

Phone Photography



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What makes phone camera (such) a good camera?

- It is HANDY, light and in your pocket
- Different modes (including 'manual') allow adjustments
- Touch screen allows for selection of focus and exposure
- HDR, Panorama shots, videos etc
- Photos can be taken of ourselves with a scene
- Images can be instantly processed and shared
- Photos are stored on a card or instantly in the cloud and can be printed.



A bit of History

- On September 9, 1997, the USPTO granted US Patent 5,666,159 to Parulski and Schueckler. This patent is cited by 207 later patents as the invention of the camera phone



June 11, 1997, Santa Cruz, California: Image taken by Philippe Kahn after his daughter's birth and instantly shared with more than 2000 people around the world

- The first camera phone released by Samsung in 2000 was the SCH-V200. It flipped open to reveal a 1.5-inch TFT-LCD, and the built-in digital camera was capable of taking 20 photos with 350,000 pixel resolution (3.5MP).
- In the earliest models of phone cameras users had to physically connect their phone to a computer to view the snapshots.

There's a strong argument that the first real camera phone was produced by Sharp and released in Japan by J-Phone (now SoftBank Mobile) in November of 2000.

The J-SH04 could take photos, like the one on the right (from [Japanese site Showcase](#)) at 110,000-pixel resolution or 0.11-megapixels

The real difference between it and the Samsung SCH-V200 was the fact that the J-SH04 allowed you to send your photos electronically.



Here's how the BBC reported on it back in 2001, asking for comments:
some are priceless.

So what would you do with a gadget like this, particularly as it costs nearly US \$500?

- If it were cheap enough for teenagers, I could see it being a great way of shopping for clothes on a wide scale. No longer would girls have to go in groups, they could each scout out the good outfits, send pictures, and compare
Set your friends up on dates and send instant pictures to potential mates.
Infinite uses for the teenager, not entirely sure what the rest of us would do with one though.

Lizz, UK

- It would be an easy way to let like minded hobbyists see what you have got, and, even let the wife choose her present from abroad!

Robbie, Scotland

- Just another example of technological advances enticing us to pay ever more money for lower quality images.

Stuart Cordon, UK

- Put the camera on the front, then you're ready for video phone calls.

Sam Silverstein, USA

Progress

- By the end of 2003, and over **80 million** had already been sold worldwide. The good news for consumers was that quality was rising and prices were dropping - \$150-\$300.
- A few years later, mobile photography progressed to include basic flash features, self-timers, primitive zoom functionality, and the first iterations of "filters" (e.g. black and white, sepia, etc.) that would come to dominate social image-sharing platforms like Instagram.
- These devices were still limited to around 1.3 megapixels — but were capable of wirelessly sending images, and in some cases, even printing them. E.g. T-Sprint PM8920 – (1289x960 pixels) had a dedicated camera button and a decent variety of settings, including a multi-shot option for taking eight quick photos



5 megapixel camera phones from 2007: Nokia N95-5
megapixel camera phones from 2007: Nokia N95, LG
Viewty-5 megapixel camera phones from 2007: Nokia
N95, LG Viewty, Samsung SGH-G800-5 megapixel camera
phones from 2007: Nokia N95, LG Viewty, Samsung
SGH-G800, Sony Ericsson K850i

The Nokia N95 was a chunky slider packed with features, including 5-megapixel camera with the Carl Zeiss lens. But camera and phone were separate features. It took beautiful photos and it could record video at 30 frames-per-second. Suffered with long shutter time In fact, 5MP remained as a high-end standard for several years.



In comparison the original iPhone hit the market a few months after the N95, in June 2007, and it had a 2MP camera with no flash or auto-focus and no video . But soon iPhone 5 has taken the world by storm

But iPhone's design and touch screen stole the show and from then the **smartphones rules**

Race started to improve the quality – and prices also came down – good for consumer

Sony Ericsson K800i released 2006. It had a 3.2MP camera with auto-focus, image stabilization, and a Xenon flash



This photo was taken with K790i with the same capabilities

Timeline

2003 - 80 million camera phone sold

2004(3/4) – two thirds of all phone shipped had a camera

After 2007 - the smartphone took over.. High res. from 2010



Year	Camera	MP	Controls	Sensor	Format	cost
1995	Patent Kodak					
1997	Samsung SCH-V200	0.11-0.35	Connect to computer	CCD	jpeg	
2000	Sharp J-SH04	0.11	electronic sharing	CCD	jpeg	\$500
2002	(US) Sanyo SCP-5300	0.3	basic flash, WB, self-timer, digital zoom, filter effects- sepia, black and white, and negative colors.			\$400
2004	(US) Audiovox - TSprint PM8920	1.3	dedicated camera button, self timer, zoom, WiFi sharing		jpeg	\$150
2006	Sony Ericsson	1.3	autofocus, IOS, flash		jpeg	
2007	(Finland) Nokia N95	5	flash, self timer, sequence, WB, exposure compensation		jpeg	£550
	iPhone	2	only back camera, no video			
	iPhone 5	8	touch screen, full HD video, image stabilisation, LED flash		jpeg	
2010	Nokia M8	12	video	CMOS - (big)		
2013	Nokia Lumia	41	face detection, touch focus, ND filter, mech. shutter	CMOS - (big)		£100
2017	iPhone 7	12	telephoto lens, 2x optical Zoom		Jpeg, raw (3rd party App)	
2018	Google Pixel 2	12	Dual-LED flash, HDR, panorama	5x RX 100	Jpeg	£650
	Huawei 20 Pro	40MP RGB lens by Leica	3x optical zoom, slow motion	3 sensors	Jpeg	£640
	Samsung A9	24 (quad camera)	ultra wide, 10MP telephoto, 5MP depth (Bokeh)	4 sensors	Jpeg, raw	£350
2019	iPhone X	12 wide angle and tele	optical zoom, and 10x digital zoom,		HEIF (compression)	£650-£750
	Huawei P30 Pro	40	5x opt. zoom	3D ToF,	Jpeg, raw	£900

Sensors, Pixel sizes and Resolution

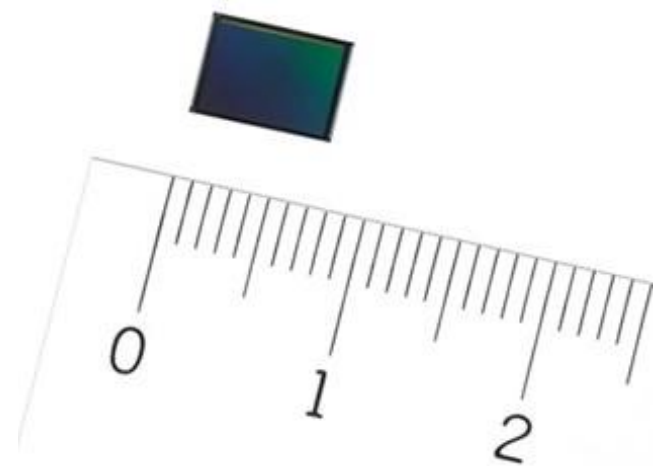
The CMOS active pixel sensor "camera-on-a-chip" in the early 1990s achieved the first step of realizing the modern camera phone. While the first camera phones (e.g. J-SH04), used charge-coupled device (CCD) sensors and not CMOS sensors, more than 90% of camera phones sold today use CMOS image sensor technology

IMX586 sensor with stacked design and ultra-compact pixel size of $0.8\ \mu\text{m}$ delivers **48 effective megapixels**, developed by Sony in 2018

Samsung ISOCELL Bright GW1 image sensor that brings **64-megapixel resolution** – also $0.8\ \mu\text{m}$

Iphone X may have **pixel sized at $1.22\text{-}1.4\ \mu\text{m}$** , the sensor size is not disclosed

ToF sensor – (time of Flight) – used for 3D photography in Huawei P30 Pro



Sensor v MP – do more MP mean better quality?

- **Not necessarily!** – more megapixels on same size sensor means that the pixels are smaller and capture less light. They are likely to be more affected by noise
- More MP also means larger files – so storage on a phone can be an issue – now addressed by HEIF (*high efficiency image file format*) with more efficient compression than JPEG.
- Also unless you wish to print or project on a 52” HD tely, smaller files are preferable for sharing on line.
- 12MP image will give a good A4 image at 300dpi. For A3 print you would need 17.4MP
- So choose your phone with care and consider what you using the images for!

Store and Share

- **File transfer onto a computer**

- By cable
- Direct from a card
- Wifi
- Bluetooth

- **Instant store and share:**

- Google Photos
- iCloud
- OneDrive (for Androids or Microsoft)

- Facebook
- Flickr
- Instagram
- Dropbox

Accessories - Lenses



Xenovo Pro Lens Kit

45x wide angle converter ,
close-up macro capabilities



Youniker 3 in 1 Camera Lens
Kit, 12X Zoom Telephoto
Lens+0.45X Wide Angle
Lens+12.5X Macro Lens, Clip-on
Cell Phone Camera Lens for
iPhone 8/7/6 Plus, Samsung...
Rom Amazon



Olloclip 4-in-1 Lens

Some lenses, like ones from Olloclip and Aukey, are relatively simple affairs that clip directly to your phone, while others, like models from Moment, require a case for your specific model of phone.

Bear in mind that none of the lenses will improve the clarity of your photos, as the light still passes through the smartphone's built-in lens. They can make the quality worse, though, if you buy a cheaply built lens.

Other Accessories

Spotlights -
Mini LED Spotlight



Micro -SD card

Stabilizers-DJI Osmo Mobile 2



Selfie stick



Joby GripTight GorillaPod

Software and editing Apps

- Software and Apps
 - For slow shutter speed
 - Manual camera on Android
 - Slow Shutter Cam
 - Spectre (iphone only)
 - Rookie Cam (camera with filters)
 - Prisma (beware of adverts)

 - Camera remote (Fuji)
 - Image App (remote for Panasonic)
 - etc
- Editing apps
 - Photo Editor
 - Snapseed
 - Lightroom CC
 - Blur Image
 - Rookie Cam
 - Prisma
 - Photo Colage etc, etc

Snapseed

<https://nortonsafe.search.ask.com/search?chn=prev&cmpgn=&ctype=video&doi=&enc=0&geo=&guid=&o=APN11908&p2=%5EET%5Ed00gb%5E&page=1&prt=cr&q=snapseed+tutorial&tpr=10&trackId=&ver=>

Rookie Cam App

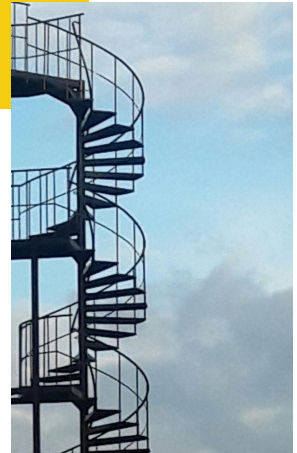
Selection of filters – this is cartoon - Few are available for free



Rookie cam



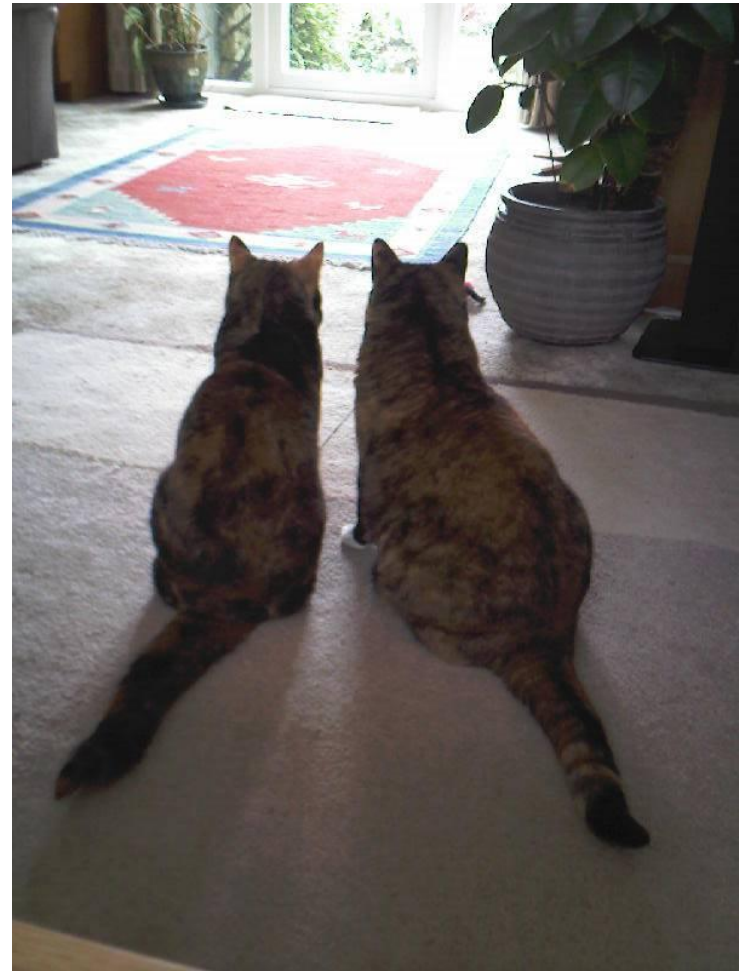
Prisma app – is fun



2009



Nokia 6500C



Samsung - SGH-G600 5MP
autofocus

2010 - Nokia 6500C



1200x1600 – 300DPI ~300kB

2011- Samsung Ace GTS5830

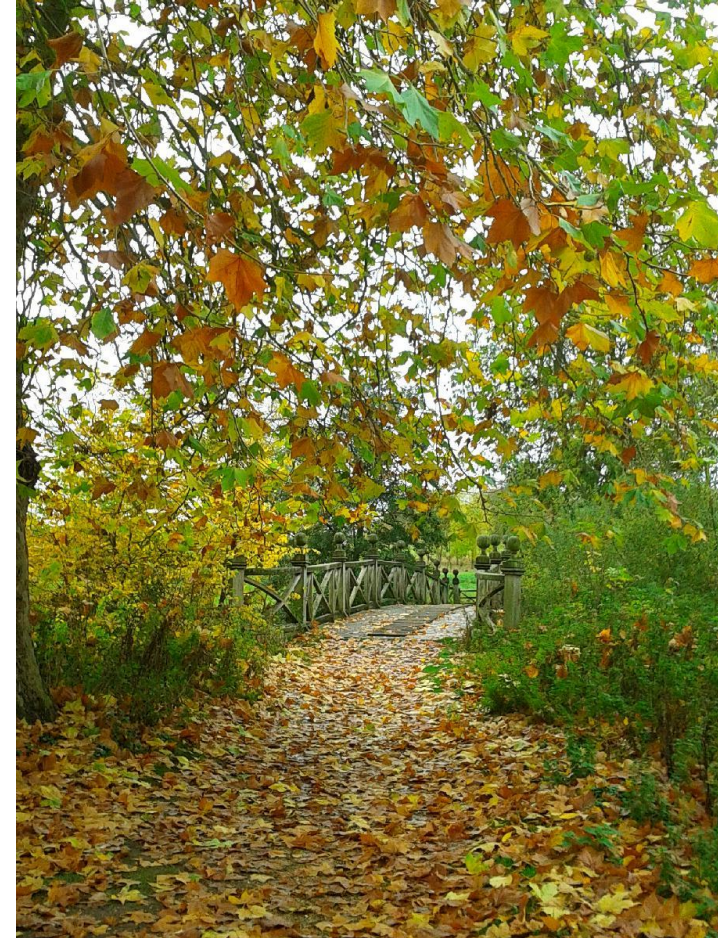


At Trollstigen – Norway

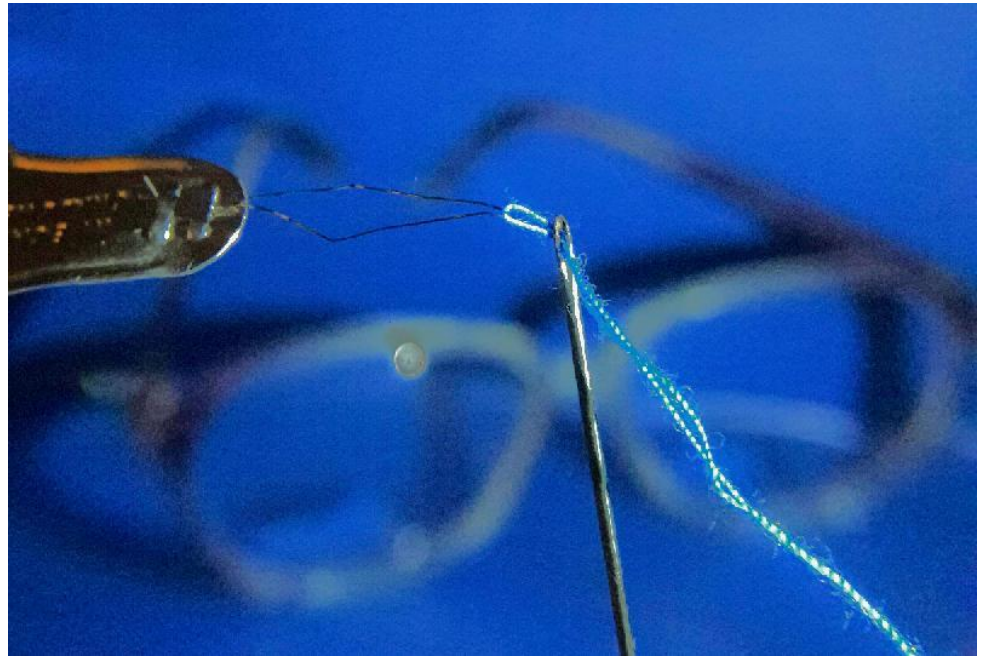
2560x1920, 96 DPI, 1.1MB, including a finger in front of the lens

From 2016- Samsung J7 – launched 2015

4128x2322 pixels, file sizes 3-5MB,

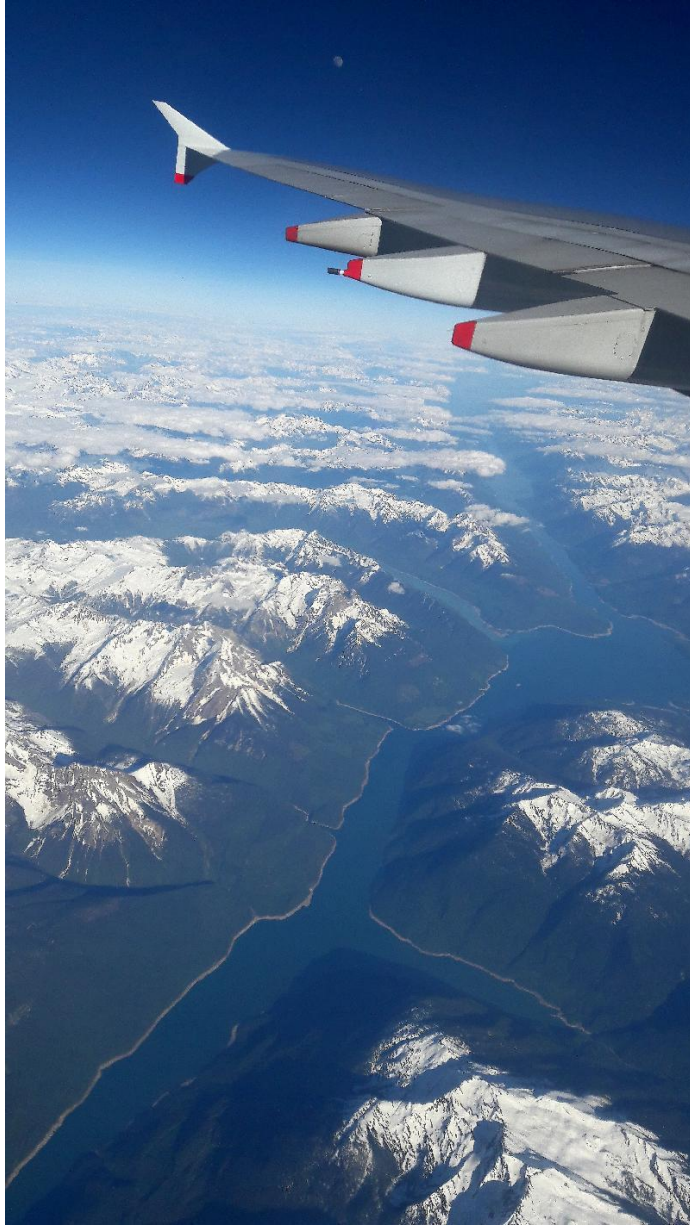


Samsung J7 Close - Ups





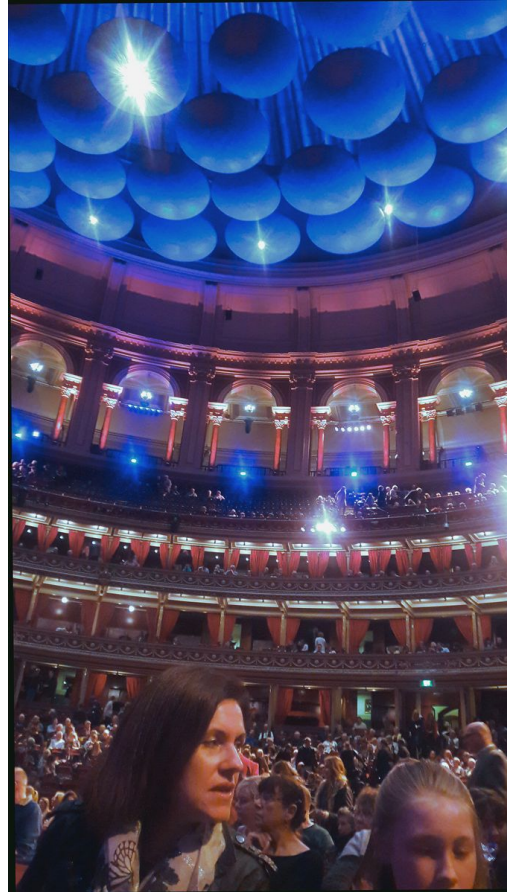
And from a long way -



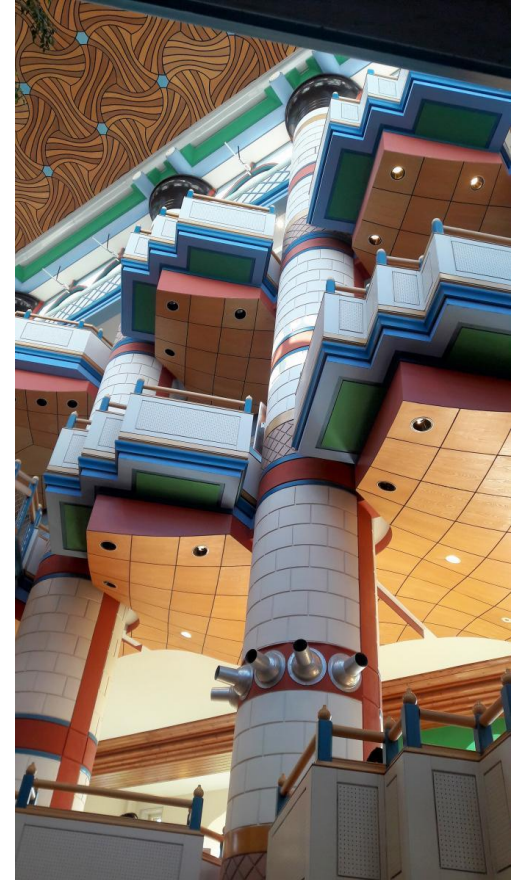
Indoors - Low light



Royston Cave



RAH

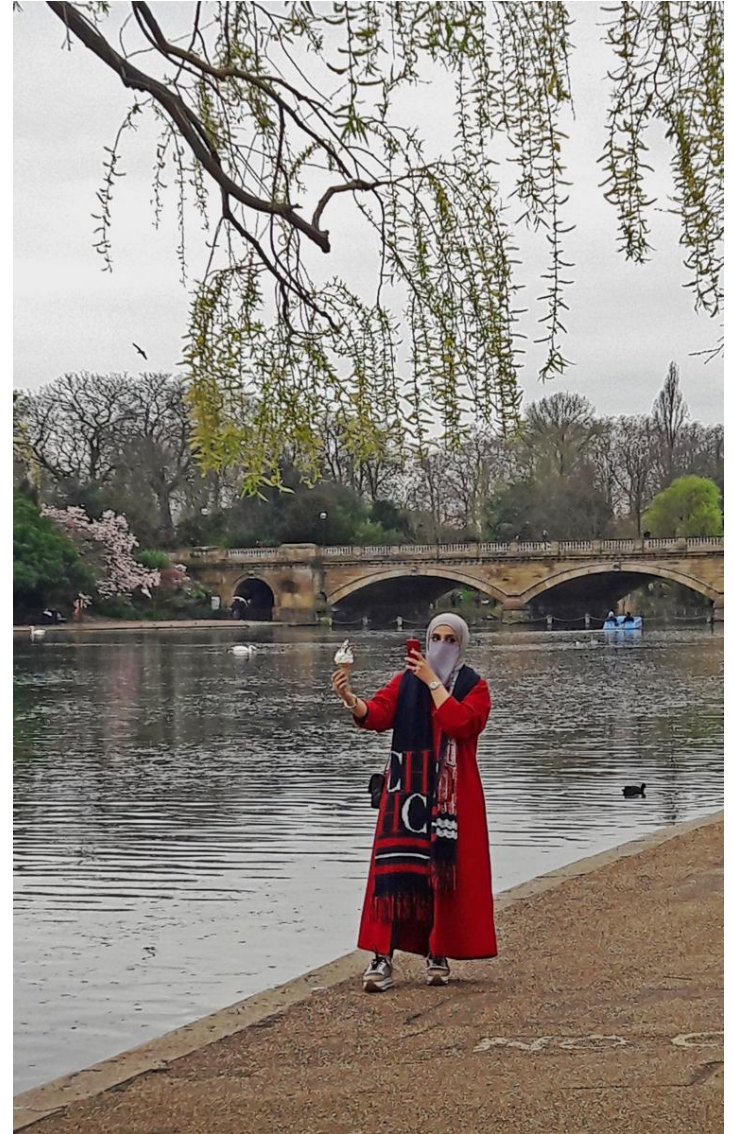


Judge School of Business

And when it is too wet for an expensive camera

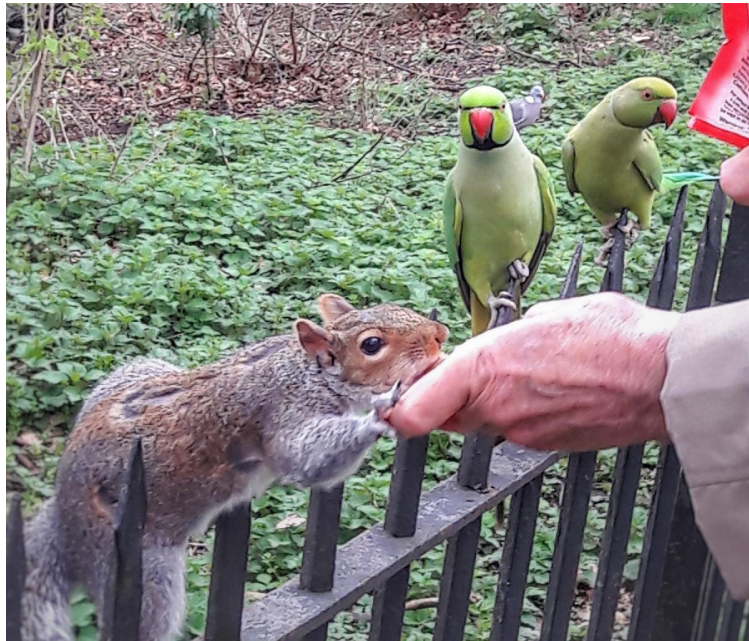


Capture the Moment

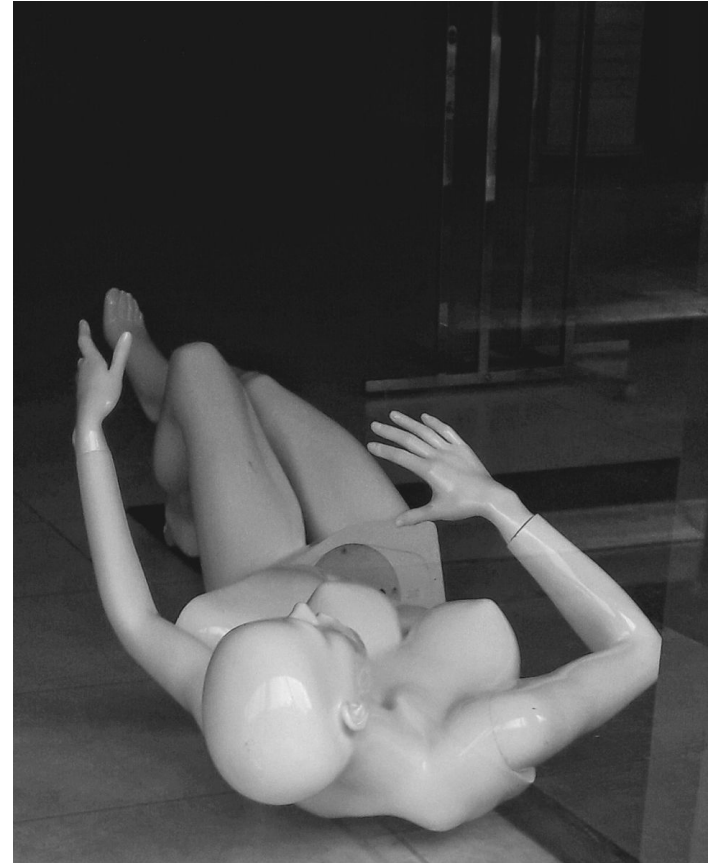




London Sphinxs - 2017



Hyde Park 2019



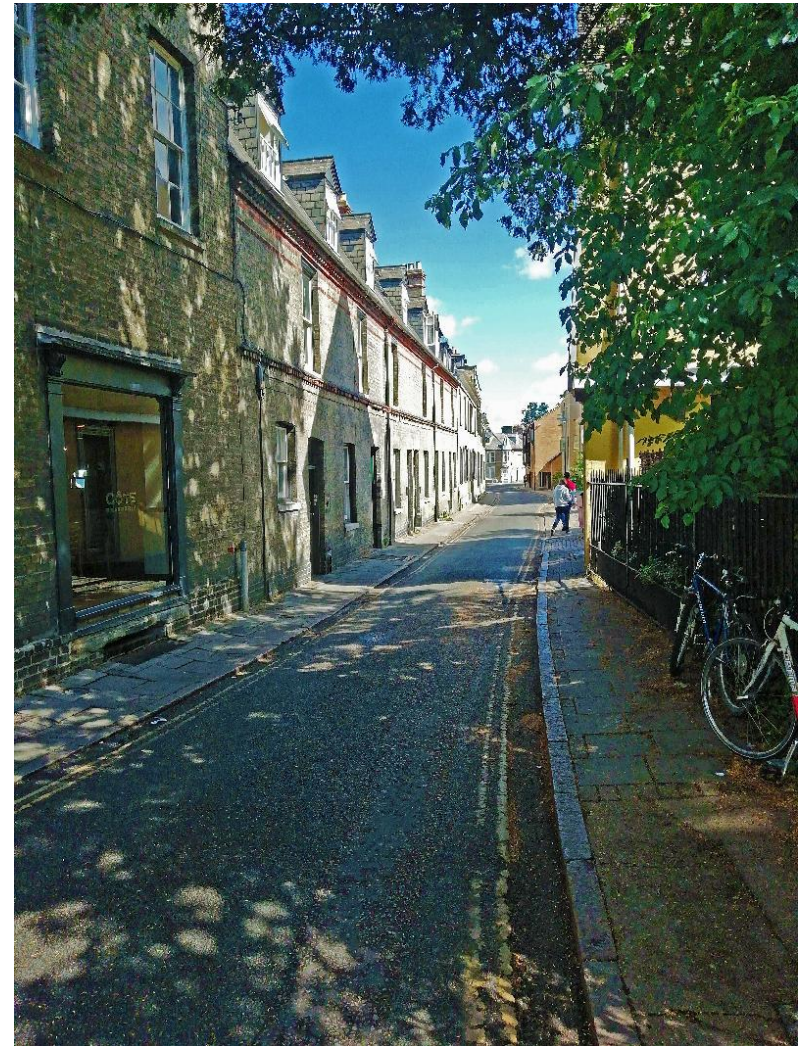
Abandoned after shop closure - Royston

Video



VID_20161116_083201253.mp4

Members Images



I have taken very few with my mobile (a simple Huawei (model FiG-LX1), not one of the ones advertised as being good for photographs). I attach an as taken and my none too subtle "enhancing" (as I wanted to see the level of detail captured) of a picture of the road just beside U3AC. The 1.8Mb file reflects the resolution of the phone. Brian,



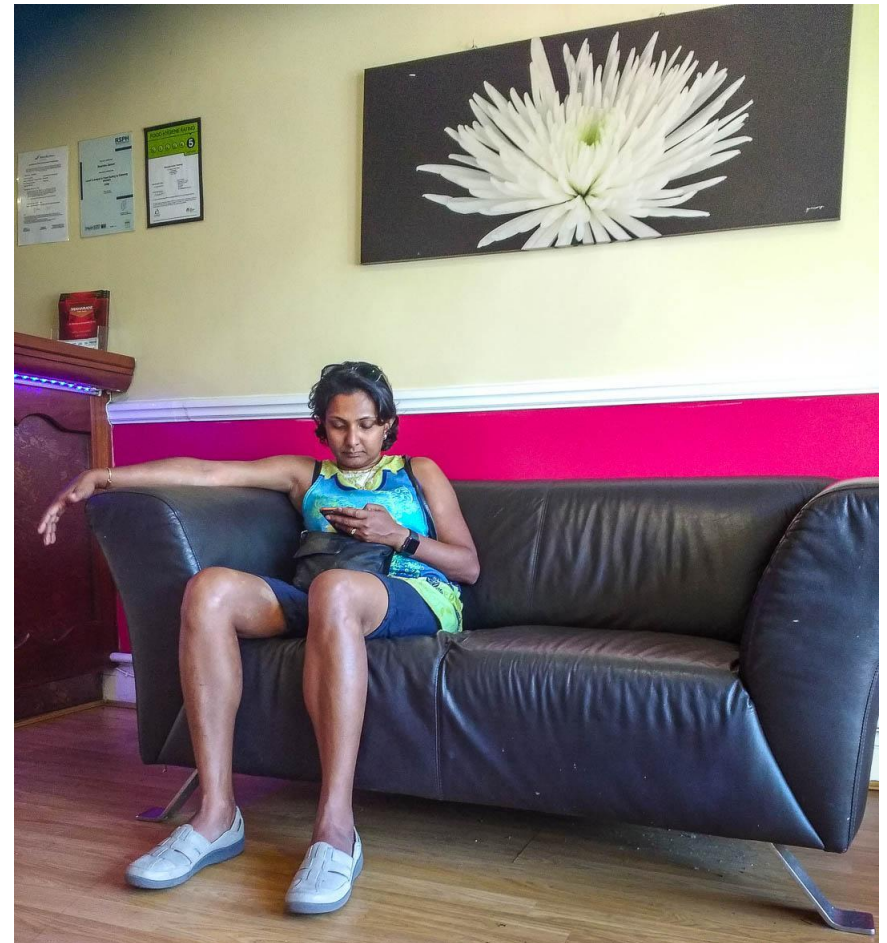
In Wistow Wood in 2017

'Take a Seat - Take a Moment' project



In Wimpole Farm

Using a Motorola MotoG3



Maharani takeaway

In the air and on water



Huwawei Honor 8x



Oneplus One

Panoramas



iPhone X

Exhibition



Motorola MotoG4

Annie Albers Tapetries at Tate Modern



Sunset on the Danube



iPhone 5s

Tips for using a phone camera

- Invest time in learning the full range of your smartphone camera's features and functionality (use YouTube or User manual to master your phone)
- Opt for a device with OIS technology to take crystal clear pictures of fast-paced scenes – or use a stabiliser
- Keep your lens clean!! Also check your fingers are not in front of the lens – (my frequent problem!!)
- Select filter if available from camera software if using.

But will smartphones replace traditional cameras?

For many, yes, absolutely.

Autofocus speeds on the Pixel 2 are phenomenal. HDR+ like image stacking algorithms will only get better with time, averaging more frames or frames of various time intervals.

The Huawei P20 can do exactly this and results are impressiveThe Huawei P20 can do exactly this and results are impressive. The P20 can also combine information from both color and higher-sensitivity monochrome sensors to yield impressive noise - and resolution - performance.

Dual (or even triple) lens units give you the focal lengths of a camera body and two or more primes, and we've seen the ability to selectively blur backgrounds and isolate subjects like the pros do. Folded optics can give you far reaching zoom.

One of the defining characteristics of *smartphone* photography is the idea that you can get a great image with one button press, and nothing more. No exposure decision, no tapping on the screen to set your exposure, no exposure compensation, and no post-processing.



This image was taken by the Google Pixel 2 XL did with this huge dynamic range sunrise at Banff National Park in Canada:

Can you tell the difference phone v DSLR



References and links

- <https://www.digitaltrends.com/mobile/camera-phone-history/>
- https://en.wikipedia.org/wiki/Camera_phone
- <http://camera.plus/posts/iPhone-Camera-Comparison>
- <https://www.trustedreviews.com/news/what-is-a-tof-camera-3690164> (ToF sensor explained)
- <https://www.dpreview.com/articles/8037960069/why-smartphone-cameras-are-blowing-our-minds>
- <https://blog.halide.cam/introducing-spectre-6f83b0981304> (Spectre for long exposure on iphone)
- How to choose your camera phone -
<https://www.macworld.co.uk/how-to/iphone/best-camera-phone-megapixels-3502115/>
- Best Images from iphone 2019 -
<https://www.apple.com/newsroom/2019/02/apple-highlights-best-photos-shot-on-iphone-around-the-world/>

Pixels, viewing and Printing

- A 12-megapixel image is 4000 pixels wide and 3000 pixels tall.
An 8-megapixel image is 3456 pixels wide and 2304 pixels tall.
- 144 pixels per inch (PPI) is what Apple describes as ‘Retina’ quality. (*at this resolution, your 8MP image couldn’t be shown larger than 24x16in, while a 12MP image would stretch 27.8x20.85in – not quite enough for 52” tely*).
- Printing needs more than 150ppi, preferably 300ppi.
- *At 300dpi, your 8MP image could be printed at 11.5in x 7.7in (not quite A4).*
At 300dpi, the 12MP image could be printed at 13.3in x 10in.