APS-C versus full frame

When choosing a digital SLR or a lens to go with it, it helps to understand the difference between APS-C and full-frame cameras. Here are the differences, and what they mean for your photography.

Macro photography, like this picture of a Preying Mantis, is one of the areas in which the size of the sensor makes a difference.

Digital SLR cameras have a sensor, which is the thing that takes the place of the film. The size of that sensor makes a big difference to how the camera behaves.

Back in the days when everyone used film, people often talked about using 35mm film in their SLR cameras. Now, when people refer to a full-frame *digital* camera,

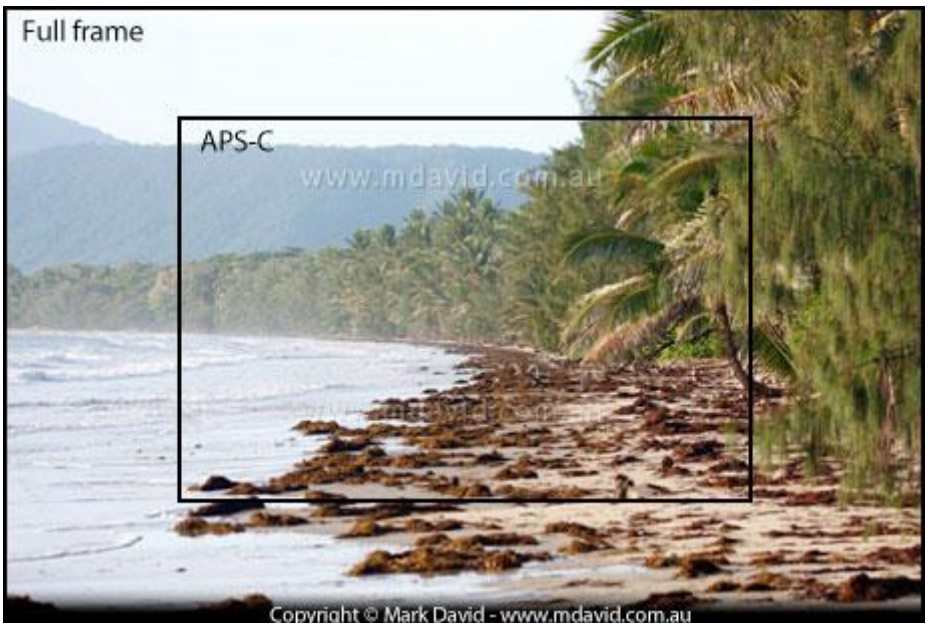
they’re talking about a camera with a sensor about the same size as a single full frame of 35mm film.

APS-C

APS-C stands for Advanced Photo System type-C. Aren’t you glad you know that now?

Okay then, here’s what it means.

APS was a format of camera film that allowed a choice of three different formats. The ‘C’ added onto the end referred to what was called the ‘Classic’ option for using that type of film.



An APS-C sensor cuts off some of the edges of a scene, compared with a full-frame sensor

How it relates to digital

An APS-C sensor is smaller than a full-frame sensor. That means the edges of the image recorded by a full frame camera are cut off (cropped) by the APS-C sensor. If you look at the picture at right, you’ll get a rough idea of how much cropping I’m talking about. You’ll see that the full frame captures a lot more!

So, why doesn't everyone use a full frame sensor?

Full frame sensors are bigger than APS-C and that makes them more expensive to make, which means more expensive cameras. And sometimes there are advantages in APS-C. I'll talk about that in a moment. Before I go on, I'll point out that full frame cameras work exactly the same as the APS-C ones, but because they capture a broader expanse of the scene, we can end up with slightly different images, and I'm talking about more than just how much gets saved or chopped off the sides.

Increasing the background blurring allows the foreground subject to stand out more

Backgrounds

Imagine you're taking a photo of a flower with an APS-C camera. You're standing close to the flower because you want it to fill the whole photo. Now imagine there's some grass in the background. That grass looks kind of, well, *grassy* and distracting and so you want to blur it away so the flower will stand out more. So you open up your aperture as much as you can to**reduce the depth of field**, which pushes the grass further out of focus than it already was. You take your shot. The grass is blurred and not as much of a distraction any more.

Now, you swap over to a full frame camera and look through the viewfinder. Same lens. Same camera settings. But, whoa! That flower no longer fills the frame. You're seeing all the scenery around it which had been cropped by the APS-C camera. So what do you do? You can take the shot and crop your photo in your image editor, and end up with the same picture. Or you can *move in closer to the flower*.

Moving in closer does more than just bring your composition back to having the flower filling the frame again. Because you're now standing physically closer to the flower, the perspective on the flower seems a little bit more extreme. And now you're focusing closer too. And when you focus closer, depth of field gets *smaller*. So that background grass is suddenly even *more* blurred, meaning that the flower stands out even more. Same subject, same lens, same aperture and even the same composition, but the full frame camera has resulted in a photo which is different! In this case, you might prefer the full-frame camera.

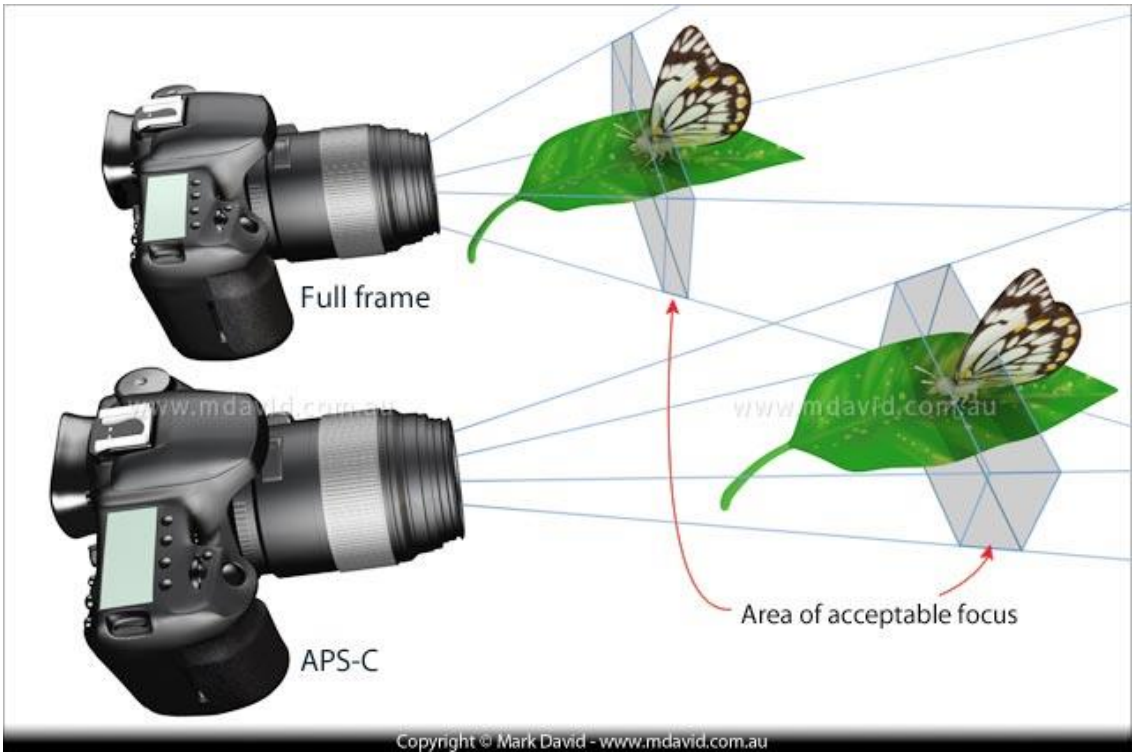
Macro

You're admiring the photo when you see a cute spider (yeah, I find them cute!) on the flower which you hadn't noticed before.

You have a macro lens and now you want to fill the photo with that spider.

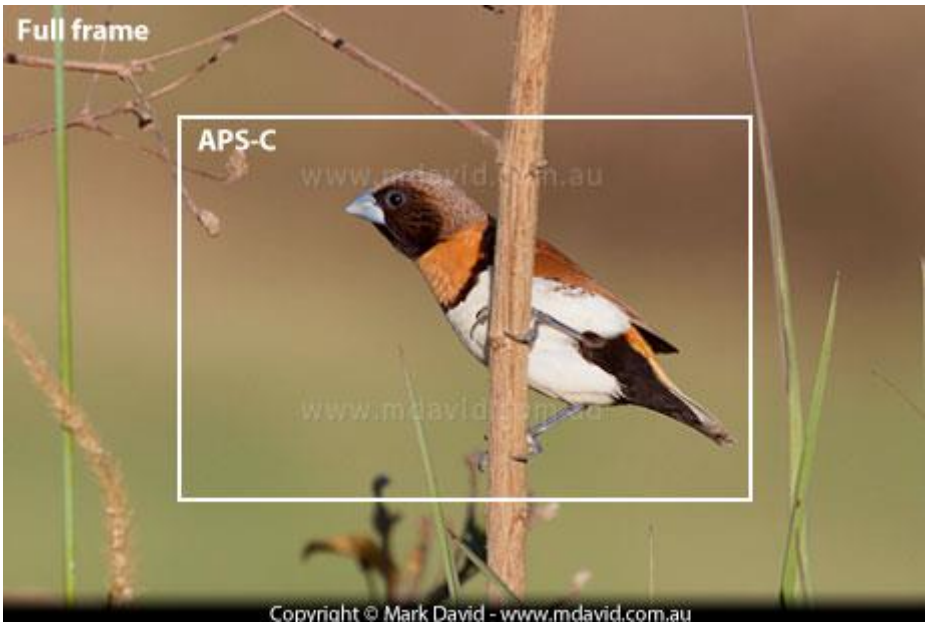
At this point, the APS-C camera might be more helpful because you won't have to stand as close to the spider to fill the frame. While that might be nice for people who don't like getting close to things that bite, being at a greater distance also means you're less likely to scare the spider! Yep. Spiders can get scared too! And in macro photography, trying not to frighten off your skittish subjects is a big deal and you'll welcome the advantage you have from being able to work at a greater distance.

But that's not all. Because getting enough depth of field is notoriously difficult in macro photography, you'll probably also appreciate the slight increase in depth of field that comes from photographing your critter at the greater distance.



Above: Depth of field increases as you move further away from your subject. This can give an APS-C camera an advantage when taking macro photos because they fill the frame with your subject from a greater distance. Note that this graphic is not drawn precisely to scale.

Distant objects



Having the sensor only capture the centre of a scene can sometimes work to your advantage

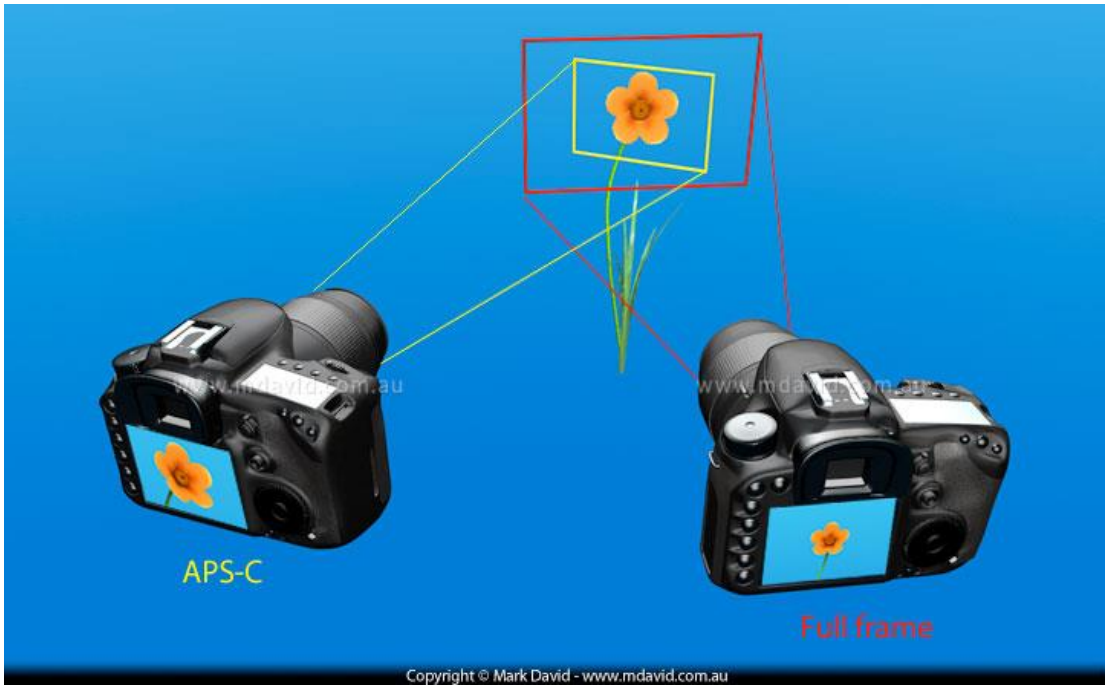
A bird suddenly lands on a plant about ten feet away. It's a species new to science and photography. Well okay, in my example at right it's a Chestnut-breasted Mannikin which has been photographed heaps of times, but it fills the frame nicely with the APS-C camera, but not so much on the full frame. Having an APS-C camera is like making your lens longer (more telephoto)!

Crop factor

Canon APS-C cameras like the 40D and 7D are often said to have a 'crop factor' of 1.6. Nikon APS-C cameras (also known as Nikon DX format) have a crop factor of about 1.5. The crop factor is sometimes called the *multiplier* factor because when you multiply it by the focal length of the lens, you see the difference in how the lens frames your scene. Now, I know that didn't make much sense when I said it like that, so I'll give you an example.

Put a 100mm lens on a full frame camera and it behaves like a 100mm lens. Well, of course it does. But put that same 100mm lens on an APS-C body with a 1.6 crop factor and it frames the scene like a 1.6 × 100 mm lens (a 160mm lens) would have done on a full-frame. And a 400mm lens on an APS-C camera will frame the scene like a gigantic 640mm lens on a full frame body. So it's sort of like making your telephoto lenses longer, but not exactly the same as having those longer lenses. You see, the APS-C camera doesn't actually magnify the image any more than the full frame. Instead, the impression that you're zoomed in more and seeing things bigger comes from the way it crops off the outsides of the scene. This can still sometimes offer an advantage though, because if the pixels in the APS-C sensor are small enough and packed in densely enough then you can capture a lot of detail in a way that is almost as good as having that longer lens. In other words, the combination of the cropped sensor plus the pixel density really can result in some magnification advantages!

Yeah, I know how nerdy and complicated that sounded. And if you want to understand that pixel density stuff better then I explain it in **this short article**. Otherwise, we can move on.



An APS-C camera and a full-frame camera with identical lenses would see different amounts of the same scene.

Anyway, by having an APS-C sensor, all your lenses frame your shots like longer lenses would on the full frame cameras. That can be great for things like wildlife photography, where a lot of your subjects will be a long way away. But not so good for wide angle photography. Because a full frame camera takes full advantage of the wide angle lenses, while the APS-C does not, due to the fact that the APS-C is cutting off all the outside bits of the wide-angle image, meaning that it's not so wide-angle any more. For example, a beautiful 20mm wide angle lens would behave more like a not-nearly-so-wide 32mm lens on the APS-C. That's not necessarily a deal breaker, because there are some extreme wide-angle lenses available now (lenses with very short focal lengths) that can restore wide-angle photography for APS-C camera users.

Specialised lenses

Some lenses are designed to only work on cropped sensors. So if you have a full-frame camera, you might find yourself unable to use some of the lenses available for the APS-C models. Of course, if you're buying a lens you should make sure at the camera store that it's suitable for your camera body. However, some people with APS-C cameras choose to only buy lenses that will work on full-frame as

well, because they might want to switch to full-frame later. That's a personal preference of course and in my opinion it's neither right or wrong. For example, they might plan to always stick with APS-C because it suits their photography. Alternatively, they might choose to eventually change to full frame. Only you will know what's best for you.

Full frame cameras

PROS

- take full advantage of wide-angle lenses
- allow the photographer to move in closer to the subject and so reduce the depth of field, which can mean you can blur away distracting backgrounds more
- the larger sensor has manufacturing advantages that can result in less **noise** in your images
- great for landscape photography and often preferred for street photography, art photography, real estate photography or product photography

CONS

- more expensive than APS-C
- more difficult to fill the frame with distant, easily-spooked subjects like birds

APS-C cameras

PROS

- less expensive
- telephoto lenses behave like something even more telephoto
- great for sports/wildlife photos and macro where the action can be at a greater distance

CONS

- wide angle lenses lose some of their wide-angle effect
- backgrounds can be slightly more in focus and therefore slightly more distracting
- the smaller sensor can sometimes result in a little bit more noise in your photos

You might be seeing now how, just by changing the size of the sensor, it opens up all sorts of interesting implications for lenses and photography. Remember that both kinds of cameras can do all the same things, but they handle them a little bit differently. And those differences are used to their maximum advantage by top photographers.

http://www.mdavid.com.au/photography/apscversusfullframe.shtml#return