



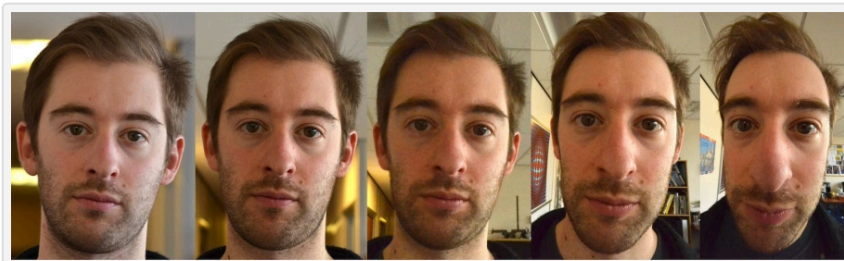
# Daniel's Visionarium

A blog about visual perception

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## Face distortion is not due to lens distortion

Here is a series of photographs of my face, taken from different distances, using lenses with different focal lengths (see [here](#) and [here](#) for more examples). Because I covaried distance and focal length, my face appears about the same size in each image. However, the relative size and positions of my various facial features changes very markedly – in the last photo I have no ears! Why does this happen?



85mm @ 200cm    35mm @ 85cm    16mm @ 40cm    12mm @ 30cm    8mm @ 20cm

Photos of me using different [focal length](#) lenses (85-8mm on an [APS-C sensor](#), so equivalent to 127.5-12mm on 35mm film) from five different distances (200-20cm). Note that the wide angle lens used for the last three photos is not a [fisheye](#) lens (it's one of [these](#)).

Many people would probably tell you this was due to 'lens distortion' – implying that the [wide angle lens](#) used for the photos on the right somehow distorts reality, creating an imperfect image. This is totally incorrect. Actually, the only 'distortions' are caused by geometry, they are nothing to do with the lens or the camera.

In the leftmost image, the subject is far away (2 metres) from the camera. At this distance, each of my facial features is a similar distance from the camera – within a few percent of the total distance – so my face appears flat. In the rightmost image, I'm about 20cm from the camera. Because my nose is about 10cm away from my ears on my head, this means that there is a large proportional difference in the distance from the camera to my nose, and the distance from the camera to my ears. My nose appears much larger, because it is proportionally closer to the camera than the rest of my face.

The crazy thing about this is that it happens in real life too, we just don't often notice it. If you look at yourself in the mirror from very close up (or get close to someone you're intimate with), you get exactly the same distortions (closing one eye helps with this, as most people can't maintain vergence that close). I find the middle image above to be how I think I look, probably because the distance of 40cm

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All of this is important, and not just to make yourself [look hot](#) on Facebook (a hint ignored in both those links: don't get too close to the camera!). Every time we go through passport control at an airport, the photo on your passport gets compared to the real life you, by someone who never met you before. Similarly, if you ever end up in court for something, CCTV evidence – usually shot from many metres away – might be used to identify you. It turns out that people are surprisingly bad at correctly identifying strangers in this way (e.g. see [this paper](#)). I wonder how many false convictions this has resulted in over the years....

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