander Nekrasov

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108. November  
22nd,  
2006  
6:54 am

I went to Cambodia last summer and set my Vivitar to shoot at 3 instead of 5 megapixels . . . came home and had a beautiful shot of Angkor Wat enlarged to 16x20 through Apple's iPhoto Kodak print service. There were quality warnings when I placed the order, but the print, now hanging in my living room, is perfect.

My experience tells me that the Megapixel Race is way overhyped.

— Posted by Jon Trimble

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109. November  
22nd,  
2006  
6:56 am

The SOLE difference is if you need a huge print (e.g. for a newspaper or a street ad). Try using a 2MP and a 13MP.

There is also another advantage... cropped pictures look better if resolution is bigger.

— Posted by Alex

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110. November  
22nd,  
2006  
7:02 am

Dave said "I wanted to ISOLATE the megapixels as the SOLE difference [as opposed to sensor size, lens quality etc.]" (post 52).

But your conclusion is not about mega-pixels in the stored image: it is about cameras: "Above 5MP, camera megapixels doesn't matter". Trouble is, you have not taken a picture with a 5MP camera, you have used a 13 MP camera, potentially one with a much larger and lower noise sensor that exists in consumer cameras (you don't give any technical detail on the test).

We can, no doubt, agree that what matters is image quality, and your study does demonstrate that after an image is sampled from a 13MP sensor, transferred into Aperture or a similar program in RAW format (I assume, though you don't say), it can then be down-sampled to a 20MB image (5 million \*32-bit color pixels) using complex compression-like algorithms for low-loss resampling (again you don't say) without visible degradation. That is a

very unreal scenario for your readers, who (a quick scan of the comments above reveals) believe that their 2MP Sony point and shoot is equivalent to a 13MP Canon pro camera costing 20 times as much.

The information coming from your test, then, is of no value to the consumer purchasing a camera and faced with a choice of cameras varying in a range of factors, one of which is sensor megapixels.

Should they disregard mega-pixels over 5? I doubt very much that this would be a good idea, as those pixels store information which the JPEG algorithm will use to compress the image. But, despite not testing what happens when the pixels are missing from the beginning, you conclude that because they can later on be (partially) dropped, that they never mattered.

A useful survey would plot the image quality against a range of variables in existing cameras: in particular sensor die size, sensor pixel count & noise, the speed of the lens and sensor, and, last but certainly not least, optical quality. All of these can be reliably quantified.

Image quality can be rated, and a formula generated along the lines of

$$\text{image} = (x * \text{sensor size}) + (y * \text{megapixels}) + (z * \text{die-size} / \text{megapixel})$$

It might even be the case that megapixels doesn't matter 😊

take care,

t

— Posted by tim bates

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111. November  
22nd,  
2006  
7:49 am

re #51, you could try configuring your one camera to take pictures at 3 different resolution levels. (most/all cameras support this in options someplace, but then you will have to use a tripod and probably lock exposure to keep them looking the same)

I'm not sure if the down sizing of the images is really equivalent to starting with different sizes (as someone earlier said). I'm sure there are image wizards out there that could explain.

Also, the comments regarding greater freedom to crop at higher resolutions are right on. This in turns let you be more free in composition when trying to capture tough subjects with the ability to crop for composition later.

However, the comments around image size and processing times are just as valid.

— Posted by Matt

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112. November  
22nd,  
2006  
7:59 am

Mr. Pogue,

Yes, you are right that you don't need high mega pixels to produce good prints. However your article implies something different and that is that an 5MP camera can produce just as good a print as a 13MP camera. If you don't agree then read the reader's responses. That is the takeaway of the majority of the responses. Cameras are systems and all you have done is discussed one element in the system. This is why there are so many camera review sites. It is all about the camera system and all cameras aren't created equal.

Regards,

Dave

— Posted by Dave Huntoon

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113. November  
22nd,  
2006  
8:01 am

The answer is in the eye of the beholder. The human eye has certain physical limitations, and no matter how much better, technically, a print can be made, the eye will not be able to discern the differences. A machine might be able to see differences between 5 and 10mp, but we are not machines, and we have some very finite limits in our physical abilities.

— Posted by William Pellegrini

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114. November  
22nd,  
2006  
8:15 am

I've always believed that the megapixel race is just a marketing hype.

But try and explain this standpoint on some Canon or Nikon User forum, most defend their megapixels better than they would their wives and families ....

— Posted by JCdeR

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115. November  
22nd,  
2006  
8:19 am

You don't exactly say clearly what you did. You say, "Same exact photo, down-rezzed twice, all three printed at the same poster size." This seems to say that all images were down-sampled. If that's true, I guess they'd all look the same, alright. No surprise there.

As for me, I've printed and printed, and I can watch quality go down with size. I'm coming from this as a large format photographer, so I have maybe extra-high standard of texture and detail coming through.

In the old days we didn't carry around 4X5 view cameras, or 8 x 10 cameras, or even medium format film cameras, just because we were crazy. Ansel Adams was a fine printer in many ways, but a good part of why his prints look better than your Aunt Millie's has to do with the extra megapixels he had to work with.

This print, for instance, I'm printing at 13 x 19, because all in all it looks good large; big chunks of color make the dominant statement of the image: But it was shot with the d70, and the detail of the tree bark and twigs just isn't quite there at that size. It just isn't. Many other images from the D70 I won't sell at 13 X 19 or larger. Unfortunately all of my infrared work is with the D70 or a 7 MP

camera; I'd love to be able to sell those at 16 x 20 or larger, but those 7MP prints don't carry enough texture and detail at that size, so they don't go out the door at that size and price. I wish. The D200 is great, but I will be happy to have even more resolution to work with in the future.

John Lehet

— Posted by John Lehet

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116. November  
22nd,  
2006  
8:45 am

This test makes NO sense at all!

In fact, it's downright dumb 😊

Here's the problem: When you downrez, you throw away pixels. Toss 'em in the garbage. If you do that, then you've also thrown away the entire benefit of the higher pixel count- the extra detail.

Unless I'm misreading (you said you -down- rezzed twice?), all you've proved is that if you throw away the pixels from a higher-resolution camera, you will get the same resolution as a lower-resolution camera.

Duh. Everyone knows that. So what are you testing?

What you should have done is printed all three the same size -without- downrezzing. Now you'd see why pixels -can- really matter. The additional detail should be noticeable.

Hey, Dave , totally flawed test. Much ado about nothing! 😊

AAK

— Posted by AAK

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117. November  
22nd,  
2006  
8:54 am

Useless article... Some types of images will display more pixelation than others. Color balance, focus, optical zoom, etc...all factors. My wife is a professional photographer, and I've seen the difference dozens of times. It's always been a small difference, and the average joe isn't going to notice, but that doesn't mean we shouldn't care. Please stop dumbing down the world.

— Posted by jason

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118. November  
22nd,  
2006  
8:55 am

Well, that was a whole lot of nothing to consider.

I am especially not going to take the random observations of people on the street unable to tell the difference between the hues of tar used on road and highways, let alone looking at photos.

What lens was used? What camera?

You did a poor job of convincing here.

— Posted by DrWho

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119. November  
22nd,  
2006  
8:57 am

The article was well done.

Surprisingly, what I haven't seen mentioned was the output of these cameras is (by default) a JPEG. It's a compressed format picture, where resolution is sacrificed for storage capacity. The whole picture is split into a matrix of squares that represent the original pixels. So unless you're getting raw or otherwise uncompressed images from the camera, will not the JPEG be the final limiter in overall resolution quality?

If you have 2 cameras, identical in every way except for the resolution (say, 5MP & 13MP), and they compress pics to JPEG with the same compression factor, the pictures ought to be identical at any printed scaling. This is my conjecture. Is this accurate?

— Posted by Matt Genovese

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120. November  
22nd,  
2006  
9:01 am

I had 2 4MP Canon G3 images blown up to 16"x20" and entered one of them in my local camera club competition. None of the remarks from the judges had anything to do with the resolution, and I can't see any digital artifacts.

Nonetheless, I've replaced that camera with one with more ISO sensitivity, shutter speed and depth of field control.

— Posted by David Saulnier

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121. November  
22nd,  
2006  
9:05 am

Long time ago I did a whole series of resolution tests with various film formats, (35mm, 220, 4x5) and lenses (over various apertures).

Long long story short. The math did not tell the whole story, but there was clearly something "more pleasing" about the 220 and 4x5 over the 35mm prints. I can tell the difference between a 35mm and 220 print even though the math says not. So I agree pixel count is not the story, after you get above a certain count and stay with reasonable print size.

I concluded a huge factor was image size, or film size, or in digital cameras the image sensor size.

When you have a very small image sensor all the imperfections of the lens, mounting errors etc get magnified. Both in the image recording then printing processes.

I am very happy with my 6 megapixel camera.

— Posted by Bob C

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122. November  
22nd,  
2006  
9:10 am

I dont get it. Why did you not show all three prints at 16" x 24" inches?

You have introduced a variable in your test by down-rezzing twice.

What people saw was not the effect of images of varying resolution printed at 16"x24" but the effect of down-rezzing twice on different resolution images.

Maybe the results would have been the same. But will never know and doubts will remain.

— Posted by Villebon

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123. November  
22nd,  
2006  
9:23 am

This is not a surprising result... but a good one to share with the public! The key to picking a good digital camera is the lense... any photographer knows that about any camera. The lense impacts ~90% of the final picture quality.

— Posted by Nick

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124. November  
22nd,  
2006  
9:28 am

Shame on you David. As someone who works for a professional graphics company, I'm telling you, it makes a difference.

Your methodology is flawed. You have to do the test with 3 different native resolutions, not with downsampled files as others have mentioned.

And no, the test wouldn't be meaningless as you mentioned in 52. Take 3 originals in a controlled studio setting using the same camera. Any decent camera will have options on original file size.

Next time you're in San Francisco, come over to our studio, and I'll prove it to you. If I didn't have to take my niece and nephew to the Monterey Aquarium today, I'd do the test myself and prove it to you.

— Posted by Bob Grow

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125. November  
22nd,  
2006  
9:30 am

Next you'll be telling us that you can get from one place to another just as well in a Ford Taurus as you can in a 427 '68 Corvette. LOL, you are right. The horsepower race is STILL on!

— Posted by Steve Levine

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126. November  
22nd,  
2006  
9:30 am

Regarding a baby picture vs. a landscape: A couple years ago I printed a 22 x 14.6 Maine landscape scene taken on my 4MP Canon S45 and there are no noticeable pixels. What you do notice is the limits of the camera's tiny lens, some color fringing, etc. long before you might notice pixelation. I just looked at it again and am amazed that I didn't get a pixelated print—but it's so. Would I have rather had my D70 or Fuji S2 Pro? You bet! But not so much for the extra pixels as for the SLR lens quality.

— Posted by Joseph Corl

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127. November

22nd,  
2006  
9:32 am

HAHA 😄 U didn't discover america. megapixel are garbage. I wont quality no big NUMBERS!!!! :/

— Posted by Dawid Gatti

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128. November  
22nd,  
2006  
9:34 am

My vote's with the pixel cropping amateurs among us. More pixels allow me to point and shoot—and compose later on.

— Posted by Steve Nagel

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129. November  
22nd,  
2006  
9:35 am

So if megapixels don't matter, why not use a camera with a single pixel? Or, better yet, no pixels at all!

— Posted by Hans

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130. November  
22nd,  
2006  
9:36 am

umm... this has been common knowledge for some time only you guys are thinking of it wrong, more megapixels means the original res of the image is WAY higher, and it can be blown up a lot bigger keeping the same resolution, of course if your talking a 5x7 then 3 mp is fine... but id recomend at minimum a 5mp camera just in case you catch one awesome shot and wanna blow it up, think about catching the photo of your life on a 1.3 mp camera, i bet you'd feel like a tool...

— Posted by wow

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131. November  
22nd,  
2006  
9:39 am

David: My problem with your assertion is that it assumes the print copy is where the need ends. I have taken digital pictures with progressively better resolution cameras over the past 7-8 years. The newer images, aside from being taken by cameras with more advanced optics, appear sharper, deeper, and more "crop-able". The older images look poor when embedded in fullscreen HD movies and presentations; i.e. they cannot withstanding any cropping or upscaling to match higher resolution screens and printers. I think it's easy to dismiss higher resolution images because they exceed the current need for limited resolution print quality. But these images will need to be preserved and re-used with more higher resolution displays and printers in the future.

— Posted by Ankush

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132. November  
22nd,

2006  
9:39 am

you all must read this! <http://www.computerworld.com/action/article.do?command=viewArticleBasic&articleId=9005180&pageNumber=1>

— Posted by james

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133. November  
22nd,  
2006  
9:40 am

The camera does an internal upsampling of the image because each photosite on the sensor collects only one color and you need 4 photosites to collect one pixel. So on a 12 Mp camera you are actually collecting 3 Mp but the camera upsamples it to 12 Mp. So starting from a 13 Mp image, downsampling it to 5Mp is basically taking the image and making it its original size from the sensor. The 13 mp will contain more information because the upsampling that is happening in the camera is based on raw data and complex algorithms. If you take a 5 Mp camera then you are starting from almost a 1.25 Mp image and then you might see the difference with a 13 Mp image.

There is an exception which is the Foveon sensor in the Sigma SD9 and SD10 cameras where each photosite collects all three colors so a 3 Mp foveon is the same as a 10 Mp CCD or CMOS camera.

— Posted by Ghislain

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134. November  
22nd,  
2006  
9:41 am

Forgot to say that I agree with the MP myth. I printed a 11×14 from a 3Mp CMOS DSLR and it looks great.

— Posted by Ghislain

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135. November  
22nd,  
2006  
9:43 am

i disagree , as i've noticed that there definitely \*is\* a difference in picture quality here's two examples from my flickr photostream

8 megapixel image

<http://flickr.com/photos/kde-head/291789652/>  
camera: Lumicron LDC-825Z3

2 megapixel image

<http://flickr.com/photos/kde-head/7042891/>

notice how far off objects appear chunkier in the 2 meg image. the 8 meg image overall is a lot smoother and more detailed.

camera: Kodak CX4210

— Posted by justin flavin

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136. November  
22nd,  
2006  
9:44 am

the only thing you showed was the artifacts left by the down rezzing software, in this case it had nothing to do with the mp's at all!

tr

— Posted by tony roth

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137. November  
22nd,  
2006  
9:45 am

This is WAY flawed! There is a difference between scaling down an image from 13 mp to 5 mp and taking a pictures at 13 mp and 5 mp.

— Posted by Brian Smith

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138. November  
22nd,  
2006  
9:46 am

Megapixels = Data. If you strip out the data, then it would be nearly impossible to tell the difference between a 13MP photo and a 5MP photo. I do think that 5MPs are great in most consumer applications, however larger MPs give you an opportunity to crop photos while maintaining quality.

At the end though, Photography is about painting with light, and lenses are as big a part of the equation as the CCD.

— Posted by Judd Spitzer

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139. November  
22nd,  
2006  
9:48 am

This is very interesting. I do have one question though. Does this mean you printed the 5mp picture at 100dpi? Thus, the difference between the prints were in the printed resolution?

— Posted by Eli

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140. November  
22nd,  
2006  
9:49 am

David,

As a technical manager in the printing business, I would say that while you are generally correct in your overall point that people worry too much about pixel counts, your actual factual statements are incorrect for two reasons.

1. the methodology used is incorrect. Downrezzing from 13 to 5 does not accurately show the difference in resolution between a 13 5 meg camera unless you were to turn off bicubic interpolation which preserves much of the higher resolution through antialiasing. Probably a better representation would be to use "nearest neighbor". It might also be possible to use two different resolutions from a single camera, but I suspect they are also using some form of antialiasing at the lower resolutions.

Thinking about it, to really show the effect of resolution, take a computer vector drawing and rasterize it in photoshop at two different resolutions and you get a fairer idea of what resolution does for you.

2. Subject matters. In printing we normally use the rule of thumb that images need to be scanned at 2x the linescreen at output. So for a normal magazine photo we would scan at 300 dpi. Rounghly 28 megs uncompressed (although this is 4 channels...call it 21 megs in rgb). This is however an average. If you have a softfocus picture of a face, half (or a quarter) that resolution would work

fine. If it is an ad for a rolex then you would see clear quality improvement by scanning at 450 dpi or 48 megs.

— Posted by Robb Lutton

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141. November  
22nd,  
2006  
9:50 am

HA, i cant believe all of you are hopping on this story when it is so obviously flawed! Of course you cant tell a difference between the prints at 16x24 because that size of a print is easily doable by any decent 5mp camera. When conducting a test you should make prints that are doable by the higher end cameras but out of the range of the lower end ones. This test is like taking a Geo Metro, a Toyota Camry and a Ferrari and saying that they are all the same because they can all hit 30 mph just fine. That said as a graphic designer I know that anything above a 5mp camera is a waste of money to the average consumer as the difference isn't visible at smaller sizes. But its is completely erroneous to say that mega pixels don't matter, they matter a whole lot to us designers. My advice would be not to pick up a new camera this Christmas if you already have a 5mp, but to invest in a high end epson printer because print quality makes more of a difference.

— Posted by punkrawkintrev

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142. November  
22nd,  
2006  
9:53 am

Did you start with the 11 meg and reduce it to 5 meg and reduce the 5meg to 3? I'd bet you started with 11 and dropped it to 5 then started with 11 and dropped THAT to 3. The compression and pixel selection became a function of the software you used.

Take a camera that has variable resolution. Mount it to a tripod and take three pictures of the same subject - each photo at a lower resolution. Run the same test and you WILL see the difference. If you start with an 11 meg file and digitally down size it you are starting large and picking out select details. Higher resolution photos have more data to work with. More is better.

— Posted by Mike

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143. November  
22nd,  
2006  
9:54 am

This post would be more convincing if you actually POSTED pictures taken with different MP cameras.

Other than that, this is a filler and no content (as well as being EXTREMELY subjective).

— Posted by Alex

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144. November  
22nd,  
2006  
9:57 am

One other factor that should be considered is the output method. Coming from a printing background, one thing that really trips people up is image resolution versus print resolution.

Many people expect perfection from pitifully low rez images, but almost just as many go for overkill. They think that a higher resolution image will produce a higher quality print. Not so. At some point, image resolution meets print resolution and any image rez higher than that is just a waste of storage space.

For sake of simplicity, if you have a 300dpi inkjet ("real" printing works a bit differently, but most people understand inkjets), then your print quality is limited to 300dpi regardless of how high a resolution you start with. To put it another way, as long as the image dpi isn't lower than the printer's dpi (or line screen), and you're dealing with images that are all being output to the same size, then you're not going to see any difference between the data from a 5mp camera versus a 13mp camera. In fact, the output device \*may\* even disguise issues of grain, contrast and color saturation.

Where you will always see a difference, however, is on screen. The fact is, 13mp is more image data than 5mp. You may not need all of that extra data when it comes time to print, but you might if you plan to manipulate the image at all \*before\* output. Perhaps your comparison should clarify that point.

— Posted by Robert

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145. November  
22nd,  
2006  
10:00 am

No, your wrong. Megapixels do matter because as more pixels are crammed onto a tiny, tiny little sensor, the amount of light each one receives is smaller and smaller. This means that the amplification of the signal from the sensor has to be higher and this results in more and more noise. Then the camera applies more noise reduction in post-processing that muddles the image by smearing the noise out. So without increasing the size of the the sensor, more megapixels means more noise and less image quality.

— Posted by woac

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146. November  
22nd,  
2006  
10:14 am

Lens quality and photographer matter more. My old Canon prints pictures better than most cameras out today and my new SD800 with the image stabilizer had a perfect test against a Sony with the same features during a recent vacation with family, my camera's pictures came out better according to my cousin and me. MP will matter when going to larger prints, like if he had used a 2MP camera and 7MP to print the 16x24, the 2MP definitely would have had a difference, between 5 and 13, both can print to that size, but if they went larger it would have made a difference. For average photographers printing up to 8x10, you can get 4, 7, 10 MP and it won't matter much.

Amar  
<http://www.americansdebate.com>

— Posted by Amar

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147. November  
22nd,  
2006  
10:16 am

Well, #50 (Eliot) has a point.

I make large-format prints regularly as part of my graphic design & printing career, and when we're printing out a 8 foot by 4 foot poster (on a 600 dpi

inkjet banner printer), there's no discernible difference between starting with a 300 dpi source file at 8' x 4' and a 150 dpi source file at 8' x 4'.

Now, David, if you had compared those images on-screen, there would have been a definite difference that most people could have recognized.

Although I agree with the basic premise of your test: Consumer-level digital photography does not require anything more than 8Mp, unless you're making wall posters. (I usually do fine with my 3 Mp camera up to 8 x 10 prints.)

— Posted by Greg Leber

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148. November  
22nd,  
2006  
10:17 am

I too agree with dp's conclusions. I've been using an old 2.5MP Olympus digital SLR I bought on Ebay, for years now. It has a good lens, and makes good-looking posters. And the fact that I could buy another one on Ebay for less than \$200 means I don't have to sweat getting it wet or lost too much, like I would if it cost a kilobuck. Hooray — I can take bigger risks with my gear and get more interesting pictures.

But, respectfully, I think our columnist's methodology is flawed. He downsampled ("de-rezzed") a high-res image. But guess what color poster printers do? They also downsample the images we feed them, but the printer companies don't give us much information on exactly what they do. The "resolution" figure they publish is actually the smallest dye-dot size they're capable of laying down, not the actual number of picture-elements per square inch the printer's software uses to work out the pattern of dye dots to lay down on the paper. If we feed a printer driver more picture elements than it needs to lay down each square inch, it will downsample them automatically. It will print the best picture it can without any dialog box saying, "Hey User Dude, I only need a quarter as many pixels as you're giving me. Information Downsampled and Lost!"

So the only conclusion dp's experiment gives us is that ALL THREE TEST PHOTOS HAVE HIGHER RESOLUTION THAN THE POSTER PRINTER HE USED, and that the printer did an excellent job of downsampling them before printing them.

I'm not saying the pictures were substandard—I'm sure they were excellent.

It would be very cool to find out more about the printer part of the resolution equation.

— Posted by Ollie Jones

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149. November  
22nd,  
2006  
10:17 am

Higher megapixels do make a difference if you have to crop the picture significantly.

— Posted by Tom Hise

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150. November  
22nd,  
2006  
10:18 am

I think many of you people here are missing the point of this test. This test is strictly testing to see what difference can be noticed by different megapixels. If

you take three pictures with three different cameras each with different resolutions, you will not be able to get reproducible results.

But if printed 5 megapixel image looks identical to the 13 megapixel it was scaled down from, than that proves unequivocally that a higher megapixel camera will not yeild a better printed picture simply becuase it has a higher megapixel. Surely you'll all agree that different cameras with the same megapixel will not yeild the same quality picture every time?

— Posted by Steven Hewitt

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151. November  
22nd,  
2006  
10:19 am

David, this was an interesting test, I would please love to examine it myself, as I think I could probably spot the difference.

Secondly, this does not make more megapixels LESS effective. What about larger sizes? I know for a fact you would notice a difference. I blew up an image from a 4MP camera to 20x30 and when you view it close you can tell it is not sharp.

16x24 is simply not large enough. Please try 24x36 or larger. Also, to the 'casual observer', of course they will not notice. I have friends who are photographers and I will notice details in their photos they did not, or notice their photoshop mistakes when they don't see them. Get someone with a real keen eye.

Interesting but ultimately useless experiment. Try it again with larger prints. I'm sure if all the professional National Geographic photographers were out in Africa using 5 megapixel cameras, we'd have a problem.

Cheers.

— Posted by phlezk

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152. November  
22nd,  
2006  
10:19 am

I don't know that much about cameras, and megapixels etc.

But in my experience with my different cameras, i get the same quality prints from my cameras, the difference is in digital display.

I can't take a picture of a couple friends with my 5 mp camera from 20 feet and crop out each person for single face shots. My 9.1mp camera can do that.

Last time I checked, mega pixels is a digital image term, and to see the true difference i believe you would have to have them on computer or digital display.

— Posted by AC

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153. November  
22nd,  
2006  
10:20 am

To isolate, use a zoom lens and zoom into the picture and crop to get the lower resolutions, instead of downsampling.

The extra megapixels do come in handy when (1) cropping, and (2) certain transforms suck as rotating, barrel distortion or perspective correction.

— Posted by simon tooke

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155. November  
22nd,  
2006  
10:25 am

David, you wrote:

"But that test, alas, would be meaningless. It would be fuddled by the lenses, electronics, light sensitivity, etc.

I wanted to ISOLATE the megapixels as the SOLE difference."

Your test is indeed flawed because you resampled a high resolution image instead of capturing image data with the lower resolution sensors and printing them at the same size, or uprezzing the lower MP files to match that of the 13MP image. This would have been a valid test.

One way to control for lens resolution, data processing, metering, and so on is to use similar DSLRs, but with varying resolution.

You don't have the equipment, but one recommendation is to capture an image with a Nikon D2H (4 MP), a Nikon D2X using high-speed crop mode (7 MP), and a D2X at full resolution (12 MP). Use the same lens, same aperture, same subject distance. Turn off auto image noise reduction (if using high ISO's) and sharpening, shoot RAW, and print the files at their native resolution AND print the D2H and D2X HSC files up-sampled to the D2X resolution (with no HSC).

Many sports shooters using 4 MP cameras, like the Nikon D2H or a Canon 1D, will increase file resolution for large prints via interpolation. This is how, in the real world, lower MP cameras are used to yield high quality enlargements: via interpolation, not downsampling.

I agree with you basic premise, completely. People falsely assume they need high resolution cameras when they don't. And small files can be processed (carefully) to generate big prints that look great. Your test methods are just backwards.

— Posted by Ted Turner

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156. November  
22nd,  
2006  
10:26 am

Let the truth be told. my first DSLR was the fuji S1 then on to the D1h,D1x,D70,Fuji S3,D2h,never once has the difference in megapixels made any major difference in my imaging, a tiff file from a Fuji S1 has brought about some wonderfuj 16x20 prints. it was the best thing going when it was new but for some reason they become junk all of a sudden when something else comes out. I read forums where people calling the D70 a piece of junk now, it was the hottest think going until the D200 was announced, and as far as i am concerned the D200 has had more problems in it's short life time than the D70 has had over its whole life span.

Pixel quality is the key but the operator has to unlock the door to creating the optimal image. i know people shooting with the D50 and D70 that shoot circles around high-end Dslr users

— Posted by norman brown

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157. November  
22nd,  
2006  
10:26 am

But the 13MP are interpolated from a Bayerpattern of 3.2 red MP, 3.2 green MP and 6.4 green MP.

Getting from there to a 5MP image will of course lead to a lot better Quality as

You will get from 1.2/1.2/2.4 MP of a 5MP Cam  
The result of Your Test may be, that the upsizing in interpolation used at Bayerpatterns is nonsense.  
But the conclusion that a 5MP Camera is as good as 13MP is not proved because a recised 5MP Image of a 13MP Cam is much better then one direct from 5MP cam.

— Posted by Steffen

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158. November  
22nd,  
2006  
10:28 am

I'm surprised you don't show us the images David - at least a small detail of each, so we can see exactly what you talking about. I take your word for it, but seeing is believing, and this, after all, the age of the internet... you could post enlarged portions several parts of each image so we can actually compare for ourselves.

The other comment I would make is, the pretext of your article is misleading. It article needs to have some statement to qualify it's purpose up front - perhaps say something like "for the purposes of shooting 5x7 glossy prints of your vacation, there's no discernible difference." There are good reasons for buying hi-resolution cameras, and one I can think of is that having all those extra pixels gives you the ability to enlarge and crop in on finer detail - that is "down-rezzing by enlarging." For scientific or forensic purposes, to name a couple, high resolution makes a difference.

— Posted by Gordon

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159. November  
22nd,  
2006  
10:32 am

A teacher of mine actually studied several printers at various resolution printing. In reality megapixels do matter, up to a certain point. Most printing will start to show quality degradation at about 150-200 dpi, but going with double quality print has become somewhat of a de facto standard for a 'safe' quality print (e.g. same theory with cd sound 44.1 khz vs human limit on hearing at 20khz).

5 MP is usually relatively safe amount for most consumers, after that it mainly depends on CCD and Lens quality.

— Posted by David

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160. November  
22nd,  
2006  
10:34 am

Actually, the real reason why MP doesn't matter is that there are physical limitations, basically, the light received through your optics is not punctual, there is a diffraction kernel involved, and this results into the light being a small disk, and you can compute the size of that disk for the average camera optics, and then you take the size of the average sensors used in the cameras, and you see how many pixels you can put such that the diffraction disk only cross say 2-3 pixels, and the results are that for the average camera, having more than 6-7 MP doesn't add any detail to the final picture (it adds only information that is already known)

— Posted by Someone

Ultimately, your point is not related to the 'work' one wants to perform on a database of information. Your arguments in the comparison assume the viewer as passive viewer of a scene. You take an expert and show they can't really tell, but you make the tell tale part of resolution inaccessible, which compromises your point.

thanks,

Doyle

— Posted by Doyle Saylor

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162. November  
22nd,  
2006  
10:35 am

I distribute my photos via the online sites and have little need for high res. My digital cameras are less than 3 mp and do just fine for that purpose.

However I do have a lot of experience (17,000+) in scanning old family slides and photos using an old HP S20 scanner and using PhotoShop to crop, adjust color, brightness and contrast. What I saw in this process was that unsharp mask works better on higher res scans. Any real geeks out there that confirm MP helps with sharpening?

— Posted by DILBERT DOGBERT

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163. November  
22nd,  
2006  
10:39 am

So the printing source doesn't need to be very high when you have a good calibrated printer. Good to know. More megapixels means you can crop and throw extras away, of course. But you started with an identical source picture, so the result tests how well your software downrezzed. Instead take a landscape shot using the same camera at all the resolutions it offers, low to high (like the Rebel). Same optics, etc, just a difference is saved pixels. Then I'll buy in a little, although I'm still using the larger size for my crops.

— Posted by David Watson

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164. November  
22nd,  
2006  
10:41 am

I wonder if the results would have been different if printed on a consumer printer or handled by a non-professional lab— you cannot entirely debunk the calculations if you are introducing a new variable. The professional lab may have employed resizing softwares that are not available to most digital camera users.

— Posted by NebulaGuava

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165. November  
22nd,  
2006  
10:41 am

I've written a program called Imatest that measures digital camera quality and perceived print sharpness. It's described on <http://www.imatest.com>. Though I wrote it so photographers could settle issues like this, it has been widely adopted throughout the imaging industry.

Imatest includes a measurement called Subjective Quality Factor (SQF), that uses the contrast sensitivity of the human eye to predict how sharp a print of a given size will look. See <http://www.imatest.com/docs/sqf.html>. Though SQF is unfamiliar to most photographers, it has been used for years in Popular Photography's lens tests. With Imatest you can measure it in your own camera.

The bottom line is that Dave is essentially right. More megapixels doesn't necessarily result in sharper prints: sharpness is affected by a large number of factors, including lens quality and settings, camera shake, and digital sharpening (which can make a BIG difference). There are good reasons to get a DSLR with a high megapixel count if you are an exacting artist and need to print large, but too many megapixels can worsen the quality of small cameras because small pixels are noisy (fewer photons) and have limited dynamic range. At last year's PMA trade show, National Geographic photographer Bruce Dale (<http://www.bruceale.com/>) showed me some beautiful 8x10 prints made from a 2-megapixel digital camera. He thinks the megapixel race is ridiculous—it's all about hype and marketing. I concur.

— Posted by Norman Koren

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166. November  
22nd,  
2006  
[10:42 am](#)

"I wanted to ISOLATE the megapixels as the SOLE difference."

But you can't. Virtually all higher MP cameras do have better optics, better sensors, better codecs (RAW->jpeg processing) ..... You did not conduct a real-world test!

And a test with different cameras would not be meaningless since it would tell the average consumer that is it OK to buy a camera with fewer MP.

Another way to look at your test: If you did a test with a 3 MP master, upsampled to 13 MP one would be testing the algorithm NOT the differences between shots made at 3 and 13MP resolutions. (There are some very good algorithms/products that do this, but we won't talk about that today. 😊)

Val

— Posted by Val

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167. November  
22nd,  
2006  
[10:49 am](#)

I think the test you does not make much sense. When you are comparing digital information, you have to look at it in digital form and not make it analog first.

What you did now is comparable with saying: people cannot hear the difference between a SACD and a normal CD, because I put examples of both on a cassette tape and no one could tell which was which.

— Posted by Paul

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168. November  
22nd,  
2006  
[10:50 am](#)

This reminds me of an article I read in Computerworld last week, called "The Myth of Maximum Megapixels."

<http://www.computerworld.com/action/article.do?command=viewArticleBasic&articleId=9005180>

— Posted by Michael Ryan

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169. November  
22nd,  
2006  
10:52 am

Re #52:

Dave, how about starting with a 13MP image — then, instead of resizing it down to 8MP and 5MP, respectively, CROP it down to those sizes. Then (1) print all three images, and (2) trim down the resulting prints so that all three show exactly the same portion of the original image (which will, of necessity, correspond to the portion of the image covered by the 5MP crop). That way, there's no issue of interpolation or of the algorithms used to resize, and it eliminates the issue you mention in #52 about different glass and different electronics.

— Posted by Mitch

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170. November  
22nd,  
2006  
10:52 am

Um, I rarely print full-frames anymore. I frequently crop, change aspect ratios (e.g. 4:3 to 3:4) and rotate. All of these burn up usable resolution.

All you're confirming is that I have more space to work with before people notice that I've cropped significantly. Before I tried not to cut more than 33%, but with these results, I might be able to go to 40-50% crops and not have complaints 😊

— Posted by Christopher

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171. November  
22nd,  
2006  
10:54 am

Interesting test! I am interested in your methodology. You wrote: *We blew up a photograph to 16 x 24 inches at a professional photo lab. One print had 13-megapixel resolution; one had 8; the third had 5. Same exact photo, down-rezzed twice, all three printed at the same poster size.* Does this mean you took a photo at 13, then used something like Photoshop to get the other two lower-resolution photos? That is neither the same as shooting with different resolution cameras, nor shooting with the same camera at different resolutions. I think you also need to test those differences to be fair. From my experience with digital cameras over the past 10 years, I am guessing the differences can be spotted easily.

Keep up the good work, and I'm looking forward to your show.

Jay

— Posted by Jay Melton

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172. November  
22nd,  
2006  
10:54 am

Bigger megapixel counts aren't a waste of money, they give you more flexibility in digital terms, such as cropping to keep the same area as you'd have had pre-cropping with a lower MP camera. Not everyone prints remember.... a huge number of people simply show prints on screen/on line.

I'm not a mega pixel fan boy BTW, i shoot happily with a 6MP Konica Minolta Dynax 7D.

— Posted by Craig A Clark

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173. November  
22nd,  
2006  
10:55 am

A good reason for more MP is to be able to crop out of the larger picture, a smaller one.

Other than that, my experiences match the others... even my old 3.3MP camera created great 8×10s.

Thanks for this.

David

— Posted by David Smith

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174. November  
22nd,  
2006  
11:00 am

One reason that a 13 megapixel print and a 5 megapixel print looks about the same is that a 13 megapixel sensor really only resolves about 3.25 megapixels worth of information. There are two factors that lead to this. The Bayer pattern of the sensor where groups of four receptor sites with 2 green "pixels" and 1 red and 1 blue "pixel" are mathematically combined to make up four full color pixels means that the green component has about one half the rated resolution, and the red and blue component has about one quarter. There is also an anti-aliasing filter that reduces the resolution so that high frequency black and white information is not falsely interpreted as color. This filter cuts the horizontal and vertical resolution in about half. Each of these factors means that the 13 megapixel image has been reduced to about 3.25 megapixels and re-interpolated to 13 megapixels before being recorded.

A fairer test would be to make a 4 and a 1 megapixel print from a 13 megapixel camera.

The limiting factor with any camera over about 6 megapixels is the photographer. Unless the camera is on a tripod, camera movement is a much bigger factor than anything else.

— Posted by hugh crawford

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175. November  
22nd,  
2006  
11:02 am

Your test is seriously flawed. There is a huge difference when it comes to megapixels when it comes to enlarging images. Take a picture of an object with a 3 Mp camera and 5 mp camera then blow that image up and you'll see a big difference. Bottom line, Megapixels do matter.

— Posted by Anon

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176. November  
22nd,  
2006  
11:03 am

Right on (for the most part)!!! I'm a professional photographer and I HATE the

fact that every time a new camera comes out it has more pixels. I will say that I don't agree completely though. For a portrait of a person you're not going to see much difference but when you're talking about a large group shot where you want more detail in the faces then the extra resolution can help. If you want to thoroughly revisit this test I'd suggest not having one photograph but multiple photographs with different subject matter. I'd suggest...

- 1) A landscape
- 2) A still life in controlled lighting
- 3) A portrait (head and shoulders, relatively close)
- 4) A group shot with 20 or more people
- 5) A high ISO noisy image (you can not downres for this test... the setup and procedure is a little more complex)

6 megapixels is certainly MORE than sufficient for your standard point and shoot. Professionals can benefit from having more in certain situations but as a professional I can tell you that 95% of the time I don't need more than 8 megapixels provided the camera in question doesn't have a super aggressive anti-aliasing filter.

To clear up a few myths many people think that doubling the pixel count doubles the resolution and it does not. Doubling the pixel count increases the image size by 25%. In other words, 3 megapixels to 6 megapixels is only increasing image size by 25%. If you want to double the image size you'd have to go from 3 megapixels to 12 megapixels.

Personally instead of this giant megapixel war I'd rather see manufacturers focus on producing sensors with a higher dynamic range and lower noise floor. I'd GLADLY take a 6 megapixel camera over a 12 megapixel camera if it provided a 1 or more stop advantage in terms of noise and dynamic range.

One final note and this is regarding noise. Let's say you had two sensors, one is 5 megapixels and another is 12 megapixels. Both sensor when measured for noise when zoomed in at 100% have identical noise characteristics. Which camera has the advantage? The 12 megapixel camera in this case will have an advantage. The reason is due to the fact that noise tends to be masked when an image is downrezed so although when viewed at 100% the noise will look the same, when you actually go to make prints the higher resolution camera will display a print with less noise (again, this test can not be accomplished by downrezzing the files, the setup is a little more complex and needs to be more tightly controlled seeing as there are no two cameras with different sensor sizes that have the same noise specs).

Cheers, Joe

Symphony Photography

— Posted by Symphony Photography

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177. November  
22nd,  
2006  
11:05 am

Thanks for the test even with some of the supposed warts and wrinkles. For the vast unwashed and mostly washed masses a camera above five megapixels is a huge waste.

I currently own a Canon S110 Digielp with a 2.1 mp rating. It has served me well for a couple years, but I'm replacing/upgrading for the following reasons - none pixel related:

Size: It was small for it's time but I'm ready to move on to something thinner...

Startup Time- Takes too long to get the camera powered up and take the first photo....which causes some missed shots.

I don't really need the extra pixels I'll get on the new models except perhaps for some cropping capabilities. I'm pretty sure the startup to first shot times on

most newer models is hugely better than my 110. I'm leaning towards an updated Canon model or maybe one of the slim Sony ones.

What are the feelings in this group of interested individuals on point and shoot cameras which have to motor out the optics versus something like the slim Sony DSC T-7 which has fixed optics?

Enjoy.

— Posted by timtimes

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178. November  
22nd,  
2006  
11:07 am

My problem with this whole exercise is that it's completely unscientific; as others have pointed out, there are holes in your methodology.

And it's going to put on TV and represented as "the truth". Nice.

— Posted by Richard Vandenberg

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179. November  
22nd,  
2006  
11:09 am

This is totally true, and something I have argued for three to four years (it's about time that the world catch up). There are a number of reasons that this is true.

First of all, the DPI doesn't tell you squat about how you will print a picture. What is more important is LPI (Lines Per Inch). For more info, go to [scantips.com](http://scantips.com) where the author gives a ton of info about this and other topics in discussing scanning. The basics of it is that a single pixel from a picture will NOT be a single dot of color on the picture, rather it will be a small grid of dots that make up a color. Although a printer may print 300 DPI, chances are that it is under 100 LPI, which is the value that should really be cared about.

What brought me to the conclusion that high resolution doesn't matter is when I used my first 3.2 megapixel digital camera when they first came out. As an experiment, I printed out a shot on my Epson photo printer at full page 8x10 resolution and I could NOT see a single pixel. It looked as good to me as a photograph. I realized that if a 3.2 megapixel camera could look so good as a print on 8x10 photo paper, that there was no point in going higher resolution, because my eyes can't tell the difference. I'm not a professional photo person, but I am a professional computer person, and I have always been able to pick out the printed pics before.

— Posted by Matt

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180. November  
22nd,  
2006  
11:17 am

Why is it that everyone assumes the Megapixels have to do with image SIZE and RESOLUTION? Similar to human eyes, the more sensors a camera CCD has, the more ACCURATE a picture it will take. Number of MEGAPIXELS on a camera does not indicate image size or resolution, it indicates how many sensors (cones) the camera has. Each sensor (each pixel) obtains one channel of color, and then the chipset inside the camera breaks down the information and re-assembles it as a photograph. (The slower the chipset, the slower your camera will take photos.) Think of a pixel like a color Cone inside the human eye. THE more of them we have, the more accurate the colors and the contrasts,

and the hues, and the tints will be. The biggest difference when viewing photos of different megapixel photography is the contrast.

It's not really fair to compare a camera of 13mp to a camera of 5mp in just viewing the photos alone. You need to compare the photos to the actual subject taken. First you could compare the 5mp photo to the scene, and then you could compare the 13mb photo to the scene, and see how they differ. The 13 megapixel camera most likely takes a much more accurate picture in terms of shadow, contrast etc.

These are not things that you would notice while you're comparing the photos to each other.

— Posted by Sebastian Speier

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181. November  
22nd,  
2006  
[11:21 am](#)

Yup, I could have told you that too. The apparent look of a blow up depends to a very large extent on the initial sharpness which is affected by both camera shake and by subject motion. Also by focus and by proper exposure.

10 million pixels are not going to look better than 5 million unless you have:

1. locked the camera down to a tripod
2. properly focused
3. properly exposed
4. using very good "glass" i.e. lenses

It's no different than the old saying, "It's not the size of your boat, it's how you sail it."

— Posted by Steve DiBartolomeo

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182. November  
22nd,  
2006  
[11:23 am](#)

Try the Nikon D2Xs. It allows for a high speed in camera crop mode that is I believe is 6MP vs. its native 12MP. It would allow for the same image to be shot from the same camera, lens & sensor. Then simply compare the resultant large prints. There will be a difference. It may be small and insignificant for smaller prints, but it is there. It is also important to be sure that the lab processing your images does not resample the image or otherwise negate your findings. Many of the mini-labs convert images using software that could have skewed your results. As others have mentioned there are many other items such as lens quality and the camera firmware/software that have a large impact on image quality. Stating that megapixel count is irrelevant misleads many who don't fully understand the issue, just as those who claim it is all about the sensor resolution.

— Posted by Brian

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183. November  
22nd,  
2006  
[11:24 am](#)

Steve is right, when you downsample a picture from 13mp to 5mp, in the 5mp there's actually information of the 13mp one, this is because the downsampling algorithm don't simple discards the extras pixels, it actually use all the 13 mp of information to make de 5mp one (this is, for example, the bicubic algorithm in photoshop).

And David, you are also right that making a test that isolate the megapixels is

very difficult because of other differences between cameras, but this method isn't the right one.

Megapixels IS the more important thing when talking about the quality of a digital picture like the megahertz IS the more important thing when talking about the speed of a processor. The problem is that people started to give too much importance to these things and forgot of other metrics of quality like lenses, color, dynamic range, sensor size, etc.

And the most common mistake when talking about megapixels is referring to the megapixels of the photo and not to the megapixels of the camera sensor (what you did here), this because, for example, I can sell a camera that takes 10 megapixel pictures and has a 3 megapixel sensor and I to do this I only enlarge the photo to 10 megapixels after taking it.

For all this you have to remember that the megapixels that matters are the ones of the sensor and not the ones from the picture. And you are right that there are other things that are very important in a camera, for example it is even possible that a camera with a sensor with more megapixels take a worse picture than a camera with less (for example in low-light).

The resolution of a digital picture is actually a very complex issue and this simple test didn't solve it. For example, a camera with a 13 megapixel sensor, actually takes pictures with 4.33 megapixels (this because you have to use those 10 megapixels for the 3 colors RGB), so when you downsampled it you have a 5 megapixel photo but this 5 megapixel photo is different to a 5 megapixel photo directly taken from a camera in that the directly taken photo will have only 1.66 megapixels. So that's the real test that 1.66 photo with the 4.33 one.

— Posted by Eugenio

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184. November  
22nd,  
2006  
11:25 am

Here's an important consideration: the effective resolution of a standard photographic print is only 150dpi, or 300ppi. So to get a decent 4x6 print, you only need a 1200x1800 pixel image, or about 2MP. See [http://www.design215.com/toolbox/print\\_guide.php](http://www.design215.com/toolbox/print_guide.php) for the background on the difference between ppi and dpi, and how 300ppi becomes 150dpi.

— Posted by Rick Innis

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185. November  
22nd,  
2006  
11:30 am

Mr. Pogue,

Sorry to crash all the time and money you and the Discovery channel put into this test, but your test doesn't compare what you meant to compare. Your intention was to test the MP count for digital cameras but instead you tested only the derezzing algorithms on your photo software. The test convincingly proves that derezzing algorithms are great at taking 13MP of data and compressing it down to 8 or 5MP.

Hopefully there's still time for you to run a test comparing \*camera capture size\* and not \*file size\* before February. Otherwise you and Discovery face the unenviable decision of choosing whether to scrap the story or to damage your reputations by knowingly misleading your viewers with a test you've learned is invalid.

Your objective is worthwhile — consumers need to know whether there's a difference or whether it's just manipulative marketing. The test just needs to compare what it purports to compare.

The best way to test camera capture size would be to find a camera manufacturer that has camera models identical except for MP count. I suspect many of them use a common platform chassis.

P.S. Please let us know what Discovery says: I'm curious to know if they'll be grateful or upset that you gave people opportunity to expose it as invalid.

— Posted by Matt Evans

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186. November  
22nd,  
2006  
11:33 am

Please tell Canon, Pentax, Panasonic and all of them to actually build/use quality sensor instead of running a Megapixel race.

— Posted by Daniel

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187. November  
22nd,  
2006  
11:34 am

David,

I agree with your tests 100%.

I performed similar tests about a year ago with a 3megapixels camera with 8" x 10" photos and 4" x 6" photos. People were a little incredulous but they knew the methods used were irreproachable so they did not argue with the results.

Ultimately I think the real differences between 2 cameras will be things like the quality of the lens, the iso sensitivity...and the likes.

Cheers!

— Posted by martin rancourt

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188. November  
22nd,  
2006  
11:40 am

Downsampling an image from 13mp to 5mp is the problem. when you downsample an image there will be no differentiation between the 3 images.

So, in short, Pogue's test is not valid.

I can tell the difference between a 2mp and 6mp image. I'm a professional photographer.

Also, the main reason the jpeg format is used is since the image from the camera comes out soft to begin with and the compression from the jpeg format sharpens the image overall.

also, using a RAW image format that I use on my Nikon D70 is the only way to go. and people can tell the difference between my images and their jpegs from their lower mp cameras.

Sorry, David, nice try.

— Posted by Joel

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189. November  
22nd,  
2006  
11:41 am

The printing process must also be verified here. Most color printers i have

worked with print color by some form of dithering of the various pure colors. As a result, a 300dpi image doesn't have as much detail as a 300dpi digital photo that contains RGB data for each pixel and color from one pixel mostly doesn't bleed into neighboring ones.

In addition, there is nothing in the article that mentions what format the photos were in before or after the resolution adjustments. Were they saved in JPEG format or a lossless TIFF or RAW format.

All that has been shown here is that there is one unidentified 13MP camera whose images are indistinguishable from the originals when down-sampled and printed on an unidentified poster-size printer.

I generally think that there are many cameras whose megapixel rating is above and beyond the capabilities of its optics and/or CCD. As a result, this photo may have had no more data than a 3MP image, it just saved every pixel 4 times.

Alternatively, the printer may not have been able to show more detail than the smallest file. It wouldn't be hard for Mr. Pogue to post the 3 files, or even crop the same area from each photo for easy comparison on each of our computer displays.

— Posted by Jacob Williams

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190. November  
22nd,  
2006  
[11:41 am](#)

What seems to be missing...

The test is very interesting and the results tell me to hang on to my older digital camera. But I would like to know what software was used to blow up the images before printing. Perhaps it was just the printer driver, or perhaps the pictures were resized in photoshop. Nonetheless, somewhere in the process some software took the low resolution images and interpolated to fill in information between the sparse pixels. Then the image was printed. Now if my software or printer driver isn't as good at this as yours, then my low res images won't print as well as yours did.

— Posted by Omniboss

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191. November  
22nd,  
2006  
[11:41 am](#)

The article indeed ignores some aspects of digital photography. The nice thing about it that you are able to crop/process the image however you want before printing it or while watching the photos on the monitor.

Most of the time I watch my photos on the monitor I like to zoom in to the points of interest. On lower resolution images you cannot do that.

Furthermore, before printing I review all the photos and crop them. Sometimes I remove the 2/3 of the image and print only the rest. It cannot be done with low resolution either.

The statements of the article is relevant only for the lame (or lazy) users who cannot (or don't want to) do anything else with a photo but send them as they are to the photo lab (or the printer).

— Posted by Peter V

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192. November  
22nd,  
2006  
[11:45 am](#)

I totally agree with the many experts who debunk the megapixel myth however

your experiment is flawed and essentially invalid for your argument.

You simply cannot de-rez a 13mp image in Photoshop down to 5mp and expect the results will be equivalent to taking the same photo with a 5mp camera.

I would expect a "tech writer" to know better.

— Posted by Bob

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193. November  
22nd,  
2006  
11:48 am

This is why I love my d50. It fit at the perfect price point, worked with all of my lenses, and gives me enough megapixels (6 or so) to make prints that I can sell in local galleries.

— Posted by Chris

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194. November  
22nd,  
2006  
11:55 am

I've been a graphic designer for years and can tell you there is no difference. A 3.2mp camera can produce a image at 8x10. Unless you blowing up images to 16x20 or 24x36 you'll never need or use anymore than 5mp. Ever.

— Posted by Jay-Michael

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195. November  
22nd,  
2006  
11:56 am

To make this a fair test, take the 13Mp camera, if it has a zoom lens, then at the mid point of the range, say 40-50mm. Have good lighting to ensure f8 or better and a shutter of 1/250 or better.

Then take a photo of a complex scene at, say, 15 metres. Move back so that the original scene occupies 2/3 (=5.6Mp) of the width of the original and take picture, and further back so that it occupies 1/2 (=3Mp) the width of the original, take the picture again.

Then crop the latter images to match the original 13Mp image and you will a true comparison. Do not adjust the resolution in photoshop, and then print either the full image or a representative sample crop to the size you want.

Then see what you get....

— Posted by Dave Brunner

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196. November  
22nd,  
2006  
11:58 am

Surely this 'test' is completely flawed, what you have 'proved' is that a 13 megapixel camera can produce a perfectly acceptable 5 megapixel print - now try it in reverse.

— Posted by Rob

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197. November

22nd,  
2006  
11:58 am

It's been alluded to in prior posts, but much depends on the output device (here, your photo lab's printer). There is a maximum amount of information it will output per square inch, and it's probably quite a bit less than the 300 pixel-per-inch number that gets thrown around so often. So, you may see a big difference between a 2MP shot and a 4MP shot on a particular printer, but not much difference comparing a 4MP shot with an 8MP one on the same device.

Also, by my math, the 13MP, 8MP and 5MP pictures printed at about 189 ppi, 148 ppi and 118 ppi. Closer than you'd think. Particularly with a relatively "soft" photo (few hard edges, etc.), the difference can be tough to spot. Conclusion: you need A LOT more "megapixels" before you see an appreciable increase in effective ppi.

— Posted by joe

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198. November  
22nd,  
2006  
12:00 pm

In #52, you say you want to ISOLATE the megapixels as the SOLE difference. But you can't do that, because no one sells just the sensor; you have to buy the whole camera.

You've demonstrated nothing more than that down-rezzed pics from the same original file will print reasonably well. There is no other way to put this; the test you've done only shows that, and nothing more.

There are no 13MP cameras sold other than two DSLRs. The only 5MP cameras sold are point-and-shoots. Your tests show nothing about the choices consumers face. Saying that 5MP cameras will produce images comparable to 13MP cameras is ridiculous; there are so many technical differences between currently marketed 13MP and 5MP cameras that there's just no direct comparison possible.

To demonstrate this, I propose a test: let's go to the top of the Eiffel Tower in Las Vegas; you bring your 13MP camera, and I'll bring my two 5MP cameras, and we'll shoot the nighttime Strip. Then, you can have the resulting images printed at the same place you had the prints for your test done, and we'll hang them up and ask people on the street to compare them. Are you game?

Bill

— Posted by Bill Funk

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199. November  
22nd,  
2006  
12:04 pm

If you want to isolate the megapixels as the sole difference, your test did not do that. Down-sampling an image that starts as a 13 MP image is not a true comparison of a 5 MP image vs. a 13 MP image. As I see it, there are only two ways to do a valid, or mostly valid, test.

One better, and more real world test, would be to take cameras from the same manufacturer of different megapixels, shoot the same subject, with the same lens, in RAW, then process the RAW files the same way, except for the final sizing to get the desired print size. For example, you could do this test using a Nikon D50 or D70S (6 MP), D200 or D80 (10 MP), and a D2X or D2Xs (12 MP). The sensors are not the same (obviously), but then that will be the case for any cameras with different sized (MP) sensors. Shooting in RAW you eliminate the in-camera processing, which will vary from camera to camera, even within the same brand.

If this is not good enough for you, then do your test using a Nikon D2X, which has the unique feature of allowing you to shoot with all of the sensor at 12 MP,

or only a portion of the sensor at about 6.8 MP. Same sensor, using a different number of pixels. Use the same lens at the same camera and lens settings. However, you will have to adjust your camera position to provide the same framing of the image since in 6.8 MP mode the camera is cropping the image (thus, the only variable in this test, other than MP, will be the distance to the subject, which may implicate the quality of the lens to a slight degree as lenses can perform differently at different focus distances, so shoot stopped down to f:8 to f:11 to minimize any possible optical quality differences). Process the images the same (in this case shooting RAW would not necessarily be required since the same camera is doing the processing), then print the same image to the desired size.

If you want to see what, if any, differences there are in MP alone, these are the only ways I can think of to do the test with any validity.

— Posted by Mark Van Bergh

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200. November  
22nd,  
2006  
12:05 pm

So what is the advantage of a dSLR? I mean for 99% of people who are NOT professionals?

My use of a camera is for reminding myself of the good times I had with my grandchildren.

— Posted by Murray

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201. November  
22nd,  
2006  
12:10 pm

So you scaled down the resolution on the 13MP, 8MP and 5MP camera to be of all equal resolution. You then printed the photos of equal resolution from different cameras and expected there to be a visual difference? Why when you removed information from the 13MP and 8MP photos?

This "test" is seriously flawed. You need to have all of the photos printed at the cameras native resolutions to compare.

You removed any advantage a 13MP or 8MP camera has over a 5MP when you scaled the pictures down to be equal to one another.

Try again without scaling the images down. Leave them in their native resolution. I don't understand how you considered this a test? A test of what interpolation with a better source?

This test doesn't prove anything... besides that images set to the same resolution look about the same. Imagine that! 1=1! BRILLIANT!

— Posted by David B.

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202. November  
22nd,  
2006  
12:12 pm

This so called "test" has no worthy results. Using algorithms to change resolutions, not knowing the effects of the printer on downrezzing, and not using three different resolution cameras, is bullshit. This would not be accepted in a high school science class.

— Posted by Dave

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204. November  
22nd,  
2006  
12:16 pm

If your pictures were of a baby as pictured, I think it would be very difficult to notice a difference. A baby is a very plain subject. Try taking a picture of something which you would actually want a large picture of, something with detail, and the number of pixels will matter.

I have done the same test and received similar results. If you have a plain subject, you can have a very small dpi. But if you have something besides a plain, consistently lit subject you will see a difference. For example, in my tests of a crowd you couldn't go lower than 180dpi without seeing horrible artifacts. But your point is made: all of your pictures are at 180dpi or above. For most people, who don't take pictures that need to be poster sized, you don't need the high resolution cameras. However, there are plenty of people with less than 5MP cameras that could use an upgrade.

— Posted by Eric

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205. November  
22nd,  
2006  
12:18 pm

I agree that for most people, the megapixels are an essentially worthless standard for comparison of cameras (once they are over 3-5 megapixels), however for a photography enthusiast, there are some things to consider that haven't been elaborated above.

Decreasing the resolution of a large photograph without lots of very sharp lines will not show up noticeably in prints. There are two things that will certainly affect this that I don't believe have been mentioned. The first is sharp edges, especially closely spaced ones. A small image which includes a grating will display moire, and if it contains text or any complex details close to the resolution, they will blur significantly. This is an effect that will be noticed no matter what the source of the image.

The second effect is based on the sensor, and will compound the previous point. image sensors on (single CCD) cameras do not collect red green and blue information for each pixel, each pixel captures data for only one color and the surrounding pixels are used to estimate the true color. This effect tends to blur sharp lines by a pixel or so, which is not very noticeable at high resolution, but is more noticeable at lower resolutions. This effect is only seen in images taken at the maximum resolution on a camera, which means that if you have a 5 megapixel camera, but shoot at 3 megapixels, your image will be sharper and will contain more detail than a camera shooting at its native 3 megapixels.

I strongly agree that for almost all camera purchases, there are other much more important features to look at, which have been mentioned extensively above, however a more extensive (and expensive) test would show small but noticeable differences in the prints.

— Posted by Cody

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206. November  
22nd,  
2006  
12:24 pm

This comparison is fatally flawed. They used ONE 13 megapixel image for all three prints. ONE image from ONE camera, run through a professional lab...presumably using a RIP on resampled versions of the SAME image. Of course it looked the same - IT WAS THE SAME IMAGE. If you want to see the

difference take frames of the same scene using different cameras. This is just more ignorant rantings by the NYT's, and I find it personally insulting of everyone's intelligence. David Pogue seems to be incredibly lazy to boot. Think about...he is a reporter, but does he quote any knowledgeable photo experts...nope. Does he get off his lazy ass and talk to the photog's at the newspaper...nope. He just assumes he knows what the hell he is talking about, and contrives a BS experiment that proves nothing...other than his stupidity.

— Posted by jim

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207. November  
22nd,  
2006  
12:34 pm

Interesting article but ideally you would need to use the same camera with different sensors to get a true comparison. Cropping is a major concern. There is no substitute for pixels when all other things are equal. You can't create real pixels from a low-res image but you can certainly remove some from a hi-res image if needed.

— Posted by Adisharr

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208. November  
22nd,  
2006  
12:41 pm

David,

Megapixels do matter. The larger the print the more pixels you need to maintain the image quality captured by the camera. Try blowing those photos up to 48" wide and any moron on the street will see the difference between images. If megapixels don't matter just grab any well taken photo off the web (240x320) and print it on a large format printer like an Epson 9600.

Megapixels do matter if your professional.

— Posted by James Saldana

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209. November  
22nd,  
2006  
12:46 pm

Re Dave Baldo's comment: "Lens quality helps, and the larger image sensors in digital SLRs create more photo-authentic images (with better depth of field), and so on." :

Actually, I believe smaller sensors have inherently better depth of field.

— Posted by Ned

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210. November  
22nd,  
2006  
12:47 pm

I've been advising people for a long time that the features and the budget considerations of the camera are more important than the megapixel count. As the local IT person in my office, I really emphasize "go to the store and try the camera, make sure it feels good and has the features you want", the megapixels pretty much take care of themselves with current technology.

— Posted by Ted Sali

generation of bad photos, part of the problem is the manufacturers need to keep the price propped up and they believe us gullible enough to go with their plan and for the most part it seems that we are. Come on Canon, Nikon etc lets see some real innovation

— Posted by Ross Murphy

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212. November  
22nd,  
2006  
12:57 pm

There is a time when having that 13 MP camera will help: when you're unable to tightly frame your subject, and you need to crop out a significant portion of the frame.

Chris B.

— Posted by Chris B

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213. November  
22nd,  
2006  
1:00 pm

Hey guys,

Well, first a few comments:

- a) most people can't see more than 150 dpi at a distance of a meter or so, so anything past that is wasted on most people
- b) the limiting factor in the ability to "see" digital problems in prints is not in the MPs themselves, but in how they relate to the JPEG compression artifacts. JPEG uses 8x8 blocks, so you'll see distortions on 8x8 block boundaries.

So, if you use high quality JPEGs for all three, you probably won't notice a difference (however, you'll still notice banding and compression artifacts if you have a keen eye).

Another interesting test would be to repeat the same test using RAW mode on a few high end cameras. That way you can take the JPEG out of the equation. In theory, more MPs means you can resolve more sharp edges, however, most portraits don't really have a lot of sharp edges in them.

— Duane

[www.duanestorey.com](http://www.duanestorey.com)

— Posted by Duane

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214. November  
22nd,  
2006  
1:09 pm

#52 wrote: "But that test, alas, would be meaningless. It would be fuddled by the lenses, electronics, light sensitivity, etc.

I wanted to ISOLATE the megapixels as the SOLE difference."

Tough cookies. What you claim to test is not what you tested, and what you tested has no bearing on what you claimed. You certainly didn't isolate the megapixels of the camera; you might have tried 2 SLRs in the same family, one that does 5 one that does 10 one that does 8. Like the EOS digital rebel (6.n), digital rebel XT (8) and digital rebel XTi (10.n) [which frankly I don't even know if they are SLRs]. Then keep the same lens between them.

I'm writing an (or implementing a well known) image resizing function right now. There's a bunch of different ways to scale the pixels, Hermite, Triangle, Bell, B-Spline, Mitchel, Lanczos etc. They all use the existing information of the

neighboring pixels to make a nice quality smaller image. The fact that sizing a 10mp to 5mp then printing it at Xmp looks about the same as taking that same 10mp and printing it at Xmp has more to do with the perceptual qualities of the sizing filter than the reality of the difference between having 10 or 5 mp; this is especially true if X

— Posted by Daniel

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215. November  
22nd,  
2006  
1:18 pm

This really should be easy. Let the sensor size and quality be given. Then all else equal, the more pixels the more signal, but the more noise. The less pixels the less signal, but the less noise. There should be some optimal number of pixels given the sensor size and quality such that any deviation from that number of pixels will lead to a degradation of the signal to noise ratio (any deviation in either direction).

— Posted by Jack

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216. November  
22nd,  
2006  
1:20 pm

Given the test, I'm not surprised at the results.

However, the test is seriously flawed, especially for figuring out whether or not megapixels matter. It is just technically inaccurate for so many reasons, it's almost painful to read. Taking three differently sized pictures, downsampling two of them to equal the size of the smallest, and then printing them (with the quality of printing in question) is NOT how you test whether or not megapixels matter, and CERTAINLY not how one does one's level best to isolate ONLY megapixels as a differential factor.

If you seriously want to prove something, here, you'd set up a single tripod, and use three cameras with everything (including brand name) identical EXCEPT the megapixels. You'd mount the cameras on the same tripod (without moving it) pointed at the same insanely busy subject matter - say, a very busy forest path in the middle of summer-turning-into-august, or a rainforest - and snap pictures with all three. Then you'd BLOW THE OTHER TWO UP to be the same size as the largest, and THEN you'd print all three with at least 300DPI on the largest, and whatever DPI was required to get the other two to be the same size as the largest. And you'd get high-end professional printing equipment to do this.

What you'll end up with is one larger, very sharp and detailed image, and two other images that, while the same size, will start to resemble mediocre- and bad-quality MPEG video frames.

Downsampling isn't the way; upsample your smaller images if you want to see the difference between Megapixels. I think you'll find that a 13mp picture of a very complex and detailed subject (containing, say, 10,000 blades of grass or leaves) holds considerably more information, more accurately, and anything under it, and 5mp won't even carry half the data.

— Posted by Gonz

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217. November  
22nd,  
2006  
1:24 pm

A meaningless test, flawed because of the way it was carried out.

Whilst it is true to say that there isn't that much difference in final print quality between a 5mp camera and a 7 or 8mp one, there is a very big difference in quality when you jump to 10,12 or 16mp.

Lots of factors make a difference, not least sensor size and the electronics used in the camera to process the image. Try using a Canon EOS 5D 12.8 mp camera at 1600 iso then doing the same with a 12.4 mp Nikon D2X. Although both cameras have a similar size in mp the nikon image will be much 'noisier' at that iso setting.

— Posted by John Robertson

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218. November  
22nd,  
2006  
1:45 pm

I have images taken at 6MP that are blown up "Tack Sharp" to 24x36 Inches and 11x14s taken at 2MP. If you are happy with the images you are getting there is no reason to upgrade.

— Posted by Blair

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219. November  
22nd,  
2006  
1:48 pm

These pro-big-megapixel people crack me up. It is like someone buying a car that can go 250MPH. They never use it to it's fullest potential but they love bragging about it.

These camera companies will never say that 8MP is enough because they want people to constantly upgrade.

Hey, I still win awards shooting with a \$15 Polaroid instamatic camera!

— Posted by Christian

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220. November  
22nd,  
2006  
1:51 pm

I must disagree to some extent with megapixels don't matter. I do a lot of photo editing/correction in Photoshop these correction include color balance, saturation and level changes. The greatest latitude for correcting images is had by working with high resolution images captured in the RAW format. The more information (bits) contained in the original file, the more transparent any corrections will be. It's a lot like working with film negative. Higher density = more information and more ability to pull out fine details through custom printing. Low density negatives on the other hand have very little room for correction.

For the majority of snapshot takers making 4X6 prints you are correct in supposing that more megapixels don't necessarily result in better image quality.

But for those of us correcting our images in apps like Photoshop the extra information contained in higher resolution image files leaves the ability to make dramatic corrections without corresponding dramatic increase in noise.

— Posted by Marc Buckman

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221. November  
22nd,

2006  
3:01 pm

I Agree, is not only MegaPixels, in a digital camera is even important the optics and the light management. Is possible to buy a 10 MP chime-made camera, but with very poor quality due the lens, zoom and white balance.

— Posted by LeoWins

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222. November  
22nd,  
2006  
3:03 pm

This test, used a 13,8 and 5 MP pictures. Total print area was 384 sq inches. This is roughly 184, 144 and 114 dpi. I am guessing the images were up-scaled to 300 dpi before printing.

I have printed pictures at 150dpi, 200dpi and 300 dpi. I have not seen much of quality difference. Printing at 100 dpi I did observe a significant drop in image quality.

Some one mentioned earlier, that we should try printing at native resolutions..

We also need the following information to call this "test" a true test.

1. Print resolution
2. Which camera was used / lens and other specifics.

That being said, for a typical 5×7 picture (35 sq inch), a 3.15 MP camera can supply 300 dpi image. Good for all practical purposes.

— Posted by Vivek

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223. November  
22nd,  
2006  
3:09 pm

The New York Times actually pays you to write this bullshit? You obviously don't know shit about photography. You don't mention anything about what Camera/Lens is used, what format you used (e.g. JPEG, RAW), what printer the images was printed with, what DPI is used (300?), what ISO was used to take these images, etc. If you take these images with a 10 megapixel+ SLR camera with a large sensor and good lens, and compare it to a similar 5 megapixel predecessor, I can guarantee you will see a huge difference in quality at 11×14.

Bottom Line: Megapixels do matter.... but so does the size and quality of the sensor, the quality and speed of the lens, the firmware on the camera itself, and so on.

Learn a little about photography before confusing people with your bullshit journalism. Oh, and the quality of the image posted with the article is absolutely awful. Get rid of your 320×240 camera phone and get a real camera... the type of camera that real journalists use.

If I were your manager at the NYTimes, you'd be fired.

— Posted by Kyle Day

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224. November  
22nd,  
2006  
3:10 pm

The New York Times actually pays you to write this BS? You obviously don't know shit about photography. You don't mention anything about what Camera/Lens is used, what format you used (e.g. JPEG, RAW), what printer the images was printed with, what DPI is used (300?), what ISO was used to take these images, etc. If you take these images with a 10 megapixel+ SLR camera with a

large sensor and good lens, and compare it to a similar 5 megapixel predecessor, I can guarantee you will see a huge difference in quality at 11×14.

Bottom Line: Megapixels do matter.... but so does the size and quality of the sensor, the quality and speed of the lens, the firmware on the camera itself, and so on.

Learn a little about photography before confusing people with your ludicrous journalism. Oh, and the quality of the image posted with the article is absolutely awful. Get rid of your 320×240 camera phone and get a real camera... the type of camera that real journalists use.

If I were your manager at the NYTimes, you'd be fired.

— Posted by Kyle Day

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225. November  
22nd,  
2006  
3:11 pm

I think camera makers are even starting to agree with you. How else to explain the dSLR-model successors having the same number of megapixels (e.g., D40 vs. D50). Now improving ease of use and the occasionally unique feature (e.g. built-in WiFi) will be the thing

— Posted by DLF

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226. November  
22nd,  
2006  
3:15 pm

#52 replied: "...But that test, alas, would be meaningless. It would be fuddled by the lenses, electronics, light sensitivity, etc.

Agree completely with that.

"I wanted to ISOLATE the megapixels as the SOLE difference."

But you didn't.

These tests also included how the data was interpolated up or down by your use, I assume, of some version of Adobe Photoshop, as well as also how the printer/ printer driver combination re-interpolated the data up or down to make the same size prints.

And as a measure of how well the newer printers make high quality prints from varying size files, I think your test was outstanding.

If you had shot three frames with the same camera at varying distances to the subject so you were only cropping to 5mp and 8mp that would be a better megapixel to megapixel to megapixel comparison. Or varying the focal length on a zoom lens which would keep the camera to subject distance the same so perspective rendition doesn't change — but introduces the lesser variable (assuming a high quality lens was used) of lens properties.

— Posted by Ellis Vener

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227. November  
22nd,  
2006  
3:28 pm

p.s. Oops.

— Posted by Matt (again)

Now, my only comment is that the subject of the photo matters a great deal. You can get away with huge enlargements from low res cameras for many subjects; at photo shows, you can see 4 foot by 6 foot prints from 5MP consumer digicams that look great. But do this same test with a detailed landscape and I suspect you'll see the difference. Higher res cameras are only needed for highly detailed subject matter, and even then, you may have to get closer than "comfortable viewing distance" to make out the difference in detail. The existence of high res cameras is warranted; their success in the consumer marketplace is not.

— Posted by DJ

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229. November  
22nd,  
2006  
4:08 pm

It has been said before, but there is a difference between the resizing method you used for your test and actually shooting with three different cameras to create images of those resolutions.

Also, a trained professional did discern the difference—is it right to then claim that as a lucky guess?

Try this test with three cameras and a group of photographic professionals and we'll talk.

And to Brad, who was not able to take better pictures with a 6mp Leica than he was with a 2.5mp Canon—sorry, Brad, photography may not be your bag.

— Posted by James

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230. November  
22nd,  
2006  
4:13 pm

At design school I learned about the difference between printing resolutions and (digital) image resolutions. It DOES NOT take a 300 ppi image to print a foto at 300 dpi. Less than half is usually more than enough (there's a formula for this, which I forgot - I don't design for 'old media' anymore...)

This has to do with the fact that one \*pixel\* contains all color information for that pixel, but a printer can only print \*one\* color with each \*ink dot\*. So - to convey the same information your camera puts into one pixel the printer needs \*four ink dots\*! (at least - if it's a CMYK-printer. Modern ink jet printers use even more colors I believe)

— Posted by Bas

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231. November  
22nd,  
2006  
4:27 pm

Flawed comparison. There are MANY more variables to consider for quality than just megapixels:

- Lens Quality
- Sensor size (and, therefore, noise)
- Compressed output? How much compression? 8 bit per color? 10 bit 12 bit?
- Photographic technique (was the shutter speed high enough? was the camera on tripod? was mirror lock up used to minimize vibration? was the lens focused correctly? was the f-stop the right one for maximum sharpness?)

AND then:

IS YOUR LAB PRINTER REALLY CAPABLE OF PRINTING ALL THE 13 MP?  
ISN YOUR PRINTER DOWNSIZING THE RESOLUTION BEFORE PRINTING?  
IS IT CAPABLE OF REAL 300DPI?

I bet that, in this flawed test, either

a) The photo printer wasn't capable of printing real 13MP at 16x20", and/or was downsampling the photo internally before printing.

OR, MOST LIKELY:

b) The photo wasn't done with the appropriate technique and/or wasn't from a quality camera capable of producing a full 13MP where each megapixel had detail.

— Posted by Flavio

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232. November  
22nd,  
2006  
4:29 pm

The subject matters a lot. The subject was here a portrait. It is not possible to achieve perfect sharpness over a whole portrait. At small apertures diffraction will reduce sharpness, at large apertures depth of field would limit sharpness. Normally in a portrait the aim is to get at least one eye sharp. If there is a difference between 5 and 13 MPixels it should be visible in the area of critical focus, that is the eyes.

Best regards

Erik Kaffehr

— Posted by Erik Kaffehr

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233. November  
22nd,  
2006  
4:39 pm

Winner! Does this set a record for comments?

HAPPY THANKSGIVING !!

— Posted by Murray

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234. November  
22nd,  
2006  
5:05 pm

You said that you had to go to a pro photo lab to make the poster sized photos. Even though you say you got equal quality on all three photos, you must have paid a lot of money on them. You have to increase resolution depth, etc. and even on the fastest computers, that can take a great deal of time. Also, if a person had an 8 or 10 mp camera they could resized the photo without wasting time or extra money and get same quality without the hassle. Using a lower res. camera to make posters is a hassle when you can do it in less time and money with an 8mp+ camera. Or, just use a film SLR.

— Posted by k

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235. November  
22nd,  
2006  
5:44 pm

If you are printing it at 300 DPI of course there will be no difference as the

5megapixel foto is significantly higher resolution than 300 DPI. A lot of the photo printers have radically higher print quality than 300 DPI. Even home printers are capable of 1440^2 DPI. If you look at a film camera you are looking at a minimum of about 4000 dpi, and that is for what is considered very grainy 800 ASA film. I think if you printed the pictures at a very high resolution with a very high resolution printer you would absolutely see a difference. I don't know if anyone has taken a film picture of the same thing with an 800 ASA film, a 400 ASA film, a 200 ASA film, and a 100ASA film, but I can tell you in almost any picture I can tell the difference between 200ASA film and 400 ASA film. The difference between 100 ASA and 800 ASA even a layman can tell. It just looks grainy.

— Posted by Mikel

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236. November  
22nd,  
2006  
5:52 pm

This post is a discovery only for those who never been serious about photography. Anyway, well exposed sharp picture from 10M will show advantage over 5-6M camera starting from 20x30 size. It's not about MP's but about hands and skills. 😊

— Posted by Alex

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237. November  
22nd,  
2006  
6:56 pm

Your test is flawed because you used the same high res source image and simply down-sampled, which is actually different to taking a photo of the same scene with 3 different cameras with varying megapixel values.

Anyone who has used photoshop for as long as I have can tell you downsampling an image will always produce a better result than if you simply took a photo of the same scene with a lower megapixel value.

Additionally, you did not mention how the photos were printed, on what paper, and what printer. Some printers, typically those found in photo labs will make lower res photos look acceptable when printed using some sort of smoothing technique. My mum had some digital photos printed ranging from 1.3 megapixel to 5 megapixel, and I was surprised to see no difference in quality when printed. This is testament to the quality of the print lab's hardware. But when printed on her laser jet, the difference was clearly obvious.

— Posted by Mikey

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238. November  
22nd,  
2006  
7:13 pm

Everything has been said before, but I'll say it again in other words: One pixel in Photoshop (or whatever image editing software you use) contains three values: One for red, one for green, one for blue. One pixel in your camera is only one value. A 4 megapixel camera has 1 million red pixels, one million blue pixels, and 2 million green pixels, arranged in what is called the "Bayer" pattern.

So a 5 megapixel image in Photoshop still has  $5 \times 3 = 15$  megapixels in camera terms! Of course you can scale down an image from a 13 megapixel camera to 5 Photoshop megapixels and not lose much information.

However, that scaled down picture will look astonishingly better than the image you would get from a 5 megapixel camera.

In other words: The whole test is completely worthless, without reservation, and says nothing about the relative image qualities of cameras with different pixel counts.

— Posted by Mark Probst

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239. November  
22nd,  
2006  
7:52 pm

5.0 MP - (2576×1932);  
4.4 MP - (2576×1716), 3:2;  
4.0 MP - (2304×1728);  
3.2 mp - 2048 x 1536  
1.8 MP - (1552×1164)

doubling resolution requires quadrupling the number of megapixels.

8mp is not double of 4mp.

$4\sqrt{2} = 2$

$8\sqrt{2} = 2.83$ (not double of 2)

$16\sqrt{2} = 4$ (double of 2)

16mp is double of 4mp.

$100 = 10 \times 10$

$200\sqrt{2} = 14.14$  (not double of 10)

$400\sqrt{2} = 20$ (double of 10)

$400 = 20 \times 20$

MPs resolution

4mp = 2000 x 2000

8mp = 4000 x 2000(not double resolution of 4mp)

16mp = 4000 x 4000(double resolution of 4mp)

— Posted by romphotog

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240. November  
22nd,  
2006  
7:55 pm

I think it is interesting that instead of printing your posters with the full resolution of each image (10MP, 8MP, 5MP) that you chose to resize the 10MP and 8MP down to 5MP there by throwing out image data and having whatever program you used to do this guess at how to re-assemble the lower resolution image.

If you wanted a real honest and fair test you wouldn't have down sized any of the images, but instead taken them right from the cameras with no adjustment and printed them at the same poster size and then have people compare.

Your results are as invalid as your method for testing. Anyone with half a brain knows it.

Now this is not saying that your original assumption isn't correct. You don't see a lot of image detail improvement from a 5 to 8 to 10. However, they way you choose to try and show this is very flawed, just like Bush's Iraqi war plan.

The on thing that the higher resolution does give is a lot more cropping room. And, that is worth its wait in gold especially with dSLR's that are almost impossible without spending thousands on a super zoom lens to zoom in a something 500 feet away. Like an animals face at the zoo.

Robert

— Posted by Robert

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241. November  
22nd,  
2006  
8:02 pm

So many opinions. It seems the majority of people that claim the test is invalid have never made prints, because I haven't read claims that in their OWN printing they see the difference. If they have, they would have come to the same conclusion as author years ago. Are there differences between 13MP cameras and 5MP cameras? Of course. But when you factor in viewing distance and the fact that the majority of people will not walk up to a print and start looking at each pixel via a loupe and have the luxury of comparing it to the same print at a different MP density, the claim that a 5MP camera can produce quality print similar to a 13MP camera is absolutely valid.

The reality also is that most consumers will not be able to print 16x24's off their home inkjet. Most will only be able to squeeze out a nice 8x10 or 8.5x11. At those sizes I have printed 2MP, 3MP and 5MP prints. If you know what you are looking for, you can tell probably pick it out, but the truth is that for most people, they can not. So between 2 and 5 is a bit of a stretch, but under the right conditions most won't be able to tell the difference between 3 and 5 MP. This is just 8x10. I would not be surprised that a 5 MP camera prints well up to 16x24. I know people who have beautiful prints larger than movie posters using a 5 MP DSLR.

The biggest factor is not the amount of pixels but the quality of pixels. A 5MP DSLR will look significantly better than an 8MP P&S. By better I mean the overall image clarity, crispness of edge definition and color tonality.

In the end don't worry about the number of MP in your camera, worry about taking better photos. If you get so good that your work gets displayed in galleries and the prints are bigger than movie posters then yeah, get the camera with the largest number of MP's you can buy. Until then be happy that you can take twice as many pictures on your 5 MP camera on your next vacation than you can, if you had a 13 MP camera.

— Posted by George

242. November  
22nd,  
2006  
8:51 pm

Many people here are missing the point massively. If you go into a shop where some idiot tries to sell you a 7Mp camera because it will give you better shots than a 5Mp when the differences in pixel resolution make little or no difference in the outcome of the shot.

All the clowns comparing a DSLR to a consumer grade 5Mp should no better, the Mp rating of the camera is going to have little to do with the resulting image compared to the far better lenses etc (and most likly the person using the camera).

While the testing performed is little more than an endorsement and hardly subjective it does prove a point to most non experts that for most people the increased is not that significant for there needs.

— Posted by Tim

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243. November  
22nd,  
2006  
8:59 pm

I'm not sure what this "test" proves exactly. The reason the photography professor got it right was because she knows what to look for in manipulated digital images. Average joe schmoe will look at them and just say they look the same, because he has no idea what to look for. Its true for the average user, about 5 MP is good enough.

Let see the results of your test with a room full of professional photographers who shoot digital. I bet 99% get the order right.

— Posted by John Ireland

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244. November  
22nd,  
2006  
9:02 pm

Many posters have been arguing for 13Mp so that they can crop more easily. If so, then maybe they should opt for a 24Mp camera or maybe 96Mp. The point is that economics governs the choice of a camera. So if the price difference is irrelevant, and all other things are equal, then buy big. On the other hand, how many people bother to crop?

— Posted by Clinton Mah

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245. November  
22nd,  
2006  
9:38 pm

Hey Dave,

I was delighted to discover that the Times has seen the light and embraced my style of journalism.

Love,  
Bill

— Posted by bill o'reilly

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246. November  
22nd,

2006  
9:38 pm

Here is a different test done with a 8 MP and 12.8 MP DSLR camera. Same lens on a tripod (24-70mm f2.8L), just different focal length to compensate for a cropped sensor in the 8 MP camera. No sharpening or upsampling / downsampling applied. Crop from original files -you see what you get. Can you spot any difference? I think that I can.

[http://members.shaw.ca/branimir3/pogue/resolution\\_5D\\_30 D.jpg](http://members.shaw.ca/branimir3/pogue/resolution_5D_30 D.jpg)

- image on the left: 12.8 MP camera ("full frame"), lens at 70 mm f11  
- image on the right: 8 MP camera (1.6x crop), lens at 50 mm f11

Branimir  
[www.branimirphoto.ca](http://www.branimirphoto.ca)

— Posted by Branimir

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247. November  
22nd,  
2006  
9:53 pm

I would have loved to take that test, as I'm pretty sure I would have "gotten lucky," according to Pogue.

Here's another test. Take a 6MP super compact and a 6MP DSLR and see how many people can tell the difference. (Assuming the DOF is the same on both.)

[www.vancefry.com](http://www.vancefry.com)

— Posted by Vance

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248. November  
22nd,  
2006  
10:11 pm

Wowzers! Name-calling, obscenities, experts with conflicting explanations—so much heat, so little light.

Of all of these comments, I think George summarizes my opinions best:

"So many opinions. It seems the majority of people that claim the test is invalid have never made prints, because I haven't read claims that in their OWN printing they see the difference. If they have, they would have come to the same conclusion as author years ago."

So could the test have been better? Sure. As another poster wrote: "If you seriously want to prove something, here, you'd set up a single tripod, and use three cameras with everything (including brand name) identical EXCEPT the megapixels."

Correct! I would have much preferred this test; alas, it's impossible. Nobody manufactures three models that are identical in every regard except megapixels.

The same reader concludes: "What you'll end up with is one larger, very sharp and detailed image, and two other images that, while the same size, will start to resemble mediocre- and bad-quality MPEG video frames."

No. That's just wrong. I've variations on this experiment before, and the results are always the same; a few of the comments in this thread explain why that is. (Read the ones concerning DPI and why 8 megapixels is not actually twice as sharp as 4.)

By the way, I'm well aware that extra megapixels are nice to have when you want to crop. It's a point I always make in my camera reviews, and on the TV show as well.

What I challenge, though, is the camera makers' implication that MORE MEGAPIXELS = BETTER PHOTOGRAPH.

It's a lie. As #247 says above, "Take a 6MP super compact and a 6MP DSLR and see how many people can tell the difference." There would be a HUGE difference. Why? Because there are MANY camera factors that affect a photo—lens quality, circuitry, compression algorithms, etc.—more than the number of megapixels.

Meanwhile, more megapixels carry a price. Your memory card fills up faster. The pictures take longer to download. They fill up your hard drive insanely fast.

Worst of all, more megapixels mean that the photosites (light-sensor pixels) are packed tighter on the sensor, therefore growing hotter and increasing the likelihood of digital "noise" (speckles) in low light.

I'm enjoying reading all of these comments, even the hostile ones. But so far I'm unswayed from my conclusion: That for the kinds of prints average consumers make (up to poster size), for the way normal people view them (that is, not with a loupe pressed up to the glass), anything over about 5 megapixels is a waste of money, all other camera factors being equal (and with due acknowledgment of the cropping point).

—Pogue

— Posted by David Pogue

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249. November  
22nd,  
2006  
10:43 pm

I think the biggest problem with the test is that you make no mention of how subject matter can affect how far you can push enlargement. In many ways portraits are the least critical (and from the image here I'm assuming that's what you used). We don't need to see every pore at 16×20.

And yes, cramming more megapixels into a point and shoot IS pointless and can actually reduce quality because of noise. At the other end there's no point in buying a fancy \$1000+ DSLR simply for its resolution if you only print 4×6 or even 8×10.

But lack of resolution becomes more obvious with other subjects like landscape or architecture, where the difference in resolution between a 6mp and a 12 or 16mp DSLR can make a difference. It might not be hit-you-over-the-head obvious, but that's not really the point.

You're obviously aiming this at the average Joe, but I think you've simplified the issues enough to be misleading. To say there's NO difference at all, that resolution is irrelevant (no matter what subject matter you choose) IS wrong. And yes, I have made prints...

— Posted by matt

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250. November  
22nd,  
2006  
11:07 pm

1. Lens Quality
2. Sensor Size and Quality.
3. Megapixels

thats it, just that, and thats all... except everything else such as software in the camera, compression algorithmis, shooting mode, light sensitivity, etc.

If we ignore all that for now: it comes down to the three above (some people will argue that 1 and 2 should be in the other order but if you have a crap lens then a good sensor wont help much. they are just as important as eachother but one has to come before the other just because thats the direction that light travels.

oh and you need a good eye and working knowlege of the particular camera and photography in general to take a good photo on purpose, but at the same time, retards can take good pictures if they get lucky and pro photographers often throw away half their images because they are crapola.

— Posted by Simon Boyd

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251. November  
23rd,  
2006  
12:12 am

Thanks David, I've read other articles that stated it was more important to have a bigger and better quality sensor, better quality lens than megapixel size and I agree.

The sensor point was in an article on the Mars Rover cmos sensor (there are various articles talking about this) and the better quality lens point is well known although I first started to pay attention to it due to amateur astronomy.

I think a lot of the commentors miss the point by trying to point out imperfections of the test. Obviously the test is not perfect and cannot be. The point is that advertisers tout megapixel size as if it's the decisive factor and many lay consumers are led to just think more megapixels = better pictures. I've had to correct this misconception many times among friends.

Indeed it is common for camera manufacturers to use the same sensor and/ or same lens, release 2 or 3 cameras with different model numbers and charge 100 to 200 more for the higher megapixel one. But based on what I already knew and what this article says, I wouldn't let the megapixel count influence me, I would balance up the other features of the camera (if any extras) to see if the increase of price is worth my value.

In my own limited experience, I remember when I got my first digital camera (a Canon powershot s30, ~3mp), I remember very clearly that my friend bought a more expensive and newer olympus a couple of months later (up to 4mp I think but definitely more than 3).

I took pictures at 2mp (not my max), he took pics at his max (4) and he was complaining about how all his shots looked visibly worse than mine. I said my camera had better quality components and lol of course I was the better photographer 😊

— Posted by cindy

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252. November  
23rd,  
2006  
12:24 am

Oh give me a break! You took the photo at 13 Mp and THEN down-rezzed the material. Let's take the photo at 5 and then print a 16 X 24 , same with a 8Mp camera. Then we have a FAIR COMPARISON.

This is why I don't believe experts anymore.

I've done this test properly and everyone picks out the print order - easily.

I am very disappointed.

— Posted by chris jones

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253. November  
23rd,  
2006  
1:02 am

Nice try David. Shifting the arguement away from your initial conclusion to one you didn't even say in your article. I quote...

"I'm telling you, there was NO DIFFERENCE.

This post is going to get a lot of people riled up, I know, because in THEORY, you should be able to see a difference. But you can't."

Now you say that "normal" people won't notice. But in the article it's "There is no difference...and that you can't see a difference." That is utter bullshit, and it proves your arrogance. There is a difference, and it is discernable...I assume you are smart enough to know that is true...so by insisting that it isn't...doesn't that make you ignorant by choice...or stupid?

If you wanted to make the point that average picture takers don't need anything beyond 5 megapixel cameras...then say that, and don't insult the intelligence of a host of people that know you are blowing smoke out your ass when you devise an irrelevant test, and compound it with a non sequitor conclusion pulled from thin air.

— Posted by Jim

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254. November  
23rd,  
2006  
1:35 am

Funny how everyone seems to think that because an article is printed it is correct. This article is just another example of technobabble (aka hogwash).

The conclusions the writer made cannot be drawn from the test he did. True that the image quality from a large sensor 5MP dslr top of the line camera will beat that from a small sensor 12MP point and shoot any day. But the same cannot be said with otherwise comparable cameras. Too many variables go into determining image quality - MP \*is\* one important factor.

— Posted by Mim

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255. November  
23rd,  
2006  
2:03 am

WOW, talk about misleading!!! The statement that megapixels do not matter is totally off base and misleading, What you should be saying is that there is a balance between megapixels and lens quality and sensor quality and printer quality. Anyone of those may be the limiting factor in a particular system. If the lensing system will only support resolutions equivalent to 4 Mp, then going to 8 will buy you nothing. Not even for cropping (so you are incorrect there also). What you are saying is the same as me saying that lens quality doesn't matter because I'm testing with 1 Mp cameras and can't detect the difference. It's true for that situation/system only, not in general.

It would be more correct to say that megapixels don't matter once you reach the limits of the lens/sensor/printing/compression system and then try to educate people as to ways of determining the limiting factors.

But, of course, you wouldn't get as much attention as you do by making outlandish and misleading generalizations.

— Posted by meBigGuy

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256. November  
23rd,  
2006  
2:25 am

Very interesting post. My experience supports David's findings and the comments of others here. More megapixels doesn't mean a better camera. I have an old 2.4 megapixel Fuji FinePix40i. My wife happens to work for Fuji Film and she had a friend in the lab enlarge some shots we took of a recent

vacation. The photos were only about 760kb in size each, yet the guys at the lab enlarged them to beautiful 11.5×9.5-inch prints. I don't know if they did any special tweaking, but they produced head-turning shots that people in my wife's office thought were taken with a film SLR. Unless you stick your nose right against the print, you can't see any blurring or pixelization.

Maybe it's the camera, maybe it's the lab, but whatever it is, I'm going to use my FinePix40i until it dies.

FWIW,

— Posted by Shawn

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257. November  
23rd,  
2006  
3:24 am

200 wrote: "So what is the advantage of a dSLR? I mean for 99% of people who are NOT professionals?"

My use of a camera is for reminding myself of the good times I had with my grandchildren"

For years, I used a film SLR to shoot photos of my children. It was great, I could get wonderful closeups, and I never thought once about "shutter lag". And then we bought a digicam. Suddenly, great moments were missed... sometimes just a bit of delay, others—nothing, because the camera couldn't focus, or the previous picture was writing to card, or the flash was recharging or something awkward. I finally broke down and bought a digital SLR, and I'm back in photo heaven. For that reason alone, it's worth considering a digital SLR.

As to the megapixel race... I use a 3mp Canon D30. It takes super smooth images that rez-up for 11×14 prints, but I have never been able to get convincing prints that size from 2-5 mp images from digicams. The noise just goes overboard, and let's not forget jpeg artifacts that get exaggerated. Yes, you can do it, and it's fine up to a point—11×14 is probably as big as you want—to be safe, from anything under 6 mp... but guess what—

That's probably the largest your average family photographer will ever want!—other than the rare poster, but my mom has a poster of me at 2, and it looks \_horrible\_ IMO, but \_she\_ loves it! And that's what matters.

Personally, I think the megapixel race could have ended at 6mp.... NOT, mind you, that I wouldn't love to have a 5D! It's my "next" camera, in fact. (someday, down the road when it sells for \$400, and "normal" cameras have 30 mp)

One other good reason to stick with less than 6 mp is computing horsepower. My RAW 3mp images take up gigabytes of space, and my poor old 2000 model Apple PowerBook does all it can to keep up with them. Granted, I'm on the extreme bottom end here, but more megapixels means more computer. All these need to be added to the equation when considering a camera.

Sorry it was so long...

— Posted by Jon Glass

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258. November  
23rd,  
2006  
4:42 am

i'd really like to see a test that addresses this issue properly. what pogue did was going some part of the way towards figuring out how many pixels you need for a nice print. but the actual, big question here is: could spending the money on more MPs in a \*camera\* possibly pay off? if i don't take the picture for my 5MP print with a 5MP camera, but with a similar model that has a 10MP or 15MP sensor, will \*that\* make a difference? pogue has given the (largely) correct

answer, but dissenters won't easily be silenced with this test that doesn't prove anything in this context.

mikel said: "If you are printing it at 300 DPI of course there will be no difference [...] Even home printers are capable of  $1440^2$  DPI."

mikel, JFYI, this is a really stupid opinion. 'home printers' are not capable of  $1440^2$  DPI. when a professional technician at a photo lab talks about reproducing image data at 300 DPI, what he does is just that. when a salesperson tries to sell you a plastic receptacle for the most expensive liquid in the world ... err, i mean an inkjet printer, he or she will try to impress you by citing the resolution of the dot pattern the machine squirts onto the paper. of course you need more than one miniscule squirt of ink in order to portray one 24bit pixel, therefore the resolution of the picture you're actually reproducing will be quite a bit lower than the numbers you find in sales brochures.

— Posted by nex

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259. November  
23rd,  
2006  
4:57 am

How about since you want to isolate the megapixels you don't take one photo and use a resizing algorithm on it but rather take three photos at different resolutions?

— Posted by Jeff Wong

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260. November  
23rd,  
2006  
5:44 am

If megapixels dont make any difference, why didnt you actually use a 1megapixel phone to show what reproduction you would get then ?

Megapixels CERTAINLY make a difference at the lower end. I agree that 4mp is probably enough for almost all images you'll want though.

— Posted by Mike Scofield

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261. November  
23rd,  
2006  
6:27 am

Totally agree with you Mr. Pogue,

Its the whole more Mghx is faster in the AMD / Intel CPU race a few years ago!

For the vast majority of images taken, you would be better off with a camera with 5-7MP, with good optics, do you have any suggestions based on this? Cameras that have a good lens are compact/easy to use...

So would taking a 13/8/5MP image using the same camera, but, at different image resolutions using the cameras settings be any better a test. I would assume that in this case the CCD would still be sampling at the native 13MP resolution and the cameras internally downsampling the image...Is this correct?

Sincerely,

Alek.

— Posted by Aleksander Kenton

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262. November  
23rd,

2006  
6:46 am

The truth about this Post...

Try with 32 x 48 inches .... and do the test again.....

— Posted by Paul

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263. November  
23rd,  
2006  
7:09 am

I completely agree that for the average consumer who will print his pictures in 8x10" on his personal printer, you won't see a difference on paper between a 5Mpix and a 13Mpix camera. I already did the test myself to show it to a few skeptical people. (2Mpix, 5Mpix and 7Mpix on 8x10"). And it's true, why load your hard drive with hundreds of MB if you just want to print in 8x10"?

However, for a professional use, the difference between 5Mpix and 10Mpix is obvious. In one case you have 2592 x 1944, in the other you have 3888 x 2592. Not useful for the average person, but sometimes indispensable for a professional (graphic designer, photograph, ...). This will of course not appear on a personal printer.

In conclusion, yes, the extra mega pixels are not worth it, but yes, there is a difference between 5, 8 and 13 Mpix.

— Posted by Mike

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264. November  
23rd,  
2006  
7:11 am

Well I started my DSLR experience with a 1.75Mp Minolta, moved to 6Mp Fuji S1, then an S2, then to a 14Mp Kodak SLR/n. I now use a 10Mp Nikon D200. When I look at my old prints 13" x 19" or larger which were all printed by me they are not as good as the Kodak or the Nikon. And I shudder now at the quality of the Minolta prints. Most of the pics taken with the Fuji S2, the Kodak and the Nikon were taken with the same lens so it's not a difference in the lens. More megapixels give you more detail, I think that your test was flawed because you downsized a large file.

— Posted by eric in oz

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265. November  
23rd,  
2006  
7:33 am

The problem with the experiment was the photo lab...the experiment must be printed on a home printer...not a photolab (ridiculous).

Nobody go to a photolab to reveal their digital pictures.

The photography teacher must know the artifacts that came with 5 and more than 5 megapixels (purple light in the details)

— Posted by Jonathan Kent

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266. November  
23rd,  
2006  
7:39 am

Ya know, when I was getting ready to buy my first DSLR (a Nikon D1H) I downloaded a file from a review web site and made a very decent 13 x 19 print

at home. That camera is roughly 3MP. I bought it (and a companion D1X) because it had super fast AF, took my legacy Nikon glass, and had good image quality. I still use both bodies.

There are a number of pitfalls and benefits associated with all the optical and digital processes at play during the production of a digital image — from the time the light reflects off the subject until when the light reflects off the print. In such a production chain, MP is only one of the deciding factors.

A number of people posting are presenting very interesting points regarding the technical accuracy of your “test”. Often these are folks with a considerable investment in high MP gear, or are high MP wannabees. To them: “Good luck.”

The bottom line is that 99.9% of digital shooters will make at least 99% of their prints 4×6, or down-sample images for use on photo web sites or as e-mail attachments. Of the 1% or fewer prints that are larger, the vast majority will be 8×10 or less (partially due to the cost of matting/mounting and framing anything larger — and also because most of us don’t have gallery walls at home or in the office.)

The pixel counters really need to get a life.

— Posted by Larry

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267. November  
23rd,  
2006  
7:43 am

I’m cradling my beloved 5mp Olympus E-1 right now... From my cold, dead hands, as I think you say in the States 😊

— Posted by Dennis Low

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268. November  
23rd,  
2006  
7:44 am

This kind of debate is fantastic, it keeps the “geeks” happy, the camera club boys confused and leaves the pro photographers to get on with it.

— Posted by Graham Fox

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269. November  
23rd,  
2006  
7:45 am

NICE ONE!

Thanks 😊

— Posted by Love

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270. November  
23rd,  
2006  
7:49 am

While I’m in agreement that the megapixel myth has to be busted, I must note that this test has a fundamental flaw to it that others have pointed out already. You say you “blew up a photograph to 16 x 24 inches at a professional photo lab. One print had 13-megapixel resolution; one had 8; the third had 5. Same exact photo, down-rezzed twice, all three printed at the same poster size”.

Now, a 13-megapixel image downsampled to 5 megapixels will retain a lot more detail than what a 5-megapixel sensor captures in the first place. A 5-megapixel image produced by a 5-megapixel sensor does not have detail down to the pixel level, whereas a 13-megapixel image downsampled to 5 megapixels does.

You are also saying: "Nobody manufactures three models that are identical in every regard except megapixels." Well, what about comparing a Nikon D1x with a D200 and a D2x using the same lens, say, an 50mm f/1.4? 5, 10 and 12 megapixels, respectively. You could do that.

Don't get me wrong, I'm using a 5-megapixel DSLR myself - the Olympus E-1 -, and am confident the output is perfectly acceptable for any purpose except multiple-page magazine adspreads and Playboy centerfolds, which I have not yet been asked to do...;-)

— Posted by Zoltán

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271. November  
23rd,  
2006  
8:54 am

All this shows is how little typical mainstream reporters understand technology. Even the "technology" reporters.

The first mistake is in using a downsized image. Digital cameras you the Bayer CFA to produce color, which they have a sparse amount of sensor info. They use an algorithm to determine the missing colors. The net effect is that you can downsize a typical bayer image by half an essentially use lose no details, because the size of the output is something of a misrepresentation. So that 13MP bayer source image is in reality only a container for about 6.5 MP of information. Even at his smallest size of 5MP there is not a significant difference. A real 5MP digital camera would only contain about 2.5mp worth of information. There would be much more drastic difference using a 5MP camera, than a 5MP downsize which is really equivalent to 10MP camera output.

Second major flaw was choosing a largely low detail subject.

Repeat the test with a detailed landscape shot and using actual cameras instead of a downsize and then you might have something to make your case.

As is you have flawed evidence either do shallow understanding of the issues, or purposefull misrepresentation.

— Posted by Peter

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272. November  
23rd,  
2006  
8:58 am

But aren't You now doing what You were trying to avoid?

You say You can't make this test with different cameras because there are no cameras who are identically but in MegaPixels. But than You generalise Your conclusion to all these cameras who were not comparable???

I agree to Your conclusion! To an average user a 5 or 6 megapixel camera is enough even for large prints. But Your test did not prove that at all, because Quality of a downsized 13MP Bayerpattern Camera image is much better then a picture of an 5MP Bayernpattern.

Your Test is very interesting but my conclusion would be a complete different that is not better for camera industrie.

A 13MP Sensor gives You an image that is not worth to be saved as 13MP! 5MP are enough!

The interpolations made by reading the BayerPattern are only blowing up data but don't give You more information. I think the people from Sigma and Favoen will like to hear this...

But in 5MP cams they use the same interpolations and this would of course mean that a 5MP cam is only worth 2MP.

— Posted by Steffen

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273. November  
23rd,  
2006  
9:15 am

Higher megapixel is absolutely important because it allows to crop without compromising the printed dimensions and I think sometimes (like photographs taken with focus at infinity) it becomes important to crop the image to emphasize the subject (and the mood). Sometimes, you have to crop to remove vignetting. So, some people have commented, more megapixels give more freedom to crop.

Though the war against “MORE MEGAPIXELS = BETTER PHOTOGRAPH” was not mentioned in the original post, for “average consumers”, who don't bother or don't have time to modify an image with a freely available software, 6MP camera should be good.

Finally, for some strange reason, it seems, the author of the original post was not very sure if his 3-print experiment good enough to establish what he intended to establish and so he had put up the entire thing for public opinion here. 😊

— Posted by Hampu

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274. November  
23rd,  
2006  
9:17 am

this test is so flawed it is off the charts. the 8 and 5 megapixel pics were not taken at these resolutions they were derezzed from larger sized images. second, who the hell makes a 13 megapixel camera? canon, nikon, sony? please tell me who. i have seen tests of photos taken with the SAME lense on different dslr nikon cameras and at 16 x 20 the difference would be noticeable to someone with a cane.

— Posted by gary

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275. November  
23rd,  
2006  
9:29 am

The Test is Wrong!

The Picture was taken using a 13 megapixel bayer sensor, which means, 50% of the pixels are green, 25% red and 25% blue. That's the way such sensors work (as long as they are not from faveon).

From this 13 million single color triplets, the camera software (or the raw converter) interpolates a large 13 million pixel rgb jpeg file.

This jpg file has got 39 million single color triplets! 13 million values for red, green, blue each.

By scaling this rgb file down to 5 megapixel rgb, you still have 15 million single color triplets stored in the 5 megapixel rgb file, which is still more than the 13 million color triplets the sensor has.

So the way the test is done there should not be a visual difference, as long as the software for downscaling uses modern algorithms.

This Test was done to check the difference of 5, 8 and 13 Megapixel cameras.

To do this test, he should have better taken the picture of a still scene using a tripod and 3 DSLR Bodys with the same high quality Lens and different sensor resolutions.

For example, with canon digital rebel series there would be a chance to check 6 8 and 10 megapixel sensors in an almost equal environment.

Chris

— Posted by Chris

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276. November  
23rd,  
2006  
9:40 am

What if you rasterbated the pics? Would that make a difference?

— Posted by Random rasterbator

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277. November  
23rd,  
2006  
9:44 am

The Test is Wrong!

The Picture was taken using a 13 megapixel bayer sensor, which means, 50% of the pixels are green, 25% red and 25% blue. Thats the way such sensors work (as long as they are not from faveon).

From this 13 million single color triplets, the camera software (or the raw converter) interpolates a large 13 million pixel rgb jpeg file.

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For example, with canon digital rebel series there would be a chance to check 6 8 and 10 megapixel sensors in an almost equal environment.

It is a fact, that higher resolution will give more detail and you can see this in poster prints. 5 megapixel from a olympus 5060 WZ dont look as good as 8 megapixel from my canon eos digital rebel, the higher resolution gives me much more details in 30 x 45 cm prints.

I like to do posters, and therefore i stick to my 8 megapixel dslr, at the moment i dont see a reason to get the newest 10 megapixel eos digital rebel xti (400 d here in germany).

At this point, another effect becomes more and more important: the size of a single sensor cell. the bigger the cell, the smaller is the effect of random image noise.

a dslr has an big enough sensor, to host 8 to 10 megapixel providing a very low level of image noise.

on the small pocketable cameras, the sensors are much smaller, today 7 or 8 megapixel models there suffer extremely from image noise problems.

in this pocketable camera size, 4 megapixel on a big sensor (1/2 of the size of an APS-C for example) would be enough for normal prints and would provide pictures with an equal noise compared to DSLR models. Such a camera would be my favorite over every POCKET SIZE 7, 8 or 10 megapixel model, it would make wonderful pictures. BUT IT WOULD BE NOT WELL SUITED FOR POSTERS! therefore the resolution is too small.

Chris

— Posted by Chris

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278. November  
23rd,  
2006  
10:28 am

Try taking an image with an older Sony 1.3MP camera, and then one with a newer Sony 6MP camera. There is a huge difference apparent immediately.

The differences in your test may not be apparent to the human eye, nevertheless there IS a difference. You seem to be saying there is not, which is simply not true. If you had a printer capable of printing higher resolutions you would indeed be able to see the differences.

— Posted by Kevin

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279. November  
23rd,  
2006  
10:34 am

as for the use of 3 same branded cameras with different megapixel res, I suggest testing with the entry-level Canon DSLRs.

Digital Rebel (EOS 300D) 6 MP //  
Digital Rebel XT (EOS 350D) 8 MP //  
Digital Rebel XTi (EOS 400D) 10 MP //

also, using the same 18-55mm (and only one) kit lens that comes with either camera would reduce the variables of the test.

Most average shooter/photographer would be printing pictures only with either 5x7 photos or up to 8x10 (on average meaning mom or dad going to Walmart for a printout of their son's birthday cake blowing or Christmas gift opening moments...) so it would be best bet printing on those range of sizes.

Setting the printing DPI to let's say 400DPI on all of the printouts would bring down another factor.

Happy testing!

— Posted by Chris Ramiscal

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280. November  
23rd,  
2006  
10:37 am

quote: What I challenge, though, is the camera makers' implication that MORE MEGAPIXELS = BETTER PHOTOGRAPH.

I fully accept that challenge. More megapixels = better photograph when you use cameras with the same quality CCD and lenses. What you really challenge is: more megapixels = better PRINTED photograph. On that front you are absolutely accurate.

— Posted by Paul

---

282. November  
23rd,  
2006  
10:59 am

Now it's quite logical if the difference is microscopical then of course no difference can be observed. So only use high MP if you need to print really large pictures.

— Posted by sdf

---

283. November  
23rd,  
2006  
11:02 am

Yes. The prints may be very good to the human eye but...

It all comes down to post process with digital photography.

As a professional photographer, high resolution imaging gives me the pixel data necessary to make color and contrast corrections and even crop in certain situations.

Remember there are many factors that go into the file before print.

— Posted by Mitch D. Weiss

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284. November  
23rd,  
2006  
11:03 am

#278 wrote: "Try taking an image with an older Sony 1.3MP camera, and then one with a newer Sony 6MP camera."

Somebody else wrote: "Try with 32 x 48 inches .... and do the test again"

Well, sure. Why not take a 64x 480 cameraphone photo and blow it up to a Times Square billboard?

Dudes—I didn't say "MEGAPIXELS DON'T MATTER."

What I said was: "For the kinds of prints average consumers make (up to poster size), for the way normal people view them (that is, not with a loupe pressed up to the glass), anything over about 5 megapixels is a waste of money, all other camera factors being equal (and with due acknowledgment of the cropping point)."

—Pogue

— Posted by David Pogue

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285. November  
23rd,  
2006  
11:18 am

Hey, it's me again.

It's my impression, from reading the comments here, that there's a world of disagreement about the test and about the value of megapixels. Some of you fault the printing process we used, some fault the camera method, some are unhappy with the subject matter (it wasn't—there was TONS of detail in the baby's hair, sweater, jeans, and the old flaky-peeling boat he was sitting).

So here's my challenge to you guys: I'll redo the test, based on a testing protocol that YOU, THE READERS, agree on.

It has to be something that can actually be done; for example, it can't be, "Take 3 different cameras that are identical in every way except for the resolution." (There is no such set of 3.)

I rather suspect that there IS no perfect testing protocol, that there exists no test in the world that would satisfy all of the commenters here. But I'll throw this idea out there—let's see what you come up with!

—Pogue

— Posted by David Pogue

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286. November  
23rd,  
2006  
11:58 am

2 questions.

1. Almost a sure bet that the 13 megapixel camera was not a point and shoot. So comparing 3 cameras is fishy. you need to get 3 cameras with same sensor size, lens size (how much light they let in) and make sure that they are all either dslr or point and shoot.

2. down rez'd the pics twice? correct me if I am wrong, but downing it twice is sure to mess up the quality of the image. Were they all jpeg?

Its this pseudo-testing that I have a problem with. If you are going to compare you have to get the approximate same types of cameras.

Makes me wonder if he applied the same pseudo-testing to the whole series. Will wait and see.

— Posted by Andy Fowler

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287. November  
23rd,  
2006  
12:13 pm

Why down rez twice? You don't need to take 3 different cameras that are identical in every way except for resolutions, all you need is one camera, and change the resolution with-in the camera, I know that all Sony cameras allow you to choose from their highest resolution to a couple of other resolutions lower. I used to work at the Sony store, and I did this test but I didn't down rez the files(still don't understand why you did) and printed all 3 pics on 8x10 paper, and all my customers can tell the difference when I show them the pictures. They would not be able to tell the difference if I put the pics 5 feet away mind you, but I had them in a binder that they can hold and compare side by side.

— Posted by Jimmy Lin

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288. November  
23rd,  
2006  
12:22 pm

My problem is with the down resizing, if you were doing a bicubic resampling going from the large to the small... the condensed image will have a lot of info that is based off of the larger resolution image. I don't know that the data is different than what a camera would have come up with (it should be right?) but I think this could account to part of the reason you don't see ANY difference.

I'd argue you could put this question to rest one of two ways...

First, take a 5 megapixel image and resize it to 13 and print them out. See if anyone can tell a difference between those two. If they still can't, then clearly resizing isn't the test's weak point.

Really I think I'd prefer to see three different cameras used.... maybe an older low megapixel DSLR, a midrange canon P&S, and then a new ultra 13megapixel P&S.

It may be a loaded test... but hell, there's no way to make everyone happy. It'd get the same results I'm sure.

— Posted by Chad

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289. November  
23rd,  
2006  
12:28 pm

What kind of printer was used? Was there any visible pixelization in the prints? What software was used to print the pictures? Were the pictures interpolated by the software to fit the print size?

How many things were done to the pictures that the average or even enthusiast home user is unaware of or doesn't have the use of when printing?

What I'd like to see is if the average user took those same three photos and printed them on a printer at home with his home setup, would the differences be just as indistinguishable?

I've gotten good 8 x 11 prints out of 3MP and even OK ones out of 2MP photos, so I can see a 16 x 24 print being good from a 5mp picture when, especially using some tools/methods available to enhance the picture.

With the assumption that most home users are OK at taking pictures and end up cropping 40% of the picture off, I'd like to see how well the remaining 60% can be printed on a couple of widely available and inexpensive printers using the Windows print function, XnView (free, so very widely available), and Photoshop.

Try your experiment using a 2MP (60% crop of a 3MP), a 3 MP (crop of 5MP), and a 5MP (crop of a 8MP); each as an 8 x 11 glossy. Then let us know how well these pictures turn out for each of the combinations of solutions available most of us on budgets.

These results will mean more to most of the people reading this.

— Posted by Andy

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290. November  
23rd,  
2006  
12:29 pm

Re #285,

Let's combine Peter's suggestion with mine. Take a 5-megapixel Nikon D1x and a 12-megapixel D2x (maybe also a 10-megapixel D200) with the same lens, preferably a sharp prime, and take the same landscape shot from the same tripod position at the same exposure settings with the two (three) cameras, within minutes of each other. Capture raw data, and develop each file with the same raw converter. This way you'll bypass the in-camera processing engines, and use the same processing technology for each file.

Finally, print the three images at the same print size, and the test can begin!

I personally do not expect the results to differ significantly from what you got now, but this test shall be more authoritative than the current one.

— Posted by Zoltán

tested was two 13MP CFA images versus one 5MP image.

The test doesn't test what Dave Progue says it test.

This isn't myth busting, it is myth creation.

— Posted by Jay Turberville

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292. November  
23rd,  
2006  
1:01 pm

David, I am not always a fan of everything you but this time I am on your side completely. Obviously these people are not scientists, or else they would be very familiar with the phenomenon that what is true in theory is not always true in practice. Your experiment shows what it shows, that when printing at 24 by 16 inches, there are way manipulate the image that make it extremely difficult to tell them apart.

It's like you did an experiment showing that a Honda is better than a Lamborghini for normal every day street driving and people said that test was invalid because at 150 mph the Lamborghini would smoke the Honda.

That said, I think the most fair way to do this is to find a camera that lets you shoot at several resolutions. From what I have seen most of them do.

— Posted by superdave

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293. November  
23rd,  
2006  
1:23 pm

A test has already been proposed that'd help solve some of this (without details of the output, there's not way of telling if that's affecting the test.) Shoot with a D2Xs at 12.5MP and in high speed crop mode which should be ~6MP. Print those on a high res printer and compare the results. Alternately, redo the test with 3 generations of Canon or Nikon DSLRs, and see if there's a difference there- Sure, noise will be different, but lots of folks are shooting the 4MP D2Hs with good results still- so it shouldn't be a total wash.

— Posted by Paul

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294. November  
23rd,  
2006  
1:36 pm

How can one call this a comparison between 5MP and 13MP cameras if there is only one file from a 13MP camera used?

Your test says more about the software used to create thee three files than about the difference between as 13 and a 5MP camera hence the 5MP camera was absent...

— Posted by S

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295. November  
23rd,  
2006  
2:01 pm

THE IDEAL TEST: [as scientific as I can get it]

I spend way too much time retouching images, and I can say from experience that it is very easy to differentiate a 5 megapixel image at this test size from a 13 megapixel image.

**Set up:**

Focus point must be on a single focus plane (ie objects must be very close together).

This must include small objects and must be quite contrasty, small/thin black/white stripes. All placed in the centre of the frame.

A tripod must be set up and each camera fitted with a quick release plate to ensure exact positioning.

The subject must be lit by a high output constant light source no flash!

**Camera Settings:**

1. No in camera sharpening.
2. Use raw format then convert to TIFF
3. No in camera curves/saturation adjustments.
4. Manual Aperture/Shutter Speed Setting.
5. Use 'sweet spot' aperture of chosen lens.
6. Use the same lense for all set ups: preferably 50mm prime.

**Suggested camera bodies:**

Nikon D2H - 4MP

Nikon D70 - 6MP

Nikon D200 - 10MP

Nikon D2X - 12MP

\* I think these all use the same sensor size and even similar sensors.

**Printing the image:**

1. Convert to greyscale. Colours might distract from what we are testing, detail/sharpness, not colour saturation. [Optional]
2. Upsize all images to 16x24 using photoshop Bicubic. ['nearest neighbour' would give it away too easily]
3. Crop the centre section that was used as the focus point and create 7x5 prints that people can view and compare.
4. Print on a Fuji Lightjet on crystal archive.

**Testing:**

1. Give the subjects all the prints and ask them to find the best and the worst.
2. Then tell them to arrange all four prints in order from best to worst.

I'm pretty certain most people will spot the best and worst.. or close enough...

— Posted by Alistair

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296. November

23rd,

2006

4:57 pm

This test is bogus.

A 13 MP picture is not sharp - so you will not lose so much by downsampling it. You have to zoom and crop instead if you want to do the test.

— Posted by Donald

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297. November

23rd,

2006

5:02 pm

Go look up Nyquist sampling theory.

[http://en.wikipedia.org/wiki/Nyquist-Shannon\\_sampling\\_theorem](http://en.wikipedia.org/wiki/Nyquist-Shannon_sampling_theorem)

The source image is wildly oversampled compared to what real native sensors would deliver. This means that little details are detected and then averaged into the final pics whereas with a lower sample resolution, little details run from severely aliased to totally omitted.

— Posted by MrX\_TLO

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298. November  
23rd,  
2006  
5:04 pm

“Hey, it’s me again.

It’s my impression, from reading the comments here, that there’s a world of disagreement about the test and about the value of megapixels. Some of you fault the printing process we used, some fault the camera method, some are unhappy with the subject matter (it wasn’t—there was TONS of detail in the baby’s hair, sweater, jeans, and the old flaky-peeling boat he was sitting).

So here’s my challenge to you guys: I’ll redo the test, based on a testing protocol that YOU, THE READERS, agree on.

It has to be something that can actually be done; for example, it can’t be, “Take 3 different cameras that are identical in every way except for the resolution.” (There is no such set of 3.)

I rather suspect that there IS no perfect testing protocol, that there exists no test in the world that would satisfy all of the commenters here. But I’ll throw this idea out there—let’s see what you come up with!

—Pogue ”

I made such a challenge.

Let’s go to the Eifel Tower in Las Vegas; you bring your 13MP camera, I’ll bring my two 5MP cameras.

We’ll take nighttime photos of the strip from the top of the tower.

Are you game?

Here’s the point: you claim you’re trying to help consumers when buying cameras (read the last line of your article).

Yet, when saying there’s no difference between 13MP sensors, and 5MP sensors, you miss an extremely important point: when people buy sensors, they come wrapped in cameras.

You go on to emphasize that you think that, “all other camera factors being equal...” what your article says is true.

BUT, all other camera factors CAN’T be equal. This is reality: even speaking of just average, everyday buyers, if they take your article to heart, they will buy that 5MP P&S camera and wonder why their photos don’t come close to my 8MP 30D’s photos. Hey, you said they would!

So, when do we meet in Vegas?

Bill

— Posted by Bill Funk

299. November  
23rd,  
2006  
7:31 pm

13Megapixels is ridiculous for small format...

But when you're doing something for large format or say editing some photo manipulations you want all the pixel information you can get at.

Say you have a nice image but for a poster and then someone says they want it cropped down to a smaller object in the piece for a more profound statement... you can just crop and adjust the size and still have enough resolution to print clearly.

More pixels please, but not for the scrapbooking.

Just my 2 cents from the printing industry.

— Posted by Joe Preston

300. November  
23rd,  
2006  
8:14 pm

David,

as you now realized it was a big mistake to tell the people that there is no difference between 5 and more megapixels. You wont be able, as you also said, to make a test that is perfect. There will always be issues that some people will gnaw at.

I would basically agree with the statement, that there is no visible difference between 5 and more MP if you look at the 16x24 print from a adequate distance.

There is now the same problem with HDTV. If you have a 32 inch SD screen and a 32inch fullHD screen and sit in a usual distance of 3 to 5 yards to it you wont see a big difference in quality! If the screen is 100inches then you will. Its always the question of screensize and viewing distance! or better said the aligning power of the eye. And that is (under good lightning conditions) 0,5-1 arc minutes, what means that the eye can resolve 300dpi on a distance of 10 inch (thats where this standard of 300dpi comes from - the 10 inches have been defined as standard viewing distance for an object covering about 45degrees of the human viewing angle).

So lets do the math:

a 5Mpix (2560 x 1920 4/3) image printed with 300dpi (175lpi magazine print quality - or what todays inkjet printers do) has a size of 21x16cm (8,3x6,3inches). if you now print a 8 or 12Mpix image to that size and view it from a distance of of 10 inches you (someone with "normal" eyes) is physically not able to see a difference!

if you double the viewing distance you need four times less resolution, what means that there is no viewable difference between a 5 or whatever more Mpix image printed to 16x24.

So you are quite right if you say "I'm telling you, there was NO DIFFERENCE." But if there was no difference viewed from 5 or 10 inches then the prints were definitely bad!

cheers

— Posted by ivan

301. November  
23rd,  
2006  
9:38 pm

rofl. megapixels do count.

if you take a 2mp photo and enlarge it to a4

— Posted by chesterqw

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302. November  
23rd,  
2006  
9:48 pm

I agree with some of what each comments says. I believe also the printer may be a limiting factor. If you are going to print a certain size, the MP plays an important role. Thats all. Nothing else. Sometimes, when viewing a picture on the computer, you may sometimes zoom (digital zoom) in to see what was captured in the background. On a 13MP, you will get better clarity then on a 5MP.

Having said all that, your test is a good example of what most average camera users need. Not some over powered, hyped up marketing gadget to do simple task.

— Posted by Lloyd

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303. November  
23rd,  
2006  
9:55 pm

Downrezzing a 13 MP image to match a 5MP image throws away information captured by the higher resolution sensor. Essentially you've crippled a 13MP camera's output to make it comparable to a 5MP camera. This makes your test result moot. It's like taking a V8 car engine and removing half its cylinders and comparing it with the performance of a car with 4 cylinders.

A better test would be to uprezz the 5MP to match the 13MP camera and then print the output.

Sensor resolution does affect picture quality. Its contribution diminishes with increasing resolution for most consumer level applications. And I do agree that many other factors affect the quality of a photograph. But your article may well lead consumers to discount the purchase of higher resolution cameras for the wrong reason.

— Posted by wjtan

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304. November  
23rd,  
2006  
10:06 pm

Unless you're going to retouch or use those photo in "Professional Prints" (Magazine, etc...) I don't think anything above 2MP is necessary.

I don't see many people print out their photo these days, something larger than their monitor resolution is useles... 😊 And you have to spend some CPU time rescale it to fit the monitor.

I'm sitting in the office right now, and my office was decorated with Wall Sized photo. (like 2Meter high x 4 meter long ) I don't know the megapixels that photographer were using - it's already look really nice from my desk. Even though when it is so distorted when i walk up close!

— Posted by Nant

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305. November  
23rd,  
2006  
11:56 pm

A previous post of mine seems to not to have made it through - I hope this

shorter version of my thoughts does show.

Basically, the problem is that really what your test is measuring is information density of an image - that is to say, how much detail is held in each pixel?

If an image from a camera really held unique detail in each and every pixel, then your test would not have worked and people would have been able to tell more easily which images were which. But most cameras do not hold this level of detail in an output image, and so every time you downsampled you were effectively just compressing information that was already spread out into a smaller space, and for the print it was expanded again - some detail lost, but not nearly as much as if every pixel held unique levels of detail that would be thrown away.

My guess is if you had tried one more downsampling, say to 3MP, that people then would have been able to tell the quality was lower because at that point you'd be throwing away essential detail.

I think a more interesting version of your test would be to try prints between a Nikon D40 and D80 - both new cameras with new sensors, but substantially different MP ratings, and then you would see if people could discern between 6MP and 10MP from what is essentially the same camera and sensor (thus equalizing the test to cover only MP ratings, which is what you were trying to do here).

— Posted by Kendall Gelner

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306. November  
24th,  
2006  
2:13 am

Actually, a 13M Camera will produce more noise and less Dynamic Range than a 5M Camera (all else being equal), because the surface area of each individual pixel is much greater on the 5M Sensor, resulting in a much higher Saturation Point (the point where no more photons can physically be recorded). -=”The only real difference is the freedom to crop”=-, also on freakishly large 300DPI prints, which you would have a hard time finding. Cheers

— Posted by www.JoeBorton.com

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307. November  
24th,  
2006  
3:17 am

Take real cameras as equal (except Megapixel) as You can get them with the same Lens (someone guessed a plausible nikon setup from 4 to 12 MPixel). Yes there are other differences than Megapixel (newer sensor, different firmware...) but there are no actual 5MP DSLR on the market! If You'll find out 5MP are enough You're recommendation must be anyway: “Stay with Your old camera, and don't invest in more Megapixel.” So why not testing the old against the new.

If You only want to test what is the max. number of Megapixel You need for a perfect print. Take a picture that is far beyond 13MP (Scan of 8x10" Slide) and resize this to different MP-Sizes before printing.

But I doubt that a 13MP Camera will ever reach the quality of a 8x10 scan resized to 13MP...

— Posted by Steffen

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308. November  
24th,  
2006  
4:18 am

Excellent article, and I completely agree. One important thing people don't think about, when converting megapixels to DPI, is the different DISTANCES at which photographs are viewed. Sure, if you want an 8x10" print as a magazine page, you might want 300dpi. If you want an 8x10" print hanging on the wall on the other side of the room above the fireplace, there's no such concerns! Let's face it - that is, at the end of the day, what 99% of people are doing with their digital cameras.

I recently purchased a reasonable priced 5mp camera. A Samsung S500. I went to the store, and the first camera I tried was actually a 6mp Fuji. I bought it, took it home, tested it out overnight, and was appauled. It was dark, and dark areas of the images were filled with noise, out of focus, slow, lacking in features. I took it back, and got the 5mp camera instead. It took much better photos, had less noise, sharper images, lots of neat features, fast button-press, and faster saving of files. I'll take my 5mp over a higher resolution any day, thankyou very much.

— Posted by Grant Williamson

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309. November  
24th,  
2006  
[6:27 am](#)

I would have been more impressed with your test had you used 3 different cameras to take the same picture. I know from working in photoshop for years that working at a higher resolution and the downsizing (say from 600-300dpi) will always give you a better result than just working at the finished file size (300dpi). So all that you have proved is that resizing from a high resolution image downward, still gives you very good results. Please try the test again, this time with different cameras.

I bet the difference will be slightly more discernable.

— Posted by Joe McCarthy

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310. November  
24th,  
2006  
[6:50 am](#)

It's total bullshit. There's a tremendous difference between a typical 5mpx camera and a typical 13mpx camera. A shot from 13mpx camera reduced to 5mpx is way better than a shot made with a typical 5mpx camera. Also, the sensor itself makes a difference, as does the lens.

— Posted by Konstantin Sirotkin

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311. November  
24th,  
2006  
[8:01 am](#)

I have a Nikon D200 10.2 megapixel and a Canon S2-IS 5.3 megapixel. Frankly, my Canon does a better job in some cases. However, I have found that the higher the megapixel rating the faster the camera is likely to be. Consequently the payback for higher megapixels is shooting moving targets and the ability to shoot very quickly.

— Posted by Marshall

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312. November  
24th,

2006  
9:13 am

I agree with the basic premise, that the manufacturers use increasing megapixel numbers to try to entice consumers to buy new cameras, and really most consumers will not see an improvement in their photos by purchasing a higher megapixel camera. But then again, this is true of many products. Here in America we are taught more/bigger is always better.

I also agree that the test is flawed. You can't up-res or down-res an image file, and say that it's an accurate simulation of 3 different cameras. Then again, I think I could probably find 3 different cameras with the same exact mega-pixels, but each of them produced different quality images. There is a lot more to technical image quality than just mega-pixel count.

A huge issue with the quality of digital photos is noise. Noise is controlled by several factors, but the size of each pixel on the sensor has a lot to do with it. Usually you will find that a camera with larger pixels creates less noise. This is why an 8 mp DSLR beats an 8 mp point-n-shoot (PNS). It's also why in some comparisons a 4 mp PNS may beat an 8 mp PNS. The amount of noise a camera produces in the image should be a major consideration for anyone who does most of their photography indoors, or in lower light situations.

Another point I'd like to make is that there really isn't a big difference between 5mp, 8mp, and 13mp. Sit down with a piece of graph paper, and draw a rectangle 2 squares by 2.5 squares. Each square represents a megapixel, so that rectangle is 5mp. Now draw an 8mp rectangle (2x4 squares). Now draw a 13mp rectangle (3x4.33 squares). Many people may think that an 8mp camera should be almost twice as good as a 5mp camera, but when you are dealing with area it's not much of a difference. If you actually double the dimensions of the 5mp rectangle to 4x5 squares, you end up with a 20mp rectangle.

In general, it is my experience that a decent lab can make very nice prints (resolution wise) that would please almost most folks as long as the dpi from the original capture is 150 or greater. This means if 8"x10" is the largest print size then 3mp is enough.

— Posted by Matt Needham

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313. November  
24th,  
2006  
10:47 am

bullshit.

try to print your pictures in Magazine with 2-5 megapixels on A4 sized page and you get blurred or pixelized picture. The picture print quality is always depend on printing technologies you using for picture printing. try to print 72dpi picture on your home inkjet printer and the same picture with the same size and resolution in printhouse... I can tell you that ordinary human can see the difference between them.

so if you're ordinary user, you don't need the camera with more than 6MP, cuz you don't ever use pictures with this sizes for quality printing.

— Posted by Marek

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314. November  
24th,  
2006  
10:54 am

I agree with your results but like few readers noted, camera itself can make the difference. I have a Nikon 5700 that i had to sent for repairs (I forgot to "eject" from computer before disconnecting the cable-don't do that!), so as it was going to take long before getting it back, I bought a cheap Vivitar 3718s (\$100). I have to settle it to max res. (3 MP) to be able to have, even then, a poor quality photo. This is the setting I use to have on my Nikon for most of the

pictures I take, and I have always been satisfied with it as I rarely enlarge them very much.

— Posted by Guy Y.

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315. November  
24th,  
2006  
[11:18 am](#)

There's a tremendous amount of misinformation about digital photography and about "pixels" and "megapixels" in particular. The premise of this blog...that there's really little or no difference between, say, a 5MP camera and an 8, 10, or even 12MP camera....further the misinformation to even more absurd levels.

Many who have responded in agreement to this blog have done so out of ignorance and the pretense of knowledge. Many who have responded in AGREEMENT with this blog have also done so with the pretense of knowledge. Those of us who make a living as photographers know from day-to-day experience and from several years of experience with many different types and makes of digital cameras that the differences between low resolution cameras and high resolution cameras are significant, noticeable and important.

If one wants to believe that the camera makers have pulled the wool over all of our eyes and are criminally misleading us into believing that their hi-rez cameras offer more resolution than their lo-rez cameras when, according to this blogger, they don't, well...fine....believe what you want to believe. Personally, I think David Pogue should be called to task by his employer...The NY Times...for writing an article and calling it "The Truth About Digital Cameras" when, in fact, there's no truth to it whatsoever.

I also think The NY Times should be called to task for having published the article without looking more deeply into the facts and without due consideration for the consumers looking to purchase digital cameras, the professionals who use digital cameras to earn a living, and the camera makers themselves, who have literally revolutionized photography in a very short period of time. Kudos to them....not David Pogue.

— Posted by Steve

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316. November  
24th,  
2006  
[2:11 pm](#)

Although I agree with your basic premise, there is another unaccounted for variable in your test procedure.

Since they were printed by a professional printshop, were they using a professional print driver and RIPs?

If so, it is also possible that the print drivers up-rezzed the 5M picture to match the print media as it felt best. You still lose detail that would have been there but it does help compensate for a lower than ideal rez.

— Posted by Terry D

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317. November  
24th,  
2006  
[2:13 pm](#)

What a load of rubbish.

— Posted by Frank N. Stein

You'll need to explain more about the steps you undertook in this test to help me (and others?) understand the results. Anytime you "re-rez" images you're possibly throwing away information the cameras captured.

— Posted by Dave Kauffman

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319. November  
24th,  
2006  
4:40 pm

This is the most asinine print test I've ever read.

— Posted by Nate

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320. November  
24th,  
2006  
5:22 pm

Your test is not valid. 1. starting at 13 megapixels .. you must have had a higher end pro SLR. 2. such camera will have MUCH better "noise" characteristics than a 5 megapixel point and shoot. 3. Downsizing will always give you a better photo than upsizing. A more believable test would be to start with a 5 megapixel point and shoot and then up-size. Also, we need to know what software/algorithms you downsize with ... it makes a difference. Interesting street presentation, but I'm less than convinced.

And, you left out ... one of the main reasons for more pixels is so one can crop and still have a good BIG print

And, what if you need to shoot at 800ASA or higher .. let's take a look at a that 5 megapixel point and shoot blown up to poster size .. and compare it to the 13 megapixel SLR

What kind of printer that was used makes a difference too in how few pixels can be used to get a acceptable print.

WS

— Posted by Wil Smith

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321. November  
24th,  
2006  
5:35 pm

Yeah, I am convinced but this test! LOL.

If people really believe this I have a bridge for sale as well.

A 13MP capture vs a 5MP capture will look different when printed at 11"x14" and 300dpi.

You are kidding yourself if you believe the 5mp will look just as good.

— Posted by John Crampton

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322. November  
24th,  
2006  
5:40 pm

All photography is overrated crap!

— Posted by Ed Leczek

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324. November  
25th,  
2006  
2:00 am

I like the comments that contain "The differences in your test may not be apparent to the human eye..." or similar... um last time I looked the entire purpose of photographs is to be looked at by human eyes.. so if human eyes can't see a difference.. that's as good a proof as you'll ever get.

— Posted by Chris

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325. November  
25th,  
2006  
2:14 am

I regularly blow the myth out of the water with my 4.1mp Nikon D2h. I've printed up to 16x20, and had people ask me when I upgraded my camera. I tell them the photo was shot with my trusty D2h, and they go nuts.

If you wanted to do the test again, narrowing down the parameters, try shooting with a D2x and a D2h. The cameras are nearly identical, and would allow using the same lens for each shot. In its native format, the D2x is slightly better than 12mp, while in High speed Crop mode, it's only 6.8mp (or there about), and of course, the D2h is "only" 4.1. That might give you a better test.

— Posted by Don Risi

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326. November  
25th,  
2006  
2:46 am

It is hard to believe only one person got it right. There is 1/6 chance to get it right by blind guessing!

— Posted by chiu wing lam

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327. November  
25th,  
2006  
3:20 am

You need to repeat the test to make it valid, there must be reliability.

— Posted by Les Cortez

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328. November  
25th,  
2006  
4:08 am

Ragazzi ma cosa dite???

I Megapixel hanno senso SOLO per le dimensioni finali della stampa!!  
Per quello che riguarda la qualità, si è sempre saputo, sono le ottiche a fare la fotografia...

Se l'ottica è buona e lo è anche la post produzione, con una buona 5 Megapixel si può stampare anche un 50x70....

Non fare scoperte dell'acqua calda... per piacere...

— Posted by albert

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329. November  
25th,  
2006  
4:49 am

I agree with the author. A number of megapixels is just a marketing trick. Moreover, if it increases on a sensor of the same size (as many producers do), final quality is reduced because of increasing noise.

— Posted by Alex

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330. November  
25th,  
2006  
6:46 am

I work with print. Our cameras are all 8MP and I routinely scale the pictures down to print resolution. The resolution is almost never the issue; rather, it's light sensitivity and quality of the lens. We do buy high resolution pictures from professionals but they have \$5000 cameras with equally expensive lenses.

For the average user, 5MP is plenty, which I believe is the entire point of this article. You only need so much detail; if your camera or software sharpens the image, it will still appear crisp and sharp.

— Posted by Peter Modin

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331. November  
25th,  
2006  
8:17 am

Very stupid test.

Make 3 foto by different camera (not downsize from one photo) then anyone can show you which foto is from which camera.

— Posted by solarus

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332. November  
25th,  
2006  
11:18 am

As pointed out above, the test is flawed- resizing an image produces better quality results than making that same image on different systems with different megapixel counts.

But more importantly, the people used for the test are perfectly happy printing pictures from a website and considering them quality.

Take my parents, that are perfectly fine framing a printout of a 30kb photo of me poster size.

Beauty is in the eye of the beholder.

But you don't see many professional photographers running around with yesterday's cameras- the bigger the megapixels, the bigger the image, provided the camera is "honest" and does not use in-camera interpolation to produce large images by loosing detail.

The moral is, try a 5mp or so camera out, make an 11x14 print with it (of ,say, your family), and if you are happy with it, why not?

If you're looking for real happiness though, ask yourself, why does debunking make you feel so good, and how much power do you give others over your life?

— Posted by debunk\_the\_debunkers

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333. November  
25th,  
2006  
11:19 am

Your are correct in stating that megapixels alone are not the only factor in quality. However, your test is deeply flawed in that it does not test these other factors as they would exist in cameras of different resolution. You miss testing the differences caused by sensor size, lens size, and how the camera processes the digital information from the sensor. These differences would have been noticable.

— Posted by Tom Pratt

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334. November  
25th,  
2006  
12:13 pm

Counting only the number of pixels in the capturing sensor make sense if you consider the same camera. Other then this, it is a summary of influences of all devices the signal is going through until final image. Speaking of the camera part (ae. the number of bits versus pixels: Exlim EX Z60 has 1:5 so you get only 20% of 6 meg. resolution after camera compression).

Very often manufacturer will hide this for the advertising purposes.

My advice: Read between the lines and get extra info.

Wish you good hunting!

— Posted by Zbigniew

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335. November  
25th,  
2006  
12:30 pm

I'm sitting beside a shot taken of my dog in 1999 with an Oly 2020 and blown up to 18 x 24. 2 megapixels only and from 12 inches away every hair is sharp. Yes I use an 8 mp dslr now, but I still think that shot was one of my best. BTW I still use that old Olympus as it has a great lens.

— Posted by Edward D. Snow

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336. November  
25th,  
2006  
12:47 pm

My, my...you certainly stirred up up the tech weenies! As always, the funniest responses are the ones telling you what you should have done.

Good job.

— Posted by Mark Roeyer

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337. November  
25th,  
2006  
1:55 pm

Whoa, wait — you downsampled a big, detail-rich hi-res image as your test? There wasn't even a digital camera involved? C'mon!

Megapixels aren't everything, agreed — the aspects of good image quality have to do with the camera, its in-camera processing software, the lenses, the compression ratio, etc.

But you can't just take a big, beautiful, hi-detail image and scale it down and draw digital camera conclusions.

Next time, try it this way — take a nice, current-model digital SLR and shoot a test photo at full resolution, 8 or 10 megapixels or such. Then go into the camera's settings and start dialing down the resolution — 6 megapixels, 4 megapixels, 2 megapixels and repeat the test shot at each setting. Then tell me if there's a difference in the resulting shots — that'd be interesting.

The only thing you proved here is that you don't need to send off a 75MB 13 Megapixel TIFF file to the lab for a good-looking poster-size print.

Pogue, this kind of misinformation and spurious conclusion-drawing outs you as someone who is talking beyond their understanding.

— Posted by spacesuit6

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338. November  
25th,  
2006  
6:22 pm

I'm astounded at the level of some of these comments. This isn't the thoughtful discussion that usually goes on here.

The vitriol is especially eyebrow-raising when it comes from people who haven't even read the article or understood its intent!

Like #337: "you downsampled a big, detail-rich hi-res image as your test? There wasn't even a digital camera involved?"

Hello!?! Where do you think the photo came from!?!

Anyway, #337, among others, does make this good suggestion:

"Next time, try it this way — take a nice, current-model digital SLR and shoot a test photo at full resolution, 8 or 10 megapixels or such. Then go into the camera's settings and start dialing down the resolution — 6 megapixels, 4 megapixels, 2 megapixels and repeat the test shot at each setting. Then tell me if there's a difference in the resulting shots — that'd be interesting."

OK, how's this? I'll redo the test. I'll take three photos of a detailed still life, as identically as possible, with the Canon 5D at three different megapixel settings: 13 megapixels, 7, and 4.

NOTE: I'll be changing the resolution settings IN CAMERA this time, not in Photoshop.

(The one problem here: #337 also seems to not understand my hypothesis: that you can't see any difference, in any size enlargement a consumer would make, over FIVE MEGAPIXELS. Not 1, not 2-FIVE. The Canon 5D offers only a 4-megapixel setting, not 5. If someone knows of another camera that would let me try, say, 5, 8, and 10 megapixels, name it.)

Then I'll print those three samples at 16x24 again, as I did the first time. I plan to use the professional photo lab again, on the premise that its super-high resolution prints would reveal the most detail.

Here's what I predict:

\* The results will be exactly the same. Average people won't see any difference in the prints.

\* The angry hordes on this blog will be just as dissatisfied with the test, and will still refuse to believe that my theory could be true!

So dudes, here it is: IF YOU CAN THINK OF ANY TWEAKS I SHOULD MAKE TO THIS NEW TEST, SAY IT \*NOW.\*

What say ye?

—Pogue

— Posted by David Pogue

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339. November  
25th,  
2006  
7:12 pm

Obviously I haven't had time to read all the postings, but I think a few people caught the distinction that I suspect is the important one, giving some advantage to the greater Megapixel images.

Correct me if I am wrong, but if post-image taking one want to zoom into a small area of the photo and then blow up that segment, then the quality distinctions between a 5 Meg and 10 Meg image become noticeable. It is quite true that a 5 Meg image is fine for most poster-size uses (or at least 8x10 prints, as has always been the claim). But if one crops a 5 Meg image down to a fraction of the original image and then blows THAT up to poster size, the quality, or lack of it, becomes apparent.

That's my guess...

— Posted by Robin Collins

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340. November  
26th,  
2006  
1:00 am

David, I'll explain it to you. You are a flamebaiting troll. The only thing in your article that was accurate was your prediction that your grenade would rile people...and now you are "astounded" that people actually are riled. I am completely unimpressed with your style of journalism. Have a good life...bye

— Posted by jim

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341. November  
26th,  
2006  
7:24 am

I think this is like internet speed... Eventually it is so fast you CAN'T tell the difference. The human brain is not capable of telling the difference until you quantify it. e.g. 5 megapixels or 13 megapixels  
According to the experiment one could say there is a barrier the brain reaches, or possibly the human eye reaches in this controlled situation.

— Posted by Mike Hie

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342. November  
26th,  
2006  
9:07 am

Check this picture taken with a 4,3 Mp Canon Ixus. Looks ok for me... Now remember this is a JPG-file. Not a rawfile.

Picture taken in garden in Stockholm, Sweden

<http://illemann.com/bilder/buddy.jpg>

(if u like it, tell me ) 😊

— Posted by kent

343. November  
26th,  
2006  
2:10 pm

Two comments on the above posts:

1. Good photographers do NOT crop. I can't recall the last time I cropped, and I don't consider myself a good photographer. If you crop on any regular basis, you need to learn to use the most important hardware in a real photographer's kit: his/her feet.

2. Megapixels don't matter. Let's see, we've had an actual controlled experiment in which this FACT was proven, and still some of us don't believe the results. I think the conclusion is clear: anyone who believes in megapixels myth is doing so because of their religion, and they are ignoring the cold hard facts.

3. The best photos I've seen in the last 12 months were at the studio in LA of a RISD grad who is not a photographer. He is an artist. He doesn't know jack about fstops. He doesn't know jack about lighting. He bought a Rebel kit and some Home Depot lights and got a friend (true artists have amazingly attractive friends) to pose in his loft against a bedsheet as a background. He blew them up to about 4 feet by 5 feet or so. I was stunned. I didn't believe him at first when he showed me his Rebel XT and told me he just shot it on Auto. The color and clarity was spectacular. The resolution was more perfect than perfect. Could I see ever pore on the model's face? No. Why would I want to? They were fabulous images.

And yes, I know how to use guide numbers and learned to shoot sports by setting the focus by the distance meter on my lens, so you johnny-come-lately's who started in this after the invention of autofocus have nothing on me.

Bloo

— Posted by Bloo

344. November  
26th,  
2006  
3:11 pm

My feeling is that the test is flawed. The only way to get a true megapixel comparison is to use the same camera and lens and then use zoom settings to simulate the different megapixels.

Like do it using a 5 megapixel camera, then zoom to 50mm for the 5 megapixel photo, next zoom to 63.5mm for the 8 megapixel photo, then zoom to 80.5mm for the 13 megapixel photo. (My maths may be slightly screwy but the aim is the zoom factor is the square root of the megapixel difference).

Then crop the first two to the same image content as the "13 MP" photo.

None of this erroneous up-rez down-rez interference involved.

Best now to print them to 3 different sets of sizes to learn more. Print the set at 4"x6", and 8"x10" and 16"x20" and maybe a few other standard intermediate sizes and then start making comparisons. With the different print sizes you will see the printer limits appearing.

Remember that you would be working with crops so the quality limits will appear at smaller print sizes.

In my case I went through this zoom and crop exercise years ago when trying to find which megapixel roughly equaled 100 ISO print film. At that time my test showed it was 10-12 megapixels, but in truth about 8 does the job nicely now for me.

My apologies if someone has said the same thing already, I did not read each and every comment.

Regards..... Guy

— Posted by Guy Parsons

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345. November  
26th,  
2006  
5:02 pm

This test reminds me of a lot of bogus, flawed “scientific wannabe” tests of the prosumer audio world. Record a vocal at 44.1kHz, 24 bits resolution. Now down sample that 24bit file to 16bits and then 12bits using professional dithering (like the MegaBit Max algorithm or newer Mbit+). Play those 3 files to the average joe crowd and see the results. I guarantee you that nobody will hear a difference (except some true professionals with good trained ears/brains).

Same goes for that photo test of yours. Flawed. If you START OUT with maximum information available (13 megapixels) and down sample it, the down sampling algorithm makes sure that it is converted in a proper way, hence, nearly no difference. Like others have pointed out here, do a REAL WORLD test and use 3 different cameras, preferably of the same brand, and then see what the results are.

— Posted by bM

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346. November  
26th,  
2006  
5:49 pm

David Pogue (Post 338):

You are not making any difference by choosing different resolutions directly in camera because what the camera does is taking the picture at the maximum resolution and then downsampling it, so this will be the same test that you already made.

The only way to test the difference between megapixels in digital cameras IS to actually use different cameras. I know this is nearly impossible because things like optics, but it is the only way.

In your test you didn't notice any difference between the images because a 13 megapixel image taken with a digital camera has actually 4.33 megapixels so when you downsampled it to 5 megapixel you came with the same level of detail.

The true megapixel myth maybe (and this is what you forgot) is that the megapixel advertised aren't the real one. A 13 megapixel camera has 13 megapixels for ALL colors so because the camera uses 3 colors the output photo has only  $13/3 = 4.33$  megapixels, there are a lot of complicated algorithm to make this but roughly speaking is like a 13 megapixel camera actually takes 4.33 megapixels pictures and enlarge them to 13 megapixels, so when you downsampled it to 5 you came at with the same photo.

This is nothing new, I have seen this like a recommendation even, that in occasions when you have a, for example, 13 megapixel camera you can use it with the settings in 5 megapixel and you are not losing resolution. This doesn't mean that the 13 megapixel camera is the same that a 5 megapixel, it only means that the 13 megapixel originally takes pictures at 4.33 megapixels and the 5 megapixel camera only have 1.66.

— Posted by eee

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347. November  
26th,  
2006  
7:10 pm

Comment #6 (at the moment that I write, at 10:12 am on Nov 21) makes the same point that I was about to try to make, coming from a slightly different point of view. I did the math very roughly for 5 and 13 MP at 16" x 24" (384" sq) to figure that there are about 13,650 pixels/ sq in at the lower density and 35,500 at the higher. Taking the square root that is about 115 and 189 dots per linear inch respectively. The earlier comment considered the resolution of the human eye in microns; I suggest that even a 300 dpi ink jet printer will come close to blurring the dots enough to mask the difference in resolution for even a very sharp eye and a printer with higher resolution would still require the aid of a magnifying glass to be sure of it. I have only seen a Seurat painting in a photograph, with its much larger dots, but it seems to require pretty great magnification in a photo or very close scrutiny of the real thing for them to stand out individually.

— Posted by john davison

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348. November  
26th,  
2006  
8:48 pm

Dear David,

your revised test proposal is just as flawed. Please understand that a 13 MP image from the 5D downsampled to 8MP or even 5MP will not lose much information. In theory, you could pack all information contained in the 5D 13MP image in less than 5MP, indeed, the RAW format, in a sense, is just that - an about 5 MP representation of a 13MP (interpolated) image.

In order to expose "the megapixel lie" properly, you need to compare two Bayer sensors of different MP-number. To keep inconsistencies due to camera differences to a minimum, you could compare a Canon 30D (3 MP) and a Canon Digital Rebel XTI (10 MP). Both cameras use a CMOS sensor of fairly similar make, and importantly, same size. Also, you could use the same lens for both pictures. Most importantly, you can use Adobe Camera Raw to convert RAW images from both cameras using identical settings (I could process them for you, if needed). That's how tests at dpreview.com and other good camera review sites are done.

I believe this test will show the following: 10MP is better than 3MP, even at 8 by 10, but you need fine detail for it to matter.

Best regards,

Frank

— Posted by Frank C. Schroeder

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349. November  
26th,  
2006  
10:56 pm

What I have heard from people that have used the low and high end of the megapixel range that you provide is that you realize the largest difference in things like foliage. I would guess that you would see the least difference in something that enlarges fairly cleanly - say a building. I have a 5 mpix camera that I really like. This was very comforting to me. I am going to go and shoot some more pictures 😊

- Posted by Brent

— Posted by Brent Lossing

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350. November  
26th,  
2006  
11:32 pm

#348 wrote: "your revised test proposal is just as flawed."

I KNEW IT.

This test—where I use the same camera, changing its resolution IN THE CAMERA for each shot, is EXACTLY what 15 of the posters here insisted would be the only true test.

And now you're saying it's equally flawed?!

"you could compare a Canon 30D (3 MP) and a Canon Digital Rebel XTI (10 MP). Both cameras use a CMOS sensor of fairly similar make, and importantly, same size. Also, you could use the same lens for both pictures."

I would happily do that. But you know very well what would happen, don't you?

The locusts would descend, attacking the test as being obviously stupid, since I'm now testing different CAMERAS and not just different resolutions.

Even two Canons have different software, different processor generations, etc.

Any other ideas? Or are we all saying that no perfect test exists?

—Pogue

— Posted by David Pogue

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351. November  
27th,  
2006  
12:05 am

David, as many have pointed out the problem with your initial test was due to the downsampling. It would be like arguing which is faster: a Ferrari at 55mph, a Mini at 55mph, or a Vespa (downhill) at 55mph? Not a meaningful comparison.

However, I believe your revised test (post #339) is a valid way to test your initial hypothesis. It will however be disproven. A 13mp image printed at 16x24" will clearly distinguish itself from a 5mp image printed at 16x24".

Frank's concerns with your revised test (post #349) seems to have overlooked the fact that you agreed not to downsample, but let the 13mp detail be used in its hi-res form. Bayer or not, 13mp of detail will outperform 5mp of detail when printing at 16x24".

I'm puzzled by your confidence in the new test results:

"Here's what I predict:

\* The results will be exactly the same. Average people won't see any difference in the prints."

Handicapping the 13mp image by shooting a subject with little or no detail is the only way this will hold true. Shoot a picture that an "average" person is accustomed to seeing every day, for a REAL test.

For the revised test, shoot an image of the front page of the New York Times. I doubt you'll find one person who believes the 5mp image is \*exactly the same\* as the 13mp image.

Either way, you've created a good discussion. Have fun with it.

Cheers,  
Chris

— Posted by Chris

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352. November  
27th,  
2006  
12:21 am

David (post 350):

Yes, there isn't a perfect test. Like in any experiment there isn't a perfect one. If you take the canon30D and the digital rebel xti I know what will happen. You will see clearly the difference between both of them

— Posted by eee

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353. November  
27th,  
2006  
2:24 am

Rigth David!

Stop the Megapixel madness!!

— Posted by Manuel

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354. November  
27th,  
2006  
2:34 am

very facinating and all. but the high end 10 mega pixel cams are geared towards professional photography or prints meant to be large prints, thats when the

difference becomes aparent. but if a best buy employee is trying to sell a 10 megapixel camera to a sockermom... then yah... thats just rediculous

— Posted by baskotoiea

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355. November  
27th,  
2006  
9:06 am

David,

I have read your updated test suggestion, but it is still flawed.

Digital cameras using Bayer algorithms rely on green pixels for sharpness. They also throw away a lot of the color information before recreating the image to fill all the empty locations.

Furthermore, there are critical limits in all printing processes. If your sense of the results is that 5 MP is enough, then just make the print larger and encourage the viewer to come a little closer. Also, make sure it is not behind glass.

I guarantee you will find a difference among 13, 6.5, and 3.2 MP output from the same camera if you do so.

To be fair, you also need to know that there are cameras out there that have much richer pixel information and respond much better to binning, which is what you are doing when you combine those pixels. Any camera - very few at the moment - with a Foveon ([www.foveon.com](http://www.foveon.com)) imager has full-color imager with complete color information at each location. Although there are fewer locations in these cameras, the stacked sensor construction means that there is far more information per location and none of it is thrown away during processing.

Using one of these cameras available from Sigma, you could repeat your test at full, medium and low resolution with perfect binning. Since all of the pixels are the same, no information is thrown away, and the binning is done by doubling or quadrupling the size of the pixel, you would have a very consistent test device for your "test". Drop me a note if you would like to pick one up on Long Island for test purposes.

— Posted by Laurence Matson

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356. November  
27th,  
2006  
12:53 pm

I haven't rea ALL the comments, but no one in the first few questioned viewing distance. The larger the print, the further back you view it, so resolution is less crytical.

Suggest you do the same test with a 4x6 print, with the resolution bugged.

— Posted by Jim

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357. November  
27th,  
2006  
3:23 pm

Regarding post #338 by David Pogue.

As a saddened Panasonic FZ-20 user who has watched the marketing department ruin a great camera by increasing megapizels with the model number year after year, I would be curious if you tested the Panasonic FZ-50, their latest ten megapixel camera that also has 8, 5, 2 and 2 MP resolution levels. At current levels of technology this 1/1.8 " (7.18 x 5.32 mm) sensor simply can't handle 10 MP above 200 ISO. It is a shame because it has a wonderful Leica lens. I would probably still be a loyal Panasonic upgrader if they didn't insist on increasing MPs and as a consequence lowering image

quality at higher ISOs. Many Panasonic users have complained about the poor ISO performance of their cameras, but Panasonic ignores these complaints and raises the MPs and then changes their imaging engine to paint over the noise in a terribly aggressive way.

— Posted by David Landry

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358. November  
27th,  
2006  
4:17 pm

If an image 1,000 pixels wide is sufficient for printing then a camera that produces images 3,000 pixels wide allows you incredible freedom with composure - especially for macro work - that one can later crop down to the 1,000 pixel wide image.

— Posted by Derek Sikes

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359. November  
27th,  
2006  
4:47 pm

Ok, it comes down to this : screening. the 300dpi rule of thumb came from the desktop publishing industry in the late eighties and early nineties. it's to do with the way the greyscales were imaged using a series of different sized dots on a grid (screen). the grid was for pretty much most magazine quality work either 150lpi (lines per inch) or 175lpi. the rule of thumb developed that to get an accurate pixel colour to dot size representation the dot needed to have more than one pixel of information to draw on. technically you could get away with a resolution of 1.7x the screen resolution. in otherwords if you were printing at 150lpi you'd get away with 220dpi. BUT that meant you couldn't enlarge the scans, so the 300 dpi built in a margin for producing enlargements and/or bumping up the screen resolution.

today, inkjet printers and other technology are not using screening for producing output. instead they use stochastic (FM or dithering) screening, which pretty much can operate at a one to one ratio since it is all about same size dot and varying density (as opposed to screening which is variable dot and consistent frequency). Stochastic screening is what is used on inkjets that have incredibly small dot sizes now and so produce wonderful results (especially as they can be absorbed a bit by the photo glossy paper and merge into each other to create a smooth tone.)

that's why people won't be able to tell the difference...that's why the megapixel thing is a myth.

the skeptic in me also wonders at whether or not the quality of the ccd array matches the increased megapixels or whether the megapixels are just a different rendering of the ccd information...

— Posted by Stu McGregor

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360. November  
27th,  
2006  
6:52 pm

- 1) Yout test is (very) flawed
- 2) Pixels DO count, in everything from printers to digital cameras to FILM!

1) The real test should be images captured with similar sensors with varying megapixels. A very good interpolation program makes it difficult to tell the difference - and if it was done by the lab it was probably using the same number of pixels to print - just adding back more interpolated pixels. Perhaps

use the line of DSLRs from Nikon, since it seems to cover a wide range and uses the same lenses? That would discount lenses and other electronics.

2) Pixels used to capture the image will make a huge difference. It will increase contrast and resolution. Take a picture with a film camera with current film and compare it to images taken 10 years ago. The improvements made in the size of the grains in the emulsions has vastly improved the quality of the images. i.e., More pixels, Better quality. The same is true for "electronic film," too.

Take the same picture (at the same time with remotes) with three Nikons. You'll see a difference.

— Posted by JoeBob

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361. November  
27th,  
2006  
8:41 pm

The only thing this test proves is that you can take three cameras with different megapixels and make the photos appear to look the same. I've seen this test before. It really doesn't mean a lot. Anyone who knows anything about Digital cameras knows that you can produce better image quality from a Canon 5D 12.8 megapixel than from a Canon 300D with 6.2 megapixels. This is fact and has been proven in real tests. Popular Photography magazine - Dpreview.com ect.

— Posted by Milt McIlvaine

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362. November  
27th,  
2006  
10:56 pm

my very first post, buried way at the beginning, proves that only the most discerning eyes will be able to tell the difference. the difference in pixel width is a tenth of millimeter at most

— Posted by superdave

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363. November  
27th,  
2006  
11:17 pm

"On the show, we did a test. We blew up a photograph to 16 x 24 inches at a professional photo lab. One print had 13-megapixel resolution; one had 8; the third had 5. Same exact photo, down-rezzed twice, all three printed at the same poster size. "

While it may be true that no much difference have been observed between all 3 prints - the methodology of this "test" is seriously flawed, pure and simple. And yet a great number of people felt greatly relieved that "the myth has been dispelled". Why not do the following: downsample 5,8 and 13 Megapixel images (taken with 3 different cameras) to 1pixel x 1 pixel and then print 24'x16" pictures ? I am sure that there will be no difference between the pictures (well, they will show nothing, but what the heck...).

What I am trying to say, is that one can set up almost any test to produce any given results. As they teach in the first year of any good engineering course, you can connect any three dots with a straight line - you just need to use a pencil which is thick enough.

Sometimes I watch on TV this idiotic program "Myth Busters". All they bust is their credibility as thinking human beings. There is a lot of showmanship, a lot of ignorance, and not a lot of myth busting there. And yes, I am an engineer.

— Posted by Les

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364. November  
28th,  
2006  
1:32 am

I got tired after reading about 100 responses. It's actually surprising to me how many 'techy' or 'pro' posters didn't get the point of David's test. David, you should be proud of the fact that your article generated so many comments!

— Posted by Richard

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365. November  
28th,  
2006  
1:41 am

from this Canon web site:

[http://www.canon.co.jp/Imaging/enjoydslr/p\\_2\\_017.html](http://www.canon.co.jp/Imaging/enjoydslr/p_2_017.html)

"Even if a smaller sensor has the same number of pixels as a larger sensor, the larger sensor will have larger pixels. Larger pixels are more sensitive, resulting in higher image quality. Therefore, image quality does not depend only on the number of pixels.

Optics, quality build, ergonomics are all more important than mp.

Regardless, what all are missing is not the megapixels in the camera but how that is printed. Blowing up a 5 mp to billboard size will look the same as blowing up a 16 mp. That same technical translation from pixels to printer dots plus the optical changes that impact perception carries over to smaller prints too. That was what Pogue was demonstrating (in a sense.).

Another way to look at it is think of the camera as a scanner. A higher rez scan \*seems\* like it will be better but a color printer will print around 150 dpi (that's printer dots per inch - different from other dpis). So most scanning is fine at about 266 dpi (scan dpi in this case different from screen ppi, printer dpi, and other dpis). Scanning at 2000 dpi is crazy pointless and makes for a giant file size (another problem with high mp cameras).

Most people will be fine 5 to 8 megapixels. Pros 6-8+. Save your money and buy a fine but not latest 5-7 mp camera - DSLR or smaller.

— Posted by JC

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366. November  
28th,  
2006  
7:02 am

The test that was done was inaccurate and inconclusive. The method itself was not really explained. The variables are not fully defined.

DPreview.com makes an extensive comparative tests, pixel per pixel. Which I think should be the model for all would be testers.

Any downsampling or even upsampling will distort the actual data that was recorded when the image was shot.

The test didn't mention anything about the detail that was captured. Did all the cameras capture the same detail?

Were the cameras tested consumer or the semipro or even pro? Were they of the same brand?

I want to believe in this test. But it seems to me its flawed.

— Posted by JBFernandez

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367. November  
28th,  
2006  
9:25 am

As I stated before, to make this a fair test use the SAME camera, the SAME lens and the SAME focal length and exposure settings (as far as possible). Use RAW to avoid jpeg anomalies.

Take a full frame image, MOVE AWAY so that the original scene occupies 75% of the width of the viewfinder and take a picture, repeat at 50%. Crop the last two images to match the original image and then compare.

No up or down resizing, just compare.

Doing that removes ALL variables as far as is possible. I'd do it but my dSLR has only 6 Mpixels.

Come on guys, this is not rocket science.

— Posted by david brunner

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368. November  
28th,  
2006  
10:41 am

I believe that almost all of you are missing the real point here: "The average user."

No offense, but in my experience of being a photographer over the last quarter century, I've found that the average person can't tell the difference between decent photographs from consumer quality cameras and from photographs taken by professionals with the very best equipment. Every serious photographer has seen a client select a mediocre photograph over a great shot. The client is using different criteria than the professional.

Photo quality is not readily discerned by the average person. Similarly, my mother honestly can't tell the difference between music played on a boombox and music played on a high-quality system. I know that I certainly can, and I can do so consistently.

The average person does not have the same concerns as a professional in photography or graphic design. Do more megapixels make sense for the average person? I agree, they don't. I also don't think that, before digital cameras, that the average person would benefit from a Leica over a Canon SureShot. The Canon will do all that the user needs from it: take snapshots.

Most of the vitriol displayed here seems to be rooted in the differences between technical opinions. Your test is deeply flawed from a professional viewpoint. So what? You're not writing for professionals. This is more of a cognitive perception study than a technical optics and resolution study.

All you are proving is that the average person has ALWAYS confused their tools with the results of their tools. I can't count how many times someone asked me: "That's a really great photograph! What camera did you use?" I answer politely, but what I'm thinking is: "I tell you what. Let's take a picture of the same subject with the same camera and we'll see whose picture comes out better."

Lens certainly come into play; the best camera body in the world won't overcome a cruddy lens. I sigh when I see people buy the expensive camera body and then tack on a cheap telephoto lens in order to save money. A camera system is just that: A system.

Does the average person want better pictures? Sure, but I'll guarantee that you will get better results by using a monopod or tripod then you will by using a camera with a few more megapixels. Also, not every scene should be shot from

a standing position. You want a better picture of your child? Trying kneeling for a change.

— Posted by David Goen

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369. November  
28th,  
2006  
10:59 am

Look people, It doesn't matter how much data the image contains if you're printing on a relatively small surface. The printer can only "display" a limited amount of data and therefore result in prints with a negligible VISIBLE difference. We're talking about printed images and PERCEIVED quality, so the limitation is actually on the printer and the human eye... Neither of which, for Pogue's intended audience (the consumer), is very sophisticated.

The perfect test would be to have three cameras custom-built by a manufacturer who produces sensors of differing pixel resolution. Three identical cameras with three different sensors. But as Mr. Pogue points out, this is not available and even that test would be flawed, as sensors have different details to them other than pixels.

The test is flawed, get over it. Is there a difference in image quality between cameras of different pixel depths? YES. (Pogue didn't refute that). Do those pixel depths alone make a lick of difference when printing a relatively small print? NO. Folks, that is the only point Mr. Pogue is making here.

A point all semi-experienced photographers can agree on: Megapixels are far less important than almost any other aspect of a digital camera.

Mr. Pogue, I commend you for attempting to educate the masses.

— Posted by James, DBA

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370. November  
28th,  
2006  
11:05 am

So many people are defending higher-resolution cameras in their comments, talking about lens quality, CCD sensors, etc.

David Pogue performed a science experiment, and he tested it for one factor and one factor only — printing the same image with a different number of megapixels. He effectively debunked the "megapixel myth."

Did he claim a cheap 5-megapixel digicam can take pictures just as well as a 12-megapixel digital SLR? No. There are far more variables involved, and he didn't test those.

But for the average consumer trying to decide between 5 megapixels and 8 megapixels on similar cameras, Mr. Pogue's test might save them a little bit of money and a LOT of hard drive space.

— Posted by BJ Nemeth

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371. November  
28th,  
2006  
12:48 pm

I must point out that the subject of this photo lends itself very well to such an experiment - portraits do not require too many megapixels (and can actually suffer from too much resolution). A landscape shot with a lot of detail might generate a completely different result.

Bottom line, as so many pointed out, it all depends on your photogra[phic] needs, and more megapixels does NOT mean better images automatically.

— Posted by Stas

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372. November  
28th,  
2006  
1:11 pm

David,

Reading all the comments I've gotten a better feel for the message you are trying to send. The end product is what matters, but your "NO DIFFERENCE" approach seems as bad as the camera manufactures' megapixel madness tactics.

I hope in your video segment you do a lot more explanation of factors that can make one camera better than another one. You need to clearly point out that a higher MP camera might, just might, take better photos than a lower MP one.

Might have been more helpful and even entertaining to show some high MP cameras that take worse photos than low MP ones and then some other top notch quality high MP cameras that do really well.

Training consumers that higher MP cameras are a waste of money is not the right approach. Sometimes a higher MP camera is simply a better camera than a lower MP one.

— Posted by Eliot

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373. November  
28th,  
2006  
1:59 pm

#372: "Training consumers that higher MP cameras are a waste of money is not the right approach. Sometimes a higher MP camera is simply a better camera than a lower MP one."

Camera manufacturers and, to a certain degree, many camera review sites have been training consumer to think higher pixel counts are needed to print large prints. David simply illustrated that that might not be true. Since his experiment does not show "Sometimes a higher MP camera is simply a better camera than a lower MP one." it would be dishonest for him to make that statement.

-Richard

— Posted by Richard

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374. November  
28th,  
2006  
2:20 pm

Oh, this is like saying my religion and “theirs” is similar or the christmas tree is the same as a menorah. Camera’s have fanatic’s who will take it as an insult should you make any remark they believe is contrary to the accepted dogma of their set in concrete belief system. Like trolls on a computer forum or blog.... I get your point and love your books.... but the sensor size and pixel count are like a third rail or social security. Ahh, I like the diversity of thought... and I agree on the crop angle.... it makes my photo’s better when I can crop later on and the lower pixel count on the SD 400 stops me. I had a .8 megapixel FD91 and had great shots, but could not crop or print large. Yet it did the job I needed at the time

— Posted by tom McCarty

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375. November  
28th,  
2006  
5:03 pm

Most printers use “enhancement algorithms” which can hide the lacking pixels in a low resolution picture. The differences will then be most obvious in structures where the alorithm does not work very well! The 13 mp picture will in any case be most “true”, with less “guesswork” in the detailed structures.

— Posted by John Larsson

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376. November  
28th,  
2006  
6:07 pm

I wonder however if you have ever had a picture where only a small percentage of the photo needed to be blown up. Like a child’s face that looked priceless at the time the shot was taken — and it occupied 5% of the photo. For this rare occasion — it is worth being safe rather than sorry. For a few hundred more for the camera and media be safe and not sorry. Then again if you can get your kids to generate priceless expressions on demand go with a one-megapixel camera.

— Posted by Rich Tehrani

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377. November  
28th,  
2006  
7:08 pm

You’re letting the same people who formerly recorded off-the-air shows at 6-hour VHS speed, and chose VHS over Beta, judge in a contest to see if picture quality matters.

I think that’s your problem right there. The average person off the street does NOT see picture quality. They’ve been trained to ignore it.

— Posted by Randal L. Schwartz

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378. November  
29th,  
2006  
8:10 am

I have always said there is a lot of baloney spouted around about various aspects of digital photography, not withstanding the raw vs jpeg debate. I

believe the best test always comes from the viewers own eye, both on screen and in print. I have shot equally as good images with my wife's 7mp camera as I have from my own 10.3mp large cmos sensor camera. At the end of the day imaging is about skill of the photographer as much as it is about cameras and their megapixels.

— Posted by Keith

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379. November  
29th,  
2006  
1:04 pm

Would have preferred an experiment with different cameras (even use the same manufacturer for the sake of control) on their highest settings instead of one camera dialed down so you could get a comparison of price per megapixel (I drive by Discovery's HQ on a regular basis - they have the money). Once the manufacturers started making cameras with resolution greater than 4MP, meaning the pictures' resolution was virtually equal to 35mm, the vast majority of photographers would be satisfied. I upped from 3.2 HP camera to a 7 MP Nikon. There was a noticeable difference in quality not just in resolution but focus and light balancing. I've also used an 8 MP Canon Powershot (hated it - had to give everyone who volunteered to take it so I could get into picture a master's class in "hold from the sides - if you touch the front the camera will turn off before the picture snaps") and 4 and 7 MP Fujis (great outdoors, indoor shots seem out of focus). Since I'm not a professional photographer, I probably will not bother upgrading again until the manufacturers come up with some new super cool innovation - like decently sized internal hard drives so I don't have to spend \$30+ on SD cards on top of the \$300 for the camera and be locked into a particular media format for future purchases (hint: if any company reps are reading - 8 GB flash drive in the Ipod Nano and you're making us buy memory cards?).

— Posted by MR

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380. November  
29th,  
2006  
1:59 pm

Dear Mr. Pogue,

Try this methodology:

Use only one High resolution camera (Nikon D200, Canon 5D, Nikon D2Xs, Leica DMR + R9, CANon 1Ds mk2.

Choose subjects that have a fair amount of detail and keep the lighting conditions the same.

Use a zoom lens (preferably a high quality one with constant aperture) with sufficient focal length range to cover the cropping from say 16mp to 5 or 6 mp.

Keep everything the same -distance to subject, aperture and exposure, lighting, processing, etc.

Or you can send me an FTP address and I'll send you my results which you can then print (offer open only to David Pogue)

— Posted by Ellis Vener

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381. November  
29th,  
2006  
5:39 pm

This is true because I have a C-5060 and another guy has an E300 and everyone I know tells me the photos he makes suck and the ones I make are far

better.

Debunk the myth!

— Posted by Kevin

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382. November  
29th,  
2006  
6:43 pm

The number and variety of responses to the original test is really quite amazing...but, then again, not too surprising. The photo mags and other media have been labeling the ever-increasing resolution competition between digital camera brands as “The Megapixel Wars” for several years now. The issue is one of high interest, and most people don’t know what to believe anymore. The Pogue test doesn’t help things much.

David: I would like to suggest testing that might satisfy the doubters and also enable something in the way of definitive conclusions.

First, by all means shoot with the same camera. If you’re going to use the Canon 5D, I imagine you’ll be shooting all JPEG since the 5D can only capture RAW at its highest resolution. Fine. Set the Picture Style to Standard and make sure that Noise Reduction is turned OFF.

Second, shoot a complex landscape with much in the way of foliage detail....at least, as much as can be found during this near-winter weather. Tree bark, pine needles, naked branches all the way to the top of the trees would be ok. You don’t need “green,” per se. You need detail..and lots of it. Dirt and red gravel at the base of a tree is detail, bark is detail, thin branches represent detail, etc. If you can find some green and other colors, great.

Whatever you do, don’t shoot a facial portrait or a big building or any other broad and even surface as subject matter for the test. That’s not a test. In fact, in amateur hands, lower resolution cameras are often more suited for everyday portraiture because they’re very forgiving cameras. (Go to [www.reidsreviews.com](http://www.reidsreviews.com) for Shawn Reid’s wonderful essay on the “broad stroke” rendering of low-rez cameras and why, in certain situations and for certain subjects, they are preferable.)

Use Photoshot Elements 3.0 or 4.0 to process the images, but don’t process them to the nth degree. Assuming you’ve taken a half-way decent shot, just use “Auto” for the levels, then tweak all of the images identically. Don’t go too far with any of this, and, NO MATTER WHAT, don’t sharpen beyond an amount of 300, a radius of .3 and a threshold of zero. In fact, just use those settings and be done with it.

Then, print all of the images to the SAME large size. I suspect a 10” X 15” print on 13” X 19” paper should suffice. Larger would be better (17” X 22”). DON’T interpolate anything. Just increase the size percentage for the smaller rez pics. For example, print the lowest rez pic at 180% or whatever it takes to get it up to a 15” width.

I guarantee that anyone off the street will be able to see the difference between a non-interpolated 4MP pic and a non-interpolated 13MP pic pretty much right off the bat...and they’ll be able to articulate the differences, too.

Good luck.

— Posted by Steve

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383. November  
30th,  
2006  
4:29 pm

I just read your article, Saving Home Movies From Disappearing Formats, and I was surprised by your not having referenced the very insightful NY Times

Magazine article that detailed the NYT Year 3000 time capsule initiative. That article thoroughly convinced me of the futility in believing that ANY media is permanent, though I've not begun to etch photographs in nickel. I chose to make the family photographs, video, and important information readily accessible via the kitchen/dining/family room computer-driven TV so that my children's appreciation will cause them, hopefully, to recognize its importance and continue the preservation. I believe that this screensaver has had a very positive impact on my family, and several friends have been inspired to create their own. How about focusing on improving accessibility in your articles? Thanks for your wisdom and humor! I'm looking forward to the TV show.

Best wishes,  
Dan

— Posted by Daniel Soileau

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384. November  
30th,  
2006  
9:07 pm

David,

As others have correctly stated, the problem with the test as performed is that digital cameras (except for the handful that use Foveon sensors) ALL use interpolation to achieve the stated megapixels, because the Bayer pattern sensors require that the camera interpolate 2/3 of the color values for each output pixel. Because of this, you can scale down to 1/4 the megapixels and still retain 100% of the image detail.

So, how would you do this test fairly? One way is to take a very high resolution image, and then scale it down to resolutions that are ALL no more than 1/4 of the original megapixels. For example, shoot with a 12MP camera, then scale down to 3MP and 1.5MP and print those to 8x10. The 12MP and 3MP prints should be identical, but the 1.5MP print should show significantly less detail.

Or shoot with digital SLRs that are very, very similar except for megapixels. Nikon DSLRs lend themselves well to this, because they all use precisely the same sensor size, and all current models have extremely similar noise and image processing characteristics (both of which can be standardized by shooting RAW and processing with the same RAW conversion settings). For example, use a D40, a D80 and a D2Xs with a very sharp lens (e.g. 50mm f/1.8 at f/9).

You could also pick similar models of pocket cameras that differ only in megapixels but use the same optics, for example a Sony DSC-W50 and DSC-W70.

antonio

— Posted by Antonio Tejada

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385. December 4th,  
2006  
1:52 am

I am having a tough time getting used to my little digital camera: I want to focus it, I want to adjust the depth of field, I want to fine tune the zoom, I want to steady it by planting the camera in the palm of my hand and my elbow in my waist, etc etc. And now you tell my 7 megapixels are worthless?

I'm going out and buying all the film I can find!

— Posted by Ilene

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386. December 4th,  
2006  
6:28 am

Yes digital is nice but I'm not ready to give up my Nikon F2s and Kodachrome. I can enlarge as big as I want with a good chrome!

— Posted by D. Dunne

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387. December 4th,  
2006  
7:00 am

How many of your readers (or others) really make blow -ups. Many people are happily satisfied with 4x6's that they can show to their friends and neighbors. If there are people out there that wish blow-ups, then they should buy the mp. that they think they need. I think that the only people that want or need large pictures are male. My wife could care less.

— Posted by D.Noda

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388. December 4th,  
2006  
11:21 am

The "professional quality photo lab" has a physical resolution limit, which is probably below the 5Mpix range — hence all your images would be printed at lower resolution than that. It's basically like projecting a negative through an LCD screen onto regular film, which is then developed. NOBODY has 13Mpix LCD screens yet.

— Posted by L.H.

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389. December 4th,  
2006  
11:28 am

David, what you write is fine if you are making prints for home use or even framed display, but it is not true for commercial photo work, or if you can't fit the entire subject in the full frame and have to crop in, which sacrifices resolution.

— Posted by Lee Busch

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390. December 4th,  
2006  
11:36 am

I'm thinking about my first digital camera, so thanks. I will get a 5 or 6 megapixel. Thanks I know that I can't tell the difference.

— Posted by J. Pearson

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391. December 4th,  
2006  
11:50 am

The great thing about this article is that it effectively communicates a simple truth, that the number of megapixels on a given camera's sensor is only ONE aspect of the total process that is photography. Like playing a musical instrument, photography involves a creative process that is both profound and filled with nuances as well as technical expertise. This "megapixel myth" has about as much value to that creative process as playing "Twinkle Twinkle Little Star" does to a Beethoven concerto. Anyone buying a 13mp camera will hopefully have some creative purpose for doing so that goes beyond the

numbers alone. If not, what a waste. You can play Twinkle Twinkle Little Star on a Steinway Concert Grand piano, but it still won't sound like Beethoven.

— Posted by Vlad G. Spitzer

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392. December 4th,  
2006  
12:04 pm

The real reason to buy a high MP camera has very little to do with the initial quality of the captured image. Not all cameras have wide range zooming capabilities. You can take a wide shot with the subject of your photo lost somewhere in the frame, and with cropping you can get a very good quality shot that can then be blown up. It makes it so that composition and framing can be done offline. Also there is nothing to say that you must take all photos at the highest resolution. A higher MP camera simply gives you a greater range of options for image capture. And lastly, many people today are using their big screen televisions as slide show presentations, like screensavers, cropping and zooming to fill the screen and to frame their subjects is easier, as well as picture panning and panoramics as part of the presentation. All these options are easier with a higher initial resolution image.

— Posted by Jeff Duer

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393. December 4th,  
2006  
12:30 pm

I made tests similar to yours, using 17"x22" and 20"x24" prints, with a variety of lay people and had somewhat comparable results, up to a point. The best prints were made using normal Photoshop sharpening and noise reduction, nothing fancy. These were made from JPEG files made with a 5MP 1/2.5" Kodak z730 and from a 6 MP Kodak 1/1.8" z760, a RAW file made with a large sensor 10.3MP Sony DSC-R1, a scanned TIFF file from 4x5 color negative, and a RAW file made from an 8 MP 1/1.8" Kodak P880. Of all of the cameras tested, these had the best sharpness and the best acceptance by most people. I also tried this experiment with bracketed low ISO RAW files of bright outdoor scenes taken with an 8 MP Olympus SP-350, a 6 MP large sensor Nikon D100 SLR, and a 7 MP Sony 1/1.6" DSC-V3 but, surprisingly, with noticeably less sharp results - these cameras were simply less sharp in repeated testing under optimum conditions. At low ISO levels outdoors or with flash, most cameras do not show excessive noise and the limiting factors appears to be camera shake and the quality of the lens resolution.

Beyond that, most people tended to react more favorably to higher edge sharpness, higher color saturation and higher contrast rather than softer but sharper images. A professional photographer or view camera enthusiast might, with careful inspection, see differences but usually only close up.

— Posted by Joe Kashi

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394. December 4th,  
2006  
1:10 pm

The fact that you used the same exact image in three versions strikes me as an imperfect test. I would like to see the same photo taken with three different cameras of varying megapixel size.

— Posted by Deb

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395. December 4th,

2006  
2:08 pm

David,

I agree with another post that there is a difference between resampling or "down-rezzing" and shooting with camera of differing resolutions. Another critical difference is the output device. I work in pre-press for a digital print house that does large format printing. Some of our machines, the photo quality printers, all produce exceptional quality prints with a file resolution of 100 pixels per inch at output size. These printers will deliver very good quality prints down to about 60 ppi at output size. Others require 150 ppi for high quality. Still others require even more information for quality output. We have sent progressively resampled (down-rezzed) images to all of our printers and found their thresholds of image degradation, the least amount of information (smallest file size) that will still produce high quality results. Our findings are that output device means as much or more than input device.

— Posted by Tim Phillips

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396. December 4th,  
2006  
2:52 pm

Overall I think the theory of the test is sound - and that most "people on the street" have a hard time telling the difference between multi-pixeled images. AS everyone has already talked about though, there are just so many variables there's no way to make this 100% accurate.

One thing to note however, is that sometimes more pixels \*ARE\* necessary. For instance, being able to crop large sections of an image and have a fair amount left over...or, if you sell images via a stock agency that requires a particular image size, etc. Otherwise I do agree that "most" everyday consumers will do just fine with something no larger than 5-6 megapixels.

— Posted by Greg H.

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397. December 4th,  
2006  
3:14 pm

Not surprising; I've long known that it's not the tool, it's the craftsman.

Ansel Adams did more with a veritable shoebox than most people will EVER do with the fanciest of pro dSLR's.

Aside from that, on a tool-specific note, it's not the megapixels, it's the optics - crappy optics will get you crappy images with the same/similar mp sensors.

— Posted by terry

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398. December 4th,  
2006  
4:04 pm

Hi I have been a professional photographer who about 5 years ago switched over to digital. In my opinion the resolution does make a difference, furthermore, the size of the chip makes even greater difference. For example the image at 8mp on a ASP type of sansor vs. sensors on the basic consumer cameras.

Enjoy.

Greg

— Posted by Greg Khitrov

399. December 4th,  
2006  
5:02 pm

Too many of you overemphasize the technical side of the capture. So what if you can see tons of detail in a mediocre image? There are people who like cameras and those who like pictures. I am in the latter group. I do have nice cameras and lenses but to me they are just tools to make pictures.

— Posted by akimbo

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400. December 4th,  
2006  
6:03 pm

As an early adopter of digital cameras (more than 8 years ago)I agree that high megapixels in a consumer camera is unnecessary. I currently use a 3mp Canon 2IS with image stabiliser which does a wonderful job at maximum zoom of 10X. The print quality is first class - even if they are cropped.

— Posted by Eric Sandblom

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401. December 4th,  
2006  
7:04 pm

On the show, we did a test. We blew up a photograph to 16 x 24 inches at a professional photo lab. One print had 13-megapixel resolution; one had 8; the third had 5. Same exact photo, down-rezzed twice, all three printed at the same poster size.

THIS TEST IS USELESS. Sorry, but this tells me nothing. I could have done this test capturing the same transparency with three scanners - one scanner scans at some very high resolution with superior optics - they other scanner being terrible - then DOWNSAMPLETHEM to the same resolution THEN PRINT on the same printer - what does this show me ? How can any reasonable human actually think this would help show me one davantage over the other resolution wise - if there was any small detail that one camera captured that the other missed, you just THREW IT AWAY befoe you printed it - am I totally missing something here ?

Michael Jahn  
[michaelejahn@gmail.com](mailto:michaelejahn@gmail.com)  
Simi Valley, CA

— Posted by Michael Jahn

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402. December 4th,  
2006  
7:19 pm

The discussion so far, passes over a point important to lousy photographers (like me). I not only rely on AF, and AE to get a decent shot, but I can't seem properly frame many shots.

I certainly cannot tell the difference between 5MP and 10MP, BUT often I need to start with >7MPto end up with 5MP.

— Posted by Glen S. Miranker

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403. December 4th,  
2006  
11:23 pm

Storm in a teacup, as Brits are wont to say. Reminds me of the hi-fi experts who insist that even though most listeners cannot hear beyond 20K hertz, their

hearing pleasure benefits from harmonics, say, in the 40K range. But to me, the \$800 Revox I abandoned for a \$6,000 Accuphase sounded the same. Then there are Eric Asimov's friends who taste everything from licorice to cedar to earth in the wines they rate.

I have never tasted those flavors (but then, I have never really eaten earth or cedar, so how would I know?) But I have found some smashing wines in the \$10 - \$15 range that seem to equal or better some I've had that were twice as expensive. So, perhaps tweaking one or another variable in David's pixel test could make the comparison a bit more perfect, albeit possibly less than most people could detect. His basic premise is nevertheless sound: it is wasteful to blow one's bank account in a pixel chase, when in fact other factors — such as the photographer's artistic bent — are more crucial to the outcome.

— Posted by Holly

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404. December 4th,  
2006  
11:48 pm

I had been a longtime fan of David Pogue's columns until I read this one - particularly his cavalier responses to his readers. The intentional opacity of his test method - how many posts did it take before folks even had a handle on what he was saying he did? - and his dismissive responses - none of which address the valid technical points made by his critics, lower him in my estimation.

I remember deciding in my teens to ignore all reviews of hi fi and camera equipment in a "righteously" independent consumer testing publication when I saw that it tested lenses solely by focusing on the horizon and did not test hi fi electronics for signal-to-noise ratio (hiss) or harmonic distortion (fuzz). I did not see David Pogue as another self-righteous ingoramus (of the "anyone who understands the industry lingo must be part of their conspiracy" sort) until I happened upon this thread today.

Pogue complains that folks make opposite criticisms of his method, but he ignores that he created that confusion by not giving any details of what he did, forcing us to speculate on where he went off the rails.

At no point has he responded to those who have pointed out, again and again, that the output resolution of the printer could have made the entire test pointless: if it's no better than the lowest resolution image, it will blur the sharper images down to the same point. As a prior poster noted, it's like making a cassette copy of an SACD and a CD and then saying that no one you've played it for can tell the difference.

Nor has he responded to the repeated patient explanations that the megapixel count of almost all digital cameras is composed of interpolated values based on real data smaller than the smallest compressed ("derezzed") files he produced. Since all of the files are then set to the same size in the process of printing, and all are based on the same basic data, all he's really testing are the compression - expansion routines, not the value of more-expensive cameras.

Rest assured that since camera-makers are chasing consumers by touting megapixels, just as a 13 MP camera is working from only a quarter of that much data, a 5 MP camera is doing the same thing. That's why it's unfair to simply compress the same file by varying amounts - they're all based on the same amount of data, and thus have no bearing on the issue before the consumer: should I buy this 12 MP camera that captures 3 MP of real data, or should I buy that 5 MP camera that captures 1.33 MP of real data?

Assuming that his print shop can clearly reproduce all the detail in a 12 MP image, the only question he has addressed is thus: Should I set my 12 MP camera to write 12 MP files or 5 MP files?

Stop the presses: "You can fit more images on your memory card if you set your camera to write smaller JPEGs!" (I guess that headline just didn't appeal to him.)

MR. Pogue has received, in the course of this thread, over and over again, two roughly-equivalent recommendations on how to do an honest test of the effect of different megapixels: Using one camera, one lens, and the highest-resolution setting, take three shots: one of the target from close-range and then either move back or zoom out so that the target area covers fewer pixels of the sensor, corresponding to the lower-resolutions.

Then crop two smaller segments from the "zoomed-out" shots that cover the same target area as with the close-up. The cropped shots would have fewer megapixels covering the same subject as the full-frame shot. Print all three pictures of the target the same large size, with no post-processing.

No worry about different processors, different lenses, different anything.

Why hasn't he explained why he won't do this simple test - or even acknowledged it? Is it because his mind is made up that he was right to buy a cheap camera and he doesn't want to be confused by facts?

Phil

— Posted by Phil

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405. December 5th,  
2006  
12:21 am

I keep hearing that this camera or that camera take better pictures. Put the camera on a table, walk away from it, and see if it takes a picture. The point is that people use cameras. The human element introduces camera shake, out of focus images, over- or under-exposure, poor framing, bad locations, bad subjects, low expectations and poor attitudes. A good photographer is actually putting conscious THOUGHT into each of those parts of his or her photograph. The term point-and-shoot represents a mindless hope-beyond-hope that the camera you hold can do all the above-mentioned things on its own once you jab at the shutter release button. A couple helpful websites: At <http://www.dpreview.com> you can see actual images, taken by different cameras, in different price and megapixel ranges, so that the average consumer and the jaded professional can make an intelligent camera buying decision. There is a huge amount of digital photography knowledge on that site. Also, there are many picture storage sites on the web, but one I like is <http://www.pbase.com> because you can search by camera, if you wish, to see what real people do with their varied pieces of photographic gear. In summary, YOU determine the quality of your photos. The equipment is secondary.

— Posted by Dan Eakin

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406. December 5th,  
2006  
1:10 am

I am glad some has done this experiments - I have been saying this for years - 5 to be excate. Mega Pixels is to cameras what processor speed did for computers - i.e. they sold computers for years on faster processor speed.

Like all things in life it is about the sum of its parts and you are better buying a lower resolution with a very good lens (as it is that which captures the light) than to massive Mega Pixels.

I have a 3mp Nikon bought in 2001 and regularly print to A3 on epsom printer bought at the same time and once on the wall nobody knows its not a traditional photo. So by using a pro lab the results can only be better.

So spend your money on a good camera with the best lens you can afford and the mega pixels will be enough with all modern cameras. You only have to look at the pictures NASA gets - file sizes not massive (at least historically) but image quality is very good - its the lenes.

— Posted by Andy Osborne

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407. December 5th,  
2006  
6:30 am

I think many people are missing the point. This is an education for the average consumer, the ones most affected by the marketing departments of the camera companies. I have been trolling the technical publications of the Sony Electronics CX News site. Every advance in CCD production in the last five years has seemed to go into higher Megapixels. The sensitivity (better low light, less noise) and saturation (dynamic range) numbers have remained virually the same over this period. This is in spite of the fact that they have dramatically improved the microlens and the effective sensor area, you would think they would have given us a little bit of something other than more Megapixels. I guess the marketing department rules the day still. People WILL buy cameras based solely on a better Megapixel rating. But have you noticed that the sensors are starting to get a little bit larger lately. Physics is starting to intrude a tiny bit with the Megapixel race (think diffraction and the fact that many cameras cannot be set past F8). So perhaps the Engineering Dept. will yell HURRAH, and the Marketing Dept. will cry BOO HOO.

— Posted by Lester Haller

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408. December 5th,  
2006  
7:35 pm

mp is not the only variable. if you were able to hold everything else constant and only change the mp count, I think there should be a difference. lighting aperture speed, ISO setting, noise reduction software, all contribute. size and quality of the len will make an impact as well. I do agree however, the skill of the photographer does contribute. I had the first generation cannon A20 with only 2mp and it takes better pictures than a new Exlim with 4mp. just adding to the chatter

— Posted by Samuel Suen

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409. December 6th,  
2006  
11:28 am

#404 wrote:

"Pogue complains that folks make opposite criticisms of his method, but he ignores that he created that confusion by not giving any details of what he did, forcing us to speculate on where he went off the rails."

What details would you like? I took a 13-megapixel professional shot from a Canon 5D, filled with detail and texture. Downrezzed it in Photoshop to 8 and then 5 megapixels. Sent the three shots to a professional photo lab. Had each printed at 16x24. Posted them on a wall in Times Square. Stopped people on the street and asked them if they could see the difference.

"At no point has he responded to those who have pointed out, again and again, that the output resolution of the printer could have made the entire test pointless"

Because I don't understand! If the world's top-of-the-line, most expensive professional photo lab isn't good enough, then how will people expect to see the difference on their home inkjets?

I welcome YOUR suggestions as to what printer to use, with the understanding that my test is aimed at ordinary consumers.

"Nor has he responded to the repeated patient explanations that the megapixel count of almost all digital cameras is composed of interpolated values based on real data smaller than the smallest compressed ("derezzed") files he produced."

But wouldn't that be true of anyone printing any photos then? And therefore it's just what ordinary people will experience?

And therefore the whole "You need more megapixels" spiel from the camera makers is more baloney than ever?

Which was my point?

"Stop the presses: "You can fit more images on your memory card if you set your camera to write smaller JPEGs!" (I guess that headline just didn't appeal to him.)"

No, THAT IS PRECISELY my point.

More megapixels than about 5 is pointless. Fills up your camera's card faster, takes longer to download, fills up your hard drive faster, introduces noise on the sensor's photo sites... that's just exactly WHY I say you don't need >5 (except for the cropping freedom, of course).

"MR. Pogue has received, in the course of this thread, over and over again, two roughly-equivalent recommendations on how to do an honest test of the effect of different megapixels: Using one camera, one lens, and the highest-resolution setting, take three shots: one of the target from close-range and then either move back or zoom out so that the target area covers fewer pixels of the sensor, corresponding to the lower-resolutions....Why hasn't he explained why he won't do this simple test - or even acknowledged it? Is it because his mind is made up that he was right to buy a cheap camera and he doesn't want to be confused by facts?"

Actually, I have responded off-line to Ellis's proposal to do exactly that. He's the technical editor for a photography magazine, and has offered by email to conduct this test. I'm waiting to hear from him.

In other words, I'm anything but dismissive—I've been asking readers for 2 weeks to propose a better test, with the obvious intention of repeating it!

But Phil, you will perhaps be astounded when this test, too, is attacked by the hordes. I feel confident of that. It's the way of the blog.

—Pogue

— Posted by David Pogue

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410. December 7th,  
2006  
7:06 pm

It sounds right to me that you wouldn't be able to tell the difference between

5mp and 13mp on a print at 16"x24". On a much larger print maybe, but the MPs when printed can only give as much detail as the printer can. And there is a certain level to where the paper can even hold some much resolution. And also a level to where the human eye can interpret so much resolution.

— Posted by Mr. JMW

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411. December 8th,  
2006  
2:15 am

In my portfolio I have one picture 20×30 sm (9"x11"), printed from scanned image 1536×1024 dots - 1.5 megapixels. Nobody see the difference between this one and other 8Mpix pictures 😊

— Posted by yurikim

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412. December 8th,  
2006  
1:30 pm

. . . and from the dslr forums around the net was heard a great wailing and knashing of teeth.

— Posted by mbw

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413. December 8th,  
2006  
1:52 pm

on #412 that should be gnashing, not knashing.

— Posted by mbw

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414. December 9th,  
2006  
1:38 am

David, I did a similar test a few years ago with a friend's Canon Poweshot G3 and my Olympus C8080WZ. Set the cameras on a tripod and repeat the identical scene and exposure a different camera resolution settings from maximum, all the way down to 480×640. The images were all printed on my Epson Stylus Photo 960 at maximum printer resolution on 8×10 Epson Premium Glossy Photo paper.

Results:

The difference between 2 & 3 MP was obvious.

The difference between 3 & 4 MP was slight and evident only as a minor improvement in edge sharpness.

Between 4 & 5 MP the difference could only be observed with a loop or your nose right up to the prints. Again, only minor edge sharpness.

5 MP and larger images showed no discernable difference in full frame 8×10 prints in high quality paper from a high quality photo printer.

All things being equal, quality optics are more important than pixel numbers.

If all you are doing is making typically sized prints, you don't need huge numbers of pixels.

Cheers!

— Posted by Bob W

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416. December 11th,  
2006  
8:01 am

Hello David.

I believe I may have the solution for the ideal test, and (fearlessly, or, foolishly) present the logic why this is so.

-The very large quantity of pixels in the image file produced by a 10 megapixel camera need to be "distributed" or "spread around" very little to cover the surface area of a 16x24" print. As a result, the pixel count per inch is very high and the print appears to have excellent, lets call it detail.

-The large quantity of pixels from an 8 megapixel camera need to be distributed a fair amount more to cover a 16x24" print, since there are fewer of them compared to the quantity produced by a 10 megapixel camera.

-Finally, The relatively small quantity of pixels from a 5 megapixel camera need to be distributed a lot more to cover the surface area of a 16x24" print, since there are quite a bit fewer of them compared to the quantity produced by an 8 or a 10 megapixel camera.

Eventually too few pixels are "spread around / distributed" across a given print surface area and the result is a print that lacks "detail".

You are reporting that the quantity of pixels produced by a 5mp camera is sufficient so that one cannot see the difference between a 16x24" print made from a 5mp camera and those made from an 8 or a 10mp camera.

I suspect you are correct.

\*\*\* Here is the test I propose:

One camera, one fixed focal length lens so as not to introduce variables inherent in different focal lengths of a zoom lens, one highly detailed test subject photographed from one distance so that detail to be captured by the sensor does not become smaller due to backing away the camera.

- Shoot 1 (one) 10 mega pixel image, with the 10.1 mp Canon Rebel Xti. - Label that file "Original".

- Make 3 copies of the file. Label the 3 identical files as follows:  
10mp, 8mp and 5mp.

1] Open the file named "10mp" in Photoshop.

Size the file so that the pixels in the 10mp file are distributed so as to cover the surface area of a 16x24" print.

Make 1 16x24" print from this file which contains 10mp.

2] Open the file named "8mp" in Photoshop.

Crop the file named 8mp so that the surface area after the cropping has been done corresponds to "8 million" pixels. (I'll let you do the math) Size the file so that the pixels in the 8mp file are distributed so as to cover the surface area of a 16x24" print.

Make 1 16x24" print from this file which contains 8mp.

3] Open the file named "5mp" in Photoshop.

Crop the file named 5mp so that the surface area after the cropping has been done corresponds to "5 million" pixels. (I'll let you do the math) Size the file so that the pixels in the 5mp file are distributed so as to cover the surface area of a 16x24" print.

Make 1 16x24" print from this file that contains 5mp.

(Note: CROP the file, always using a RATIO of 16x24, (do not downsize, downrezz or resample the file), so as to REDUCE THE total QUANTITY of pixels from 10 mp to the lower quantities of 8mp and 5mp) (Sorry for the upper caps, I would have preferred underscore or bold formatting...)

\*\*\* All factors except the quantity of pixels available to make the prints will remain the same.

We would have a test made with image files from the same original file, only with fewer pixels, therefore making for a fair comparison between the quality of prints made from cameras, that, all other things being equal, produce 5, 8 and 10 mega pixel files.

\*\*\* Note: When evaluating the 3 prints, judge only the area near the center of the 3 prints, because keen observers will point out that the corners of the "10mp" file will naturally be less sharp than the corners of the "8mp" and "5mp" files which benefitted from cropping out the softer edges of the image circle formed by the lens.

Note to David: I emailed you earlier with the suggestion also presented by others for a test where you would have dialed in lower resolution settings using the same camera. That was good but not critic proof. My apologies.

Cheers,  
Michel Heroux,  
Free Spirit Photography Studio,  
Kelowna, BC, Canada.  
[www.TheBigPictureStudio.com](http://www.TheBigPictureStudio.com)  
1-250-868-2196

— Posted by Michel Héroux

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417. December 11th,  
2006  
8:25 pm

NERDS

— Posted by Josh

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418. December 12th,  
2006  
1:35 am

David,

I posted way back in the beginning (#36) that I agree with you. Many posts have enlightened me about the multitude of issues that are involved. (I actually spent several hours reading them all...) Thank you, (as well as many of the other contributors) for stimulating such an interesting discussion.

I've learned quite a lot...

and I still agree with your conclusion.

— Posted by Bob

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419. December 12th,  
2006  
2:02 pm

Interesting test, but I have to agree with the other posters who claim the test is flawed from the resolution change. If you had to shrink all the file resolutions down to the printed poster size (in an image editing program, in the printer's processing, or both), then any differences in resolution are due to the shrinking. Likewise, if you enlarged all the prints, the differences would depend on the quality of the software and/or printer used to enlarge the prints.

Now, I'm not saying that more pixels equals better prints, but I think that any of these tests is going to be flawed by the method used to test it. (Case in point on the resolution issue: a 4.1MP Nikon D2H produces enlarged 6MP images as good as or better than a 6MP Nikon D100, because of the amount of information captured and the quality of the software's interpolation.) About the most pure test I can think of would be to take pictures of some very fine details and then compare each image at full resolution on a computer screen to see which captures the most detail. Of course, then you're dealing with different lenses, cameras, etc. (And you can't scale the resolution within the camera,

because then you're focusing - no pun intended - on the quality of the camera's built-in scaling!)

Bottom line: I've always known that the number of pixels is not always an indicator of the quality of an image, and this experiment was very thought provoking. I think the conclusion is wrong, but I don't think you can do it right no matter what you do. 😊 Thanks for the interesting work.

— Posted by Mike

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420. December 12th,  
2006  
6:50 pm

Hi,

Although it probably makes little difference, I am a VLSI electrical engineer with graduate degrees in CS, EE, and biochemistry. I design, build, and test CCDs for a living. In many ways, the "Megapixel Myth/Race" is what puts food on my table. So I can really appreciate reading these comments.

What is frightening to me is that David Pogue is essentially correct. His original experimental design is about as good as I could do. The design is difficult because you cannot use different cameras of differing total pixel count (from what is available today). The reason? Pixel density. The same camera must be used to maintain pixel density (pixels per unit area of the focal plane). Pixel density must be maintained because parasitics, such as noise, on the plane must be similar across each photo and can affect image quality. Pogue is absolutely correct in this regard. If different cameras were to be used, differences in image quality could also be attributed to FP design and not just pixel count. FP size must increase proportionally w/ pixel count to maintain constant density. (Note that I did not comment on his use of software to downsample the image. . .)

Also, #384 is the one of the few posts that really hit the dot. The discussion on Bayer patterns and his suggested test resolutions are significant. Also relevant was the comment on the Shannon sampling theorem. I will not repeat what has already been stated.

As a scientist (besides my work in engineering, I also have had the privilege of running experiments in the health sciences, mainly cloning and blotting experiments), it is extremely difficult to design a good experiment. From designing a clearly stated hypothesis to creating appropriate control and test groups, experiments are difficult to design. There seems to be far too many armchair scientists posting who have modifications to Mr. Pogue's experiment which would actually increase the number of variables.

The one advantage that digital camera makers have over consumers is that few people have the financial means to run an experiment to plug the holes that people have pointed out in Mr. Pogue's experiment.

Furthermore, people like myself have a vested interest in this market. Also, psychologically, people always try to accommodate for any dissonance in their beliefs. If you paid a lot for a camera with higher pixel count, we would innately try to resolve within ourselves the reasons for that purchase. Also it is always easier to poke holes in someone else's experiment than to actually design one.

Regardless of what I or anyone else says, congratulations on an article that comes as close as possible to proving your point.

Thank you.

— Posted by The VLSI Guy

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421. December 12th,  
2006  
8:59 pm

VLSI Guy:

I think that you are wrong, this test is far from proving the point. If #384 hit the dot, a better test would be one where you use his suggested resolutions not the resolutions that David used. This is very simple. I don't know what camera David use, only that it had 13mp, so assuming that for example it was a canon 5d, if you enter [www.dpreview.com](http://www.dpreview.com) you can see there that this camera has a REAL RESOLUTION (because what #384 said) of nearly 4.6mp. So what happens if you print a 13mp image (that has a REAL RESOLUTION of 4.6mp) and the downsample this image to 5mp and print again... you obviously end up with the same result. The only thing you prove is that the real resolution of the camera was less than 5mp.

There is a very easy test to see if megapixel matters:

Take a 13mp picture (a landscape), then step back and take another 13mp picture of the same scene with the same camera. Then CROP the second picture (don't DOWNSAMPLE it) so that it frames the same part of the scene that the first one. So now you have two pictures taken from the same camera of the same scene and of different resolution. Print them and see. That's the real test and as close as possible to prove the point.

— Posted by edo

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422. December 12th,  
2006  
11:16 pm

Hurrah and Huzzah!

I just chose a Nikon d80 over the d70s...

But for features I wanted, \*not\* for the extra 4 megapixels!

I've made posters from 3.2 megapixel shots from my old Canon a70. Even if more megapixels would have revealed more detail in the image, one has to consider the intended viewing distance when blowing a picture up. Normally larger images are viewed from further away.

— Posted by Jeff Kosty

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423. December 15th,  
2006  
1:08 am

I just compared two shots I took in an electronics store, between my camera, a 6 megapixel Canon rebel, to the new 10 megapixel rebel xti. swapped my good lense and Cf card at the time, brought the images home and compared them in photoshop. Obviously the 10 meg image is much larger when viewed at the same percentage, the higher resolution becomes apparent when both images are viewed at 100%, and of course if you're cropping (I almost always do) those are some megapixels you'd get to throw away without worrying about it.

Subjectively speaking I used to shoot a lot of images with my 3 meg Kodak pocket cam, around the same time I bought the 6 megapixel Canon, and was surprised at how well the Kodak did as long as I didn't try to view or print images really large. Bottom line, when I upgrade I'd rather go for doubling my megapixels if I could afford it, knowing that I'd see a much more noticeable difference all other things being equal. The difference between 6 and 10 megapixels is just enough for me to go for it, so I probably will: I like to crop and can't always get close enough to my subject. I do have some uncropped 11x17 prints that look acceptable from my 6 meg camera, but I can certainly see the limits showing. There are other factors though - like that Foveon digital sensor found in the Sigma camera's, how many megapixels in the SD14? depends on how you measure that. The proof will be in how images compare to say Canon's 5d. Speaking of the Canon 5D with it's full frame sized sensor; the

rumor is that it has much better performance in low light. I agree with many of you that it's better to compare one camera and its end product to another under the same circumstances, same lense— and then you've got to decide what's worth the money to you.

— Posted by Paul Hood

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424. December 15th,  
2006  
6:32 pm

I was impressed at first, but then realized that this isn't a valid test. You didn't take the photos AT different resolutions, you said "Same exact photo, down-rezzed twice, all three printed at the same poster size." So you used software to resample the photo. That is HUGELY different from a photo TAKEN at three different resolutions. David, that is misleading! A better way to do it would be to TAKE three photos with the same camera, same lense, at the three differing resolutions (assuming there ARE cameras that will take photos at 5, 8, and 13 megapixels). The camera and lense must be top quality, of course, and you must use a good tripod, else any one of them would become the limiting factor for the three photos. THEN print all three out, unretouched, again using top quality stuff, using the same printer and paper, and all PRINTED at the same resolution. I would bet the farm that then the difference would be obvious! As one commenter said, when you use software to de-rez, the info is already there for optimum resampling, but if the photo is taken at a different resolution then the info ISN'T there to begin with. THEN the difference is plain! But as I said, you can only compare apples with apples, the equipment MUST be equal. Lastly, you must not use ANY optimizing features/options such as pixel averaging, unsharp mask, or the like, else the whole thing is as skewed as it is NOW, which is a LOT!

Ken  
Digital Photo and PC enthusiast.

— Posted by Ken Curtis

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425. December  
23rd,  
2006  
12:16 pm

Ken Curtis,

To take a picture with different resolutions in camera is the same that to take one picture at maximum resolution and resizing it later. Actually digital cameras always use its maximum resolution and then resize to the resolution that you selected. So, that test wouldn't make any differences. For a real test you have to crop, not resize, see my post 421.

— Posted by edo

426. December 27th,  
2006  
9:23 am

Interestingly, all the great photos taken by Spirit and Opportunity on Mars are done with 1MP image systems. Granted the big images are collections of individual shots stitched together but the individual frames have exquisite detail. What were the factors in the design of the cameras? The quality of the sensor and the quality of the optics.

I own a 5MP Nikon camera which does an adequate job. To this day if I need high quality, high resolution images I still rely on my analog 4X5 view camera, Schneider optics and high resolution (low ISO) film.

— Posted by Walt Martin

427. December  
28th,  
2006  
5:47 pm

It's occurred to me why a number of people who have proposed re-doing the test using one camera and moving back to have the same target cover two smaller parts of the frame have left figuring out how far back to move each time to you: it's not immediately obvious to figure out how far back to move each time!

This evening, while walking my dog, I hit upon the answer: use the "inverse square law."

Why does the intensity of light or a radio signal drop off by the square of the ratio of the distances, so that at twice the distance, it's one quarter as strong, and at three times the distance it's one ninth as strong? Because the radiant energy at twice the distance is spreading out to cover an area twice as wide and twice as high, and thus with four times the area, or three times as wide and three times as high, or nine times the area. Since the sample size stays the same, but the energy is spread out over a larger area, the sample's intensity is thinned out in proportion to the increased area.

That's precisely the relationship we're looking to solve, just in the opposite direction, since for this experiment, the megapixel number is proportional to the area of the sensor used.

To solve in the other direction: (1)divide the larger megapixel number by the smaller number to get the ratio of the areas; (2)take the square root of that ratio; and (3)multiply that square root by the distance from the target to get the distance from which to take a picture using the smaller number of pixels to cover the target.

Therefore, to make the target area of a 12MP image cover only an area expressed as 8 megapixels: (1)divide 12 by 8, to get 1.5; (2)find the square root of 1.5, which is 1.2247; (3)move the camera back so that it is 1.2247 times as far away as for the 12MP image.

To make the target cover only an area expressed as 5 megapixels: (1)divide 12 by 5, which is 2.4; (2)find the square root of 2.4, which is 1.5492; (3)move the camera back so that it is 1.5492 times as far away as for the 12MP image.

I hope this helps.

— Posted by Phil

428. December 29th,  
2006  
1:02 pm

People who say "More megapixels means more liberty to crop" don't understand what the article is about and should learn to crop before they take the shot...

— Posted by Fred

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429. December 29th,  
2006  
1:14 pm

Since you have not provided any details (beyond pixel count) regarding your comparison, it's useless. Actually, it's worth than useless, it's grossly oversimplified the issue and provided conclusions about which there is no context. What should be an honest discussion of the relative importance of pixel count, is not.

— Posted by dlugo

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430. December  
30th,  
2006  
9:12 pm

I just noticed that the starting resolution was not 12MP but 13MP. Adjusting the two calculations, you get the following:

(1) $13/8 = 1.6250$

(2)The square root of 1.6250 = 1.2748

(3)Multiply the distance used for the 13MP picture by 1.2748 to get the distance from which the image of the 13MP picture covers 8MP of the sensor.

(1) $13/5 = 2.6$

(2)The square root of 2.6 = 1.6125

(3)Multiply the distance used for the 13MP picture by 1.6125 to get the distance from which the image of the 13MP picture covers 5MP of the sensor.

— Posted by Phil

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431. January 3rd,  
2007  
12:12 pm

The megapixel craze is a great way for manufacturers to make sure you update your camera more frequently. Previously you could hold on to your precious Nikon or Canon for many years and they would still be considered a great camera.

Nowadays it seems like a 5 megapixel camera is worthless.

<http://digital-photography.info-on-the.net/>

— Posted by PeterK

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432. January 3rd,  
2007  
1:33 pm

In thinking about my recent pair of posts, which pointed out that megapixels are a measurement of area, I realized that in this dispute, both sides are right, but that the differences we've been talking about recently must be understood as minor.

Megapixels do matter, but it takes a very large difference in megapixels to make a real difference: to get a doubling in actual detail you need four times the number of pixels. To visualize this easily, imagine piece of graph paper. A one by one square has an area of 1 square. If you divide that square in half in each dimension, to double the resolution, you now have four smaller squares.

The implication of this is that to get twice the resolution of a 5 MP sensor, you need a 20 MP sensor covering the same image.

When we went from 1 MP sensors to 4 MP sensors, there was such a doubling in resolution, but since then, we've not seen another doubling in consumer cameras, which would take a 16 MP sensor.

Thus, the differences in resolution we've been talking about must be understood as minor.

This does not mean that megapixels are meaningless, but that the larger the MP base you are comparing against, the larger the difference must be to make a real difference.

So long as the cost of increasing the number of megapixels remains linear, it will become more and more expensive to make a real difference. It will take a gain in manufacturing efficiency that proceeds at least by squares to see real gains in resolution that don't carry heavy costs.

— Posted by Phil

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433. January 4th,  
2007  
6:01 pm

Ok. So, I'm no scientist – but there seems to be a simple test that, while simple, will cost a lot of dough. It requires that a camera (or CCD) manufacturer produce either: three cameras that are identical except for the CCD's (which would reflect whatever the intended test parameters i.e., vary in the actual number of pixels on CCDs of identical size) and the requisite necessary software to work with the varying resolutions; or produce CCDs of identical dimension but varying # pixels (i.e., resolution) that can be swapped in and out of a single camera (along with any necessary software adjustments).

Take pictures of same subject.

Print out.

Compare.

What's so hard about that? (other than convincing a manufacturer to do this, coming up with the dough and being sworn to secrecy). I have no doubt that manufacturers do tests similar to this.

— Posted by revbond

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434. January 5th,  
2007  
9:58 pm

“Only one person correctly ranked the prints in megapixel order, although (a) she was a photography professor, and (b) I believe she just got lucky.”

Hahahaha, nice work David. It just so happens that the photography professor is the only person to see the correct order of the images. Is it suprising that “dozens” of people couldn't tell the difference? Most people can't even tell the difference between a film and digital print. I recently spent several months as a full time printer at a high-end custom print lab. For amateur photographers, it's not a big deal. For those who can tell the difference and/or want to make large prints, you need something that will produce better images than a point and shoot anyway. If it was irrelevant, people would not be spending tens of thousands on digital backs. Once again, it's not a big deal for the average consumer, but if you need the highest quality, you wont get it for under \$500

— Posted by Rylan

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435. January 10th,  
2007  
7:46 pm

You can see the delta if you double the mp count at only the largest size.

If these tests were done with APS Size sensors you will not see much at 5, 8, 13 mp's on 16 x 24.

At 30 x 40 you should see delta between 5 and 13 !!

The real digi test is APS to Full Frame.

Its no different in the digi world than film. Bigger camera image makes Better prints.

Try a comparison between half frame full frame 35. 645, 6x6. 6x7, 6x8, 6x9, 4x5, 8x10.

— Posted by Eric Fanucchi

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436. January 10th,  
2007  
11:29 pm

#350 wrote: "This test—where I use the same camera, changing its resolution IN THE CAMERA for each shot"

But that is still taking the picture at 13 mega pixel for all 3 pictures because setting the resolution in the camera simply means the camera does the down sampling.

Therefore, people could not tell the difference because the same camera sensor (with its resolution) was used in all 3 pictures.

— Posted by Ron

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437. January 11th,  
2007  
9:38 am

I haven't read all 434 posts, so i don't know if anyone else has pointed pout that resizing a print is not a test of the camera but of the resizing software, which obviously worked very well indeed. Pogue, you should have made the same image with three different cameras with three different image resolutions.

Firstly, I don't doubt for a moment that for the typical amateur photog, a decent point'n'shoot of around 3-4MP is more than adequate - assuming it has a good lens, which is the most important part of any camera, film or digital. I don't doubt for a moment that at the usual print sizes lower camera resolution is more than adequate. So your test does a great service for the vast majority of picture snappers. And it must be said that even pro photogs are picture snappers much of the time.

However:

Secondly, the test is also of the printer driver-software, which has to translate the image data into printable data. Again, it obviously worked very well indeed. Whether a consumer cheapo printer will do as well is another question.

Thirdly, if an ink jet printer was used (Pogue, you don't say - you should've!), the test also shows up the effect of ink bleeding, which (like paint) can cover a multitude of sins. Ink bleeding smooths out the colour, and eliminates the dots.

Fourthly, the real tests of a camera's image quality is not a print of any given size, but a) the detail resolved when you blow up the print on the monitor (or in the enlarger), and b) the largest acceptable print possible with that camera's image. At this level of testing, other factors than the size of the image play a role, including for example the light level when the image was acquired, the quality of the CCD, the quality of the lens, the light exposure calculating software, the shooter's control over aperture and shutter speed, and so on. Your test did not address any of these issues. Which is just fine - it wasn't meant to. But your comments imply that the test has wider significance than it actually has.

Be happy!

— Posted by wolf kirchmeir

With more megapixels, you can crop out a larger part of the picture, and still end up with enough pixels to make a decent print.

I would say that if you are going to look for a camera that costs about \$500-\$600, I'd have to opt for the 10.1 megapixel Canon Digital Rebel XTi. I'm not affiliated with Canon in any way, but 10.1 megapixels, and a Digic II processor for the same cost as a point and shoot camera, well, I'd have to go with the XTi.

— Posted by Stan

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439. January 12th,  
2007  
8:00 am

I couldn't get through all the posts, so forgive me if its been said.

I have found that limiting factor when printing photos is the printing process. Image resolution makes a differencet to a certain point, then past that the resolution is not used.

Wake me up when there is a 10 megapixel print process.

— Posted by Albert

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440. January 12th,  
2007  
3:28 pm

Most of the good digital photographers have known about the megapixel myth for a long time; you have discovered nothing new here. Megapixels is the camera manufacturers' equivalence to stereo manufacturers' promoting watts of power. It is bogus. It has little to do with picture quality.

Not only that, but you will find that people cannot tell the difference between film and digital, despite what some others have said here. You cannot blow film up any more than you can digital without losing resolution, "CSI" and other Hollywood detective stories to the contrary. You simply cannot enhance what was not there to begin with.

A computer screen is even worse. Few computer screens display more than 1.7Mp. Anyone showing pictures larger than that on a computer screen is not getting any benefit whatsoever out of the extra pixels.

There is considerable evidence that more pixels actually degrade the quality of the picture because of increased digital noise and magnifying the effects of camera shake. Thom Hogan has gone on record that quality will be reduced if you shoot handheld with anything over 8Mp.

Yes, blowing up 10Mp over 12" starts showing visible degradation in quality. But it shows the \*same\* degradation as a 5Mp photo. People could not tell the difference between your 16x24 pictures because they were ALMOST EQUALLY BAD.

The one advantage of more pixels is that blowing things up very large shows less degradation — but it still shows some. Most people do not blow up their pictures that large, but one way that catches up to them quickly is when they start cropping the picture — selecting a small part of the frame — and blowing it up. Then is when you start getting the benefit of the extra pixels, provided you have already used a tripod, controlled the lighting, and done everything else you need to do to take advantage of the extra resolution.

— Posted by Christopher Campbell

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441. January 20th,  
2007  
9:26 pm

Great test on your picture resizing software, but what does this have to do with pixel count?

Optimising and touching up a 13MP photo and shrinking it down to 5MP will create a different photo than if it was shot with a 5MP camera and you tried to optimise that.

Secondly most photos could do with cropping here and there.

For the average person who just wants to email their photos to friends, or produce 6x4 prints, no the extra pixles won't make a difference. But if you want to crop/touchup/enlarge your photos then yes pixel count does make a difference.

— Posted by Daniel

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442. January 21st,  
2007  
2:35 am

I am so glad to hear of this experiment. I have a friend who believes spending more money means better quality. I have a 4mp, she has a 7.1mp kodak digital camera. The pics look the same. I just wish she would not waste her money thinking more money means "better".

— Posted by melissa

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443. January 22nd,  
2007  
12:26 am

Wow!

David, I now have a better understanding on why you get paid, and deserve, the big bucks!

Michael.

[www.TheBigPictureStuido.com](http://www.TheBigPictureStuido.com)

— Posted by Michael Heroux

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444. January 27th,  
2007  
6:08 pm

but what happens if you print a larger size poster, with the same cameras?? the difference is remarkable, larger the size to be printed, larger the number of MP needed.

— Posted by Federico Esquinca

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445. January 30th,  
2007  
2:50 pm

I received a panasonic dmc-fz4pp for xmas and i don't know how to operate it. I tried to read the operating instructions but they are very confusing to me. Is there anyone who has a cd or more simple instructions than the ones that came with the camera. thank you

— Posted by j.kurnath

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446. February 7th,  
2007  
11:40 pm

While I fully agree that taking a 13MP and just doing a downsampling to 5MP creates a 5MP image that has much more information than an images created

from a 5MP CCD.

However, it's possible to do this test starting with just ONE single 13M photo.

The key is in the post processing to create a 5MP image.

To do this correctly, one needs to take into account how the Bayer CCD works.

One way is to create a downsample algorithm that mimicks what a Bayer CCD would be at 5MP.

A simpler way (rough approximation) is to get the LPI difference between a 13MP and a 5MP CCD, and downsample based on that.

— Posted by ubiquityman

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447. February 8th,  
2007  
6:41 am

I love it that you started this discussion. However, I think that we mustn't go too far over to the other side where more megapixels mean nothing.

On 24" prints, the difference between 5mp (or 7mp) vs 16mp will be seen in the detail. While it won't look pixelated if it is properly upressed (as some on this blog suggest) it will look softer. Leaves in the distance will blur to nothing sooner, grass will vanish into colour sooner.

On your second test (in the library) I would very surprised if an experienced digital photographer could not tell the difference. Fine hair would appear in the higher mp shot that simply would not exist, except perhaps as a dark splodge, in the lower mp image.

So, in the end, it depends on end useage. Few people want all their wrinkles and pores blown up into a glorious detail. But we do love sinking ever deeper into the tiny aspects of a landscape.

However, we should also acknowledge that the determining factor of the quality of an image rarely rests on the detail present.

— Posted by Tim Gooding

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448. February 8th,  
2007  
10:10 am

I have read your article on the NYT technology website, and I cannot agree more.

However, I would like to point out a possible problem with your test: as some other comment (e.g. #160) has pointed out, diffraction might be a problem. That is, given the size of a lens, it is physically impossible to achieve a resolution in excess of the so-called "diffraction limit".

If you used a 13 Mpixel SLR camera with a standard 22x17 mm CCD, each pixel covers about 30 squared microns, and any image taken with an f ratio above 8 will be diffraction limited. If you just use 5 Mpixel, the pixel area will be about 2.5 times as much, and diffraction problems start at ratios above 11.

This means that if your test photographs were taken with an f ratio of 11 or larger, the law of optics tell you that there cannot be any difference between the 5 Mpixel and the 13 Mpixel version.

With this, I am NOT saying that your test is wrong. I am saying that there exists a threshold (say 4-5 Mpix for a compact camera, 8 Mpix for an average SLR, 10 Mpix for SLR with particularly large - in the sense of size, not resolution - CCDs) above which the number of pixels has absolutely no meaning, simply because you are trying to sample a resolution which cannot be achieved because of fundamental physical limits.

— Posted by Emanuele Ripamonti

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449. February 8th,  
2007  
11:51 am

I like your second test but felt it would be more imformative if it went further than 7MP why not go 5, 3 and 1.5 that way one would actually see the value of upgrading from the very earlist or cheapist digital cameras also what happens with extensive cropping. I might suggest a fixed focal length and move the camera back.

— Posted by John Miller

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450. February 8th,  
2007  
12:39 pm

Yesterday i received a copy of the test of impression of an architecture book that I am making in Italy. The book is of much quality. There are photos done with the eos 5d (12mpx) and some with the eos 300d (digital rebel) of 6 mpx with professional lenses. Nor I am able to know with as they are done. With the dslr's, from 6 mpx, the quality is assured.

— Posted by marcelo soule

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451. February 8th,  
2007  
1:35 pm

With respect, we need to move beyond our narrow focus on (obsession with?) megapixels. As a serious amateur, who has been using Nikon digitals ranging from 4.0 to 12.9 megapixels over the past four years, there is absolutely no doubt in my mind that similar subject images from the 12.9 MP camera (as testified to by camera club members and professionals who have seen my 13 X19 images produced on an inkjet printer) are much better (color, sharpness, noise, shadow detail, etc.). I hope I have improved a bit as a digital photographer since I started doing digital. But the main reason for the difference is that the cameras keep getting better, with improved AWB, vastly

better sensors (truer color), and more megapixels for sharper detail, better smoothing, and much less noise at all ISO's. The improvement is particularly evident in scenes with lots of detail (e.g., landscapes, travel — not snapshots of the kids). So, it's the whole package (of which megapixels are a part).

— Posted by Jim Hogg

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452. February 8th,  
2007  
6:16 pm

This is similar to the cropping argument, but slightly different. What your tests do is measure the quality of a printed image. I agree that mega-pixels may not be necessary to print an image at this resolution. However when viewing images on a computer, quality mega-pixels may matter. It allows users to explore their images, finding details they didn't know were there. Of course this doesn't matter for a snap-shot of your kids, but for a landscape shot it may be interesting to have that additional detail. As a test of this argument why don't you contact Graham Flint at [and ask him if he'd like to replace his camera with a 5 mega-pixel one](#). You may argue that this is a high-end scenario. But, I've watched people spend hours exploring Gigapixel images (on a computer) and it is not inconceivable to me that amateur photographers would want to create images like these themselves.

— Posted by Matt Uyttendaele

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453. February 8th,  
2007  
6:45 pm

Thank you Superdave for your comments in post 292. Honda vs Lamborghini was the perfect analogy for what is going on in these posts.

Thanks Dave for trying to educate the masses. I completely understood what you were trying to say.

Jaid

— Posted by Jaid

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454. February 9th,  
2007  
11:09 am

"I might suggest a fixed focal length and move the camera back."

I thought about that when devising the test. The problem is that moving the camera changes perspective rendition ( the relationship of points closer to the camera to ones further away from the camera) in the photographs, something that has a definite influence on a viewer's perception of the three otherwise close to identical images. I needed to eliminate as many variables as possible for this to be a fair test solely of the relationship of megapixels to resolution, acutence and perception of "Sharpness" in the prints. . This was one of those variables that could be eliminated.

— Posted by EllisVener

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455. February 10th,  
2007  
6:26 pm

The test Ellis Vener performed is certainly useful ... as far as it goes. But it was performed with a pro-level dslr camera and lens. Many of us are buying consumer-level equipment, designed for beginners and enthusiasts. And often

we don't resize, 'down-rez' or 'up-rez,' crop, or zoom out to different lengths to vary our photos.

Therefore, to better address the dilemma faced by a typical customer buying a point-and-shoot digital camera and having a choice of 5,6,7,8 or 10 megapixels, I would suggest a different test.

I'd begin with two virtually identical cameras. The Canon A630 and A640 come to mind. They have the same lens, same size sensor, same features, and evidently the same in-camera technology. They apparently differ in only one respect: the A630 is 8 megapixels while the A640 is 10 megapixels. When they were introduced last summer, I believe they were \$100 apart in price, though that gap has narrowed now.

I'd take the same photos (preferably no charts !), process and print them identically (at various sizes and perhaps with some cropping to see if the added megapixels help there), and then see what the photos reveal. The outcome will help point-and-shoot buyers determine whether they ought to ante up an additional \$100 — or whatever the difference is — for a bump in the megapixel count.

— Posted by Michael S.

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456. February 11th,  
2007  
9:04 pm

I see many people does not agree with the way you down-rezzed the pictures. I tend to agree with them, in part, so I suggest another method.

Usually the cameras can be set up to take pictures at different resolutions. Why not take the same picture, with the same camera, lighting, etc, changing only its resolution.

There's no need to photoshop, zoom out, and you'll be using the same lenses, sensors, etc.

— Posted by Janos

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457. February 12th,  
2007  
5:04 am

I came across this article after doing my own tests on 5 quality cameras between 3.3MP up to 8MP Sat.. Same subject, same distance, with flash. The depressing result is the 4900Z (3.3MP approx) appears the sharpest and the best! I'm not happy about this for \$1000's sake. But the results speak for themselves. As an ex-pro and Photography lecturer I want to know how? You have to look into how we perceive images (the brain creates the image not the eye). Rods and Cones in the eye are round and the brain uses 'shorthand' to interpret what something is. If it's dotty and in a bush it's probably a leaf? Whether that's one pixel or four isn't going to make a lot of difference. Psychological subjectivity contols our perception. Pixel resolution is now beyond the circle of confusion, and a lens is certainly not a perfect thing. I would love to do a serious study on this! In the meantime, if your subject matter is 4 pixels or less, your composition may be a problem? And for Giant prints, shoot on medium format film.

Please don't flame this...I'm only being objective!

— Posted by PaulBG

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458. February 12th,  
2007  
11:33 am

We love Digital cameras, because they have a computer inside, and that

computer can do many useful or funny things. All we have to do now is to make this thing work "at least the same" as film camera, and we need a number of dots to accomplish it. How many? I don't know. Digital camera needs pixels to start working as your old film camera, and once it gets it, the pixels' job is done, there is no need to remember about their existence.

Different photos require different resolution, test shows that 5M is a good number for a generic photograph, I will agree.

— Posted by Dmitri

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459. February 12th,  
2007  
9:23 pm

Sounds like you just used different compression settings since you couldn't have used a single RAW camera format to do such a test. All the pictures are just compressed images of a very good image to begin with. You aren't looking at the pixels. You are looking at compression algorithms. Its just like taking a high res PhotoShop image and compressing it by a third. It still looks equally good (especially when you print it on a printer which has less effective resolution).

More pixels are better. Other things are important. But if you don't have the pixels the other stuff doesn't matter. The other stuff doesn't have any chance of mattering. If all you want to do is take just OK pictures you don't need a 16.7 MP camera. But if you want to take the great picture, you will need the pixels and the lenses and the electronics and the talent.

You can't take better pictures with a 16.7 MP camera any easier then you could with a >\$5,000.00 camera and lens. It is the same game, just a few years later. Camera salespeople and the industry are always going to goad you into buying the latest and greatest so you can take great pictures. Don't get mad at them when you can't because you don't understand what you are doing.

— Posted by Harry J

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460. February 12th,  
2007  
10:43 pm

Entertaining article but bad information. I think it shows that David doesn't need to buy a 10 mp camera. You gotta use the Raw image otherwise you aren't lookin at the pixels. You can see the difference on your computer. One image might be 10' and the other 18' wide before you can see it but it is there. You only want to just print your images and you aren't going to print out such big pictures, then don't buy it. You don't need the extra pixels for printing. You need them for your digital darkroom. If you are just taken Polaroids then stay with the 5mp. If you want to do something with your images, like rotating them or something more exciting, you are gonna need some more pixels.

— Posted by Paula

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461. February 25th,  
2007  
5:06 pm

Yay for debunking. The capper will be the mythbusters having a go at it.

— Posted by Harris T.

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462. March 2nd,  
2007  
6:46 am

The article assumes that the only difference in digital cameras is the megapixels. I love it, that's an interesting test, and a good first step towards a provocative debunking of the megapixel myth.

This is a very interesting article, please click on the link to find the similar article about Digital Cameras

— Posted by Mickey

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463. March 5th,  
2007  
7:51 am

Sadly I have to disagree. Although your article has proven that more MP does not mean better pictures, but the fact that I'm a photographer myself and I have seen the obvious difference in an 8MP camera and a 3MP camera. Maybe it's just me but it's from what I know.

— Posted by Jake

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464. March 10th,  
2007  
9:45 pm

This is a misleading article, but a lot of fun talk!

#1 You can tell a difference in megapixels if you CROP an image.

Do this test BEFORE you believe this article. Take a picture with a lower meg camera and a higher meg camera and then crop both images. The more you crop them the more you can tell the difference.

#2 You can tell a difference in megapixels if you use a super powerful printer that has the ability to print super clear images.

If you use your computer at home (your \$300 one) or a basically normal printing shop (like Wal-Mart) then you are probably not going to see a difference. But send your pictures off to a very good professional printer and you will be able to see a slight difference. And a slight difference can go a long way to winning that photo contest.

**BOTTOM LINE:** If you're not serious, and you just like photography as a hobby, then use what the amateurs use. (Canon XTi, Nikon D40) But if you want PROFESSIONAL results on ALL of your images then use what the professionals use. PERIOD.

You wouldn't show up on the NASCAR track with a souped-up '69 Chevy just because it can top 200 MPH would you. No, because it's not just about one thing, it's about THE WHOLE THING!

**BOTTOM LINE:** You will not get professional images with unprofessional cameras. Period!!!!

— Posted by Keith Russell

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465. March 11th,  
2007  
10:41 am

If photographers would use the right technique or lens to begin with, cropping wouldn't be an issue. Thus, they could get by with much less meg. When I started taking photos, back in the days of 35mm, what we shot is what we got. If the subject was a long way off, we either had to figure out how to get closer or make sure we had a long enough lens. Unless the photos were sent to a professional lab, there was no cropping or post processing of any kind. I believe people learned how to become better photographers back then. Now they want the camera to do all the work. I still shoot with a 2.1 mp camera and I can print out excellent 8 X 10's. I have no desire for wall size prints so my 2.1 will serve my purposes. I just have to be a little more versatile and realize my limits.

— Posted by Mike Osmond

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466. March 14th,  
2007  
12:04 pm

Good news for the PlayStation camp, full details of Sony's PlayStation Home have been revealed, and it ain't no slacker. Alongside those avatars and achievements we heard about earlier, the "service" seems to be a new-gen Second Life killer, with public hangouts, personal apartments (to show off those fancy prizes you've been racking up in recent frag fests) and voice chat. The seeming-MMO even includes casual games such as pool, bowling and arcade machines embedded into the world, but at any time you can invite a fellow resident to join in on any PlayStation Network-capable game. As for user-generated content, PS Home allows you to hang your own pictures on your apartment walls and share videos with friends. You can of course dress up your avatar in assorted virtual clothings — for a price — all while enjoying "dynamic advertising" of some sort. A large scale beta goes live in April, with the full product to be launched this fall. Make sure to hit up the read link for a gallery of the beautiful scenery and idiotic conversations you too can be enjoying in a few months.

[www.chase-credit-card.all-courtr.com](http://www.chase-credit-card.all-courtr.com) Update: Added a video after the break with more info on the service. PlayStation Home will be a free download, and will eventually include a virtual cinema for watching movie downloads. You can also share videos and music directly out of your media library.

— Posted by GeorgeBarester

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467. March 15th,  
2007  
1:07 pm

Your test is misleading. It appears the images is taken under ideal "studio" type lighting conditions. Under these near perfectlighting circumstances, I have seen the same results: 6 megapixels and above all looks the same. However, I am a professional wedding photographer and have to deal with less than perfect lighting conditions on a regular basis. If you performed this test in a variety of less than perfect lighting conditions, low light-high ISO for example, you would see a clear difference between the photos. I can see the difference between 6 megapixels and 8 megapixels in poor lighting. I shoot some wedding photos with an 8 MP and a 6MP side by side for a backup. You generally have more noise and grain in the 6 megapixel photos and that's the dead giveaway. Many other location photographers will tell you the same, and in fact, I've heard the same from colleagues. I challenge you to redo the test.

— Posted by Daniel Green

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468. March 19th,  
2007  
6:24 pm

You are correct on the fact of the pictures do not change from a 3mp to 5mp on a camera, and the pictures look the same. However, pixels are measured

differently, so according to the type of megapixels you have, the more of those small squares you have. those squares are different sizes, and you can tell only when you zoom into the picture. at the furthest extent of your zoom (about 1600%) you will see that the megapixels on your computer may seem to be the same size, but in fact they are not, because there are some places in two different cameras and two different megapixel counts, that zoom in farther than most, therefore concluding my reasoning. And in fact different ISO settings will also interfere with your pictures as well...although i have not been able to test that yet ((my 8th grade science project is on this))

— Posted by some kid

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469. March 25th,  
2007  
6:21 pm

sorry, didn't have time to go through so many posts so someone might have already suggested this test already. if not, then i recommend you use the following test methodology instead. my hypothesis is that test #1 will show megapixels can make a difference (at some proper point of comparison) and test #2 will show other factors other than megapixels making the difference.

test #1

1) test with 3 cameras from the same manufacturer (e.g., canon 300D - 6.5mp, canon 350D - 8.2mp, and canon 400D - 10.1mp). all three have the same 1.6x crop factor. the sensor on the 300D is just slightly larger than the other two (i don't think it's significant to make a difference though), but both the 350D and 400D uses the exact same sensor. i cannot confirm but i'm guessing they all use the same firmware algorithm for JPEG conversion since they all use the Digic II processor. one may have a later version possibly.

<http://www.dpreview.com/reviews/canoneos300d/page2.asp>

<http://www.dpreview.com/reviews/canoneos350d/page2.asp>

<http://www.dpreview.com/reviews/canoneos400d/page2.asp>

2) use one lens, the exact same lens on the three different bodies

3) use same subject (preferably non-moving, like a rock), same camera-to-subject distance, same focal length zoom setting, and manually focused on the same non-moving target.

4) use same exact settings on all three camera bodies

- JPEG large, fine
- sRGB color space
- ISO 100
- auto white balance
- no exposure compensation
- standard picture style w/ no adjustments to sharpness, contrast, saturation, color tone, etc.
- manual exposure - same f/stop and shutter speed (fast enough to stop motion)
- no filters over the lens

5) use a tripod for all photos in exact same location, height and direction

6) pick a day where you have good consistent lighting so exposure and color doesn't change (e.g., light overcast day but with a full range of tones from shadows to highlights)

7) after capturing the images, do NO adjustments other than the following...

- "bicubic smoother" resizing in photoshop of the two smaller images to match the resolution of the largest (3888 x 2592 pixels) at 300 dpi for HP & Canon printers or 360 dpi for Epson printers. check to make sure the largest image yields the same dpi otherwise you'll have to resize that as well. image size of all three images should now be 12.96" x 8.64" at the appropriate dpi based on which printer you use.

- "add canvas" (white border) to make it 14" x 11".

7) print all three images on 11x14 size sheets as is, no crop, no borders (you've already made your borders). use same printer, inks, & paper on all three images. don't bother converting to printer profile; no point. files are 8-bit sRGB JPEGs.

8) when comparing, do three separate and independent comparisons.

- compare the 6.5mp with the 8.2mp
- compare the 8.2mp with the 10.1mp
- compare the 6.5mp with the 10.1mp

i'm guessing you will not see too much difference in the first two comparisons but will (should?) see some difference in the last comparison.

note post #414...

"The difference between 2 & 3 MP was obvious. The difference between 3 & 4 MP was slight and evident only as a minor improvement in edge sharpness. Between 4 & 5 MP the difference could only be observed with a loop or your nose right up to the prints. Again, only minor edge sharpness."

well, going from 2mp to 3mp is a 33% increase, going from 3mp to 4mp is a 25% increase, and going from 4mp to 5mp is a 20% increase. you get the idea. it's the point of diminishing return.

if megapixels truly made no difference, then theoretically, my old 1mp camera should compete fine against canon's 13mp 5d camera. where you will see the difference is when you take significant jumps in megapixels or when you need to really blow up the size of an image.

so going from 6.5mp to 8.2mp is a 26% increase and going from 8.2mp to 10.1mp is a 23% increase but going from 6.5mp to 10.1mp is a 55% increase. so yeah... i would think it should be noticeable side-by-side.

test #2

9) now do the same test using canon's new mark III 10.1mp camera - <http://www.dpreview.com/news/0702/07022208canoneos1dmarkiii.asp> - due out soon.

10) compare this new 10.1mp image with the previous 10.1mp image from the 400D. i'm guessing, but i think there will be a noticeable difference because there are other factors that contribute to image quality other than just megapixels.

but megapixels do provide some incremental benefit to image quality depending on how you pack it in the sensor. if you don't increase sensor size when increasing megapixels, then the pixel pitch (size) just gets smaller and is less efficient in capturing light. as a result, you get less dynamic range, more noise, etc., etc., etc. so in this situation, more megapixels is not a good thing.

but if you go with more megapixels on a larger sensor, like canon's 5d full frame sensor where pixel pitch is also larger (8.4 microns), then not only will you get higher resolution, but you should have improved dynamic range as well.

<http://www.dpreview.com/reviews/canoneos5d/page2.asp>

<http://www.luminous-landscape.com/essays/sensor-design.shtml>

[http://www.robgalbraith.com/public\\_files/Canon\\_EOS-1D\\_Mark\\_III\\_White\\_Paper.pdf](http://www.robgalbraith.com/public_files/Canon_EOS-1D_Mark_III_White_Paper.pdf)

i would love to see the results of a new test to hopefully settle this debate for once and for all!

— Posted by Chester N

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470. March 25th,  
2007  
8:33 pm

forgot to include this link in my previous post.

[http://nikondigital.org/articles/canon\\_fullframe\\_whitepaper.pdf](http://nikondigital.org/articles/canon_fullframe_whitepaper.pdf)

— Posted by Chester N

While there is some truth to the fact that manufacturers over hype the megapixel issue (similar to the way the computer guys use MHZ & GHZ ratings) , it DOES make a real difference.

The problem is that with different sensor sizes, and different pixel sizes, there is no good way to make a straight up comparison unless these variables (and others) are factored in.

For certain in order for this "test" to be even remotely informative, you need to state which camera/lens combinations were used.

But all of that aside, I bet if you had shot a subject with sharp lines and good contrast, even untrained observers would have reached a different conclusion.

Just my 2¢ worth...

— Posted by Carol Phelps

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472. April 5th,  
2007  
1:13 pm

I see this all the time. We have a couple of different camera's at our company [www.conklinoffice.com](http://www.conklinoffice.com) . Out sales thought they need to have the 8MP camera turned all the way up to take a quality picture. The pictures are huge, in file size, and the quality is no better than if you turn the quality almost all the way down. In my experience, if you don't need to turn the picture into a poster or you don't need to zoom into the poors on someone's face, I just keep the camera on the lowest setting.

— Posted by Jon

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473. April 9th,  
2007  
11:43 am

I need to buy a digital, and figured out what brand and model will give me the best choice. So I visited several times the site [steves-digicams.com](http://steves-digicams.com) and downloaded to my computer a sample photo that Steve has published in almost every review, a picture from a building with clear blue sky and a white stucco wall. I found that there is no difference between the quality of ANY camera EXCEPT the Canon and Nikon SLRs, in these samples (no matter the megapixel size of the camera) the noise in the same-colour areas is minimum and the details in the shadows is excellent. The rest of the cameras, at least in this particular picture, makes a patterned noise similar to the low-quality jpg (but in most cases the pictures are taken as raw or tiff) and there is no detail in the shadows. And close to the borders, the red or magenta is displaced from the other channels. This poor results are consistent in any brand or price, except in the SLRs, that have almost the same very good quality despite the brand or image size.

— Posted by Aldo

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474. April 12th,  
2007  
7:35 pm

You may be in theory right, but:

If you have a 13 mp photo, you can CROP it (cut a part of it) when necessary and have a 5 mp crop for instance, which is equivalent to zoom digitally, and still have the 5mp quality.

Try to do it with a 5mp photo, and you'll get a 2.2mp crop. And now try printing them. What did you get?

— Posted by Nir Nussbaum

Downey Ca

— Posted by Israel

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476. April 24th,  
2007  
6:08 am

We've known this for some time but not had direct proof so I look forward to watching the show.

We already know that most computers can only handle 2.1megapixels and for computer only purposes there is no point in going above 2.1. Obviously if one is printing on kodak paper then technically higher res' should help. However, I use a Canon300D and keep it on 'Medium Fine' and regularly print photo on kodak paper at A4 size with no pixelation being obvious. Certainly friends who view the pictures rarely realise they are digital prints in the first place.

— Posted by Dino

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477. May 12th,  
2007  
9:07 pm

Sorry this test is not valid. As a 13 mp camera can only deliver about 1/3 of its pixel count, aprox. 4-5 mp plenty of signal, all three photos from the same sensor camera (13, 8 and 5 mp) show the same amount of detail:

- 13 mp photo: 13 million of very small pixels, 4-5 million of wich will be signal and the remaining 7-8 million will be noise, absence of information.

- 8 mp photo: 8 million of not so small pixels, 4-5 million of which will be signal and the remaining 4-3 million will be noise, absence of information.

- 5 mp photo: 5 million of not so small pixel, 4-5 million of wich will be signal and the remaining 0-1 million will be noise, absence of information.

1. We are not losing information in any case, that's why people can't see difference.
2. However, your test proves another important thing: EVERY CAMERA ONLY DELIVERS AS REAL SIGNAL ABOUT 1/3 OF IS MEGAPIXELS. THE REST IS NOISE, ABSENCE OF INFORMATION.
3. A 5 mp photo downsized from a 13 mp camera is no way the same than a photo taken from a 5 mp camera!! First one will be 100% signal; second one only 33%, so it will have poorer quality.
4. You need 3 cameras with the 3 different megapixels count (13,8,5) to prove what you want to prove... and then you'll see people can see the different
5. I can see a lot of "technicians" here ignoring the basis of how ccds work in digital photography.

— Posted by dafueza

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478. May 17th,  
2007  
4:26 pm

The simple answer is that it's true pixel count doesn't matter up to a certain point.

I have a Canon 10D 6MP camera a photo from it has 3072x2048 pixels. Imagine if you printed that at one pixel per millimeter, that's a nice poster at just over 3 meters by 2 meters or 10'1"x6'9". Stand back from it a few feet, say enough to take it all in and you won't see any pixels.

I've done this at a small scale zooming in and printing that piece of image at one pixel per mm.

Now take into account that most printing software out there won't render a pixel at that size as a neat square, the software automatically blends the pixels. You're really not going to notice.

However...

A Canon 5D gives you 12.9 MP

The difference? In a photo of say a police officer on the other side of the street taken with the same lense on both cameras.

With the 10D you get a nice clear image of his face uniform etc, you can see where his badge is.

With the 5D, you can read the numbers on his badge.

With the Canon 1Ds (16.7 MP) you can see the fine details on his badge and what color his eyes are.

When you print the whole photo you don't notice, when you want to blow up a part of it, there is simply no comparison.

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As for dafueza's post

It is incorrect to say a sensor only delivers 1/3 of it's pixels in signal, the rest only delivering noise. He doesn't understand what noise is.

Perhaps he is confused by how a CCD image sensor works. A 4x4 pixel sensor might look like this:

GRGR

BGBG

GRGR

BGBG

Each pixel is monochrome and captures only one color Red Green or Blue. They are then combined using the camera's image processing algorithms software to create a full color image.

— Posted by David

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479. May 19th,  
2007  
1:33 pm  
to 478 (David)

I maybe gave an excessive simplification, but I do knew the GRGR thing...

The thing is that some years ago I tested one photo with a 4 MP sony camera. I resized it to 2 MP and to 1 MP, and I realized that:

- 4 MP image was very soft, so there was little signal and a lot of "noise", meaning pixels with no information

- 2 MP image was quite crisp, thought there were still some pixels with no information. All the information contained by the 4 MP WAS in this 2 MP photo.

- 1 MP image was totally crisp but it missed some information that was in 2 MP and 4 MP photo.

Therefore I concluded:

- CCD sensors only deliver about 1/3 of its megapixel count (more than 1/4, but less than  $2/4=1/2$ )

- Since then, I ALWAYS take my photos at directly 2 MP instead 4 MP... if I want a large copy, I resize it with Photoshop just to avoid the aliasing effect on the edges.

— Posted by dafueza again

8x digital zoom

The features are great but i want to know would it be good for video quality and pictures.

let me know thanks

Ahmed

— Posted by Ahmed Raza

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481. May 28th,  
2007  
1:42 am

This experiment is rather useless.

1. I took thousands of product photographs to be used on commercial websites - with a 1MB camera. Even, now, with a new camera, I switch to the smallest image size, and it's goof enough.

Similarly, if the intended print size is 4x6, I don't need more megapixels.

2. However, when I photograph landscapes scenes for reproduction in a travel magazine, I need the highest possible resolution.

Practical question:

I am trying to decide between Nikon D40 (6MB) and D40X (10MB).

Same physical sensor size and same optical lens (18-55mm). Target print size: 16x20" or greater.

Will the D40's 10MB with a smaller pixel size deliver higher detail or just higher noise?

I guess, the D70 and D80 comparisons would provide also similar insights.

— Posted by Les Brenner

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482. May 29th,  
2007  
4:09 pm

I would Personally go with the D40 over the more expensive D40x, the D40 has a nice higher flash sync speed, a faster default ISO, 200 instead of 100, and looks flawless at 200 so no need to go down lower, and you save 200 bucks and just larger file sizes that are going to clog space needlessly. the only really advantage is a slightly faster shooting speed, but thats negligible 3 instead of 2.5.

— Posted by Alex

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483. May 29th,  
2007  
10:11 pm

Alex,

thank you for your comments. I have, however, very specific needs.

I will use the camera mainly for static landscape scenes. Therefore, flash, frames-per-second, and similar features are not important for me. File sizes are also not critical for me.

I need the highest possible detail in large blow-ups. To give you some perspective about my needs - right now, I am using 6x17 film camera which gives me files in 200MB size (scanned at 1600dpi).

The question is: Will the more but smaller photosites on D40X sensor deliver more detail and dynamic range using the 100% resolution or uprezz it (bigger files), or I am better to work with fewer but larger photosites on D40 sensor?

— Posted by Les Brenner

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484. June 26th,  
2007  
6:46 am

This fellow doesn't know what he's doing. All that Pogue has done is to prove that you can take a very high resolution photo (13 MP) and reduce the resolution. That's all that he's proven. Two photos showing the same scene and printed at the same size and DPI will contain exactly the same number of pixels and thus the same amount of information, so of course no one can tell them apart! Now if Pogue had NOT reduced the 13 MP photo, and if he had printed it at three times the DPI (say, 1200 instead of 400), then the difference would have been obvious. THAT'S THE POINT of high-resolution photos — that they contain more information and can show more detail, and to show that detail in a print you have to print at a higher DPI. So Pogue has proven absolutely nothing! He's just proven that large resolution photos can be reduced!

— Posted by Caleb Murdock

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485. July 17th,  
2007  
4:03 am

I totally agree with Caleb Murdock!

— Posted by RedMatrix

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486. July 19th,  
2007  
7:24 pm

I cannot find anyone to answer me this question. Has anyone bothered to make a 30 x 40" print from a 7-10 megapixel point and shoot? I have been making 20 x 24" museum quality prints from my Olympus C7070 and the results are amazing at 200DPI. Was thinking of upgrading to a Canon G7 and I wanted to know if anyone has had luck printing at 30 x 40" with this camera.

— Posted by victor cobo

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487. July 20th,  
2007  
4:26 pm

BAH! The printed image is no way to compare the crispness of a photograph. There is a BIG difference between DPI and LPI, and I can assure you that your

images were probably printed on an inkjet printer, even if they were processed at a photolab.

Inkjet printers use a stochastic printing method meaning that they lay down dots randomly in varying concentrations to build up hues and values, and even if they were printed on a laser printer with a really tight halftone pattern, the resolution of the halftone would not be high enough to display the differences in the two DPI resolutions. Of course megapixels make a difference!

— Posted by Nick

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488. July 21st,  
2007  
6:49 am

hey guys, i need some help. i've decided to get a digital camera and i always thought that the most important thing is the MPs... now i have no idea how to chose, i want a compact camera but that will give a good quality photo (when printed), if possible similar quality to a file camera...

— Posted by john

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489. August 13th,  
2007  
12:41 pm

One, if I wanted an excellent great quality print, I would do, what a person posted here. Go to my nearest film store, get a 35mm film 100 asa color film or a kodachrome 25 ASA film, load it in my SLR, with a great quality lense... wait for the right moment, lighting conditions... focus, bracket, measure the light, etc. AND SHOOT, several photos and develop it, ask for a poster size print on Cibachrome paper... and voila. Something that will outlast any digital crap printed on any pro or home laser, inkjet, etc printer. Nothing, nothing beats the silver, the chemicals, and the time spent on making that Life, National Geographic, and/or name your best Photograpy book. I wonder what will happen when magnetic fields erase or degrade images on the hard drive? I will still have my prints. Daguerre was right, as well as Adams and Feininger... the smell of fixer is exhilarating.

— Posted by Nelson

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490. August 14th,  
2007  
5:49 pm

I tend to think that mega-pixel count is overrated too. Having said that the more pixels you have the better your post processing of the original image can be( to a point ). You cant do much with an out of focus picture at 10 mega-pixels but there is hope for an in focus 3 mega pixel one. How many pixels is enough? When does the lens and metering become more important?

About this authors hypothesis testing approach, I think if you started with a low res photo and up-sized it you would see a difference. This is because you would not have the information available to fill in the voids created during the up-sizing. When you downsize, most programs combine the existing pixel information to render a low res pixel, that additional pixel information is not there if you up-size.

— Posted by Rob

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491. August 16th,  
2007  
4:13 pm

Victor, I've been wondering the same type of thing the past few days and there doesn't seem to be a whole lot of info readily available on the internet...or I am having a hard time finding it. I had a 5mp camera and have printed up 13" x 19" pictures on my desk top large format inkjet printer and they've come out GREAT. But, now I have a 10mp camera and I've seen a huge 600dpi printer for sale for only \$500 and am wondering how a photo taken with a 10mp camera will look printed up on a 600dpi inkjet printer, blown up/enlarged to something like.....4ft by 5ft. All of has my head spinning. I mean if it's 600dpi, it's 600dpi no matter what size...right? A 4" x 5" photo printed at 600dpi should still hold it's integrity printed at 48" x 60", right? It's still throwing 600 dots in an inch...it doesn't care how many total inches there are overall....? Can anyone help me with this....???

— Posted by Steve

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492. August 21st,  
2007  
1:06 am

not all megapixels are equal. read this and it'll explain it all (well, not quite).

<http://www.ddisoftware.com/sd14-5d/>

— Posted by Chester N

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493. September 6th,  
2007  
11:35 am

For the average consumer that uses a digital camera much like the old Instamatic cameras - pictures of the kids, some simple outdoor shots, 4x6 prints with an occasional 8x10, then anything above 3Mp is probably a waste. My daughter uses an old Nikon 3Mp Coolpix for all her simple photo needs. It has good optics and makes excellent prints.

On the other hand, if you plan to massage the pictures electronically — create slide shows with extensive Ken Burns type effects, extensive cropping, future export to HD, then the number pixels does matter. I use Fotomagico to create slide shows that ultimately become part of a larger video. To make such videos, the more the better.

I will agree that given choice between a 5Mp camera with good optics and a 8 Mp camera with poor optics, I'll take the 5Mp. Better yet, get a fast 8-10Mp camera with good optics if your "medium" is video vice prints.

Bill

— Posted by Bill

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494. September  
16th,  
2007  
1:55 am

The results mean nothing really. You haven't debunked the myth at all. There is no mention of whether the original image was stored at native resolution in raw mode or compressed as a jpg, etc. Once compression is involved resolution is lost so unless the 13M image was printed from a raw image file to a printer that handles raw data without any processing it has been reduced in resolution also. I won't even go into the software and printer processing can of worms....

Basicly the test is flawed and is creating its own myth. It has no scientific value what so ever.

— Posted by B1

— Posted by damindenver

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496. October 1st,  
2007  
1:08 pm

I think most of these posters have COMPLETELY missed the point. The greatest value in this test is understanding that you can blow up your own prints much larger than you thought before and have them still look great. I got to this page because I'm in the situation of figuring out whether or not I can print a 9 megapixel file out at 30" x 40", and I think that the results show that it can be done just fine, even though the camera's pixels per inch will only be around 100.

— Posted by jR

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497. October 7th,  
2007  
1:41 pm

I can only concur with the results of the experiment. I recently produced a family portrait on a Nikon D70. Focus and exposure were both very accurate and my cropping was very sparing. The family wanted a 16" X 20" print. With some degree of trepidation I took the file into a fairly standard UK photo lab and collected the results the following day.

I was astounded at the quality. There were no signs of pixellation and the image was smooth and clean. I am now looking to buy a 10MP camera as I am returning to wedding photography, once I have re-established myself I shall invest in a Nikon D3. In the meantime I will be quite satisfied using a D200 and my current, D70 for back-up.

Michael

— Posted by Michael Howley

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498. October 13th,  
2007  
8:39 pm

If there was really no difference, then there is only one possible explanation. They must have the same below quality lens on both camera's...

— Posted by Eric

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499. October 14th,  
2007  
2:50 pm

Regarding #107 (slightly off-topic) "...basically, a street passer-by won't probably read the difference between the guitar Sir McCartney uses and a children's toy worth \$100."

I have the same bass guitar Paul uses - a Hofner - which I bought (legitimately) for \$135. (Of course, it's worth more now!)

— Posted by Bomis P.

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500. October 16th,  
2007  
8:45 am

Uh, I might have to disagree with you on this. There are many different variables that can affect picture quality apart from megapixels.

I also have photographic evidence that shows a large difference between a 2.4 MP and a 7 MP camera, and when I checked they had almost identical stats, with the only prevailing difference being megapixels. I'm afraid I'm not convinced with your argument.

— Posted by Will

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501. November 1st,  
2007  
7:56 am

Many of these comments are missing Pogue's point, and the audience to which his test is directed. They are not the type of people who are cropping photos. They are, however, the type of people that salesmen at "XXX Electronics" store will gladly sell a 10 MP over a 5 or 6 (or lower) for higher price with no benefit.

There are the people who will never produce larger prints, never mind crop a print.

If you disagree, go back and read his article and note what kind of store he walked into to discuss cameras (an "electronics store"). Pros aren't buying cameras from such stores.

Anyone who is into cropping photos is very likely in a completely different category of purchaser/photographer, to which this test doesn't apply.

Such people are, quite frankly, wasting their time responding on this site about how they only produce amazing photos with such and such camera, post-processed on a Mac, with professional colour profiles for all gear, the capture ultimately cropped down to 80 pixels in the lower-left of the original image, and that then blown up to 40" for display at the national art gallery exhibit on nationally-acclaimed photographers.

— Posted by Rick

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