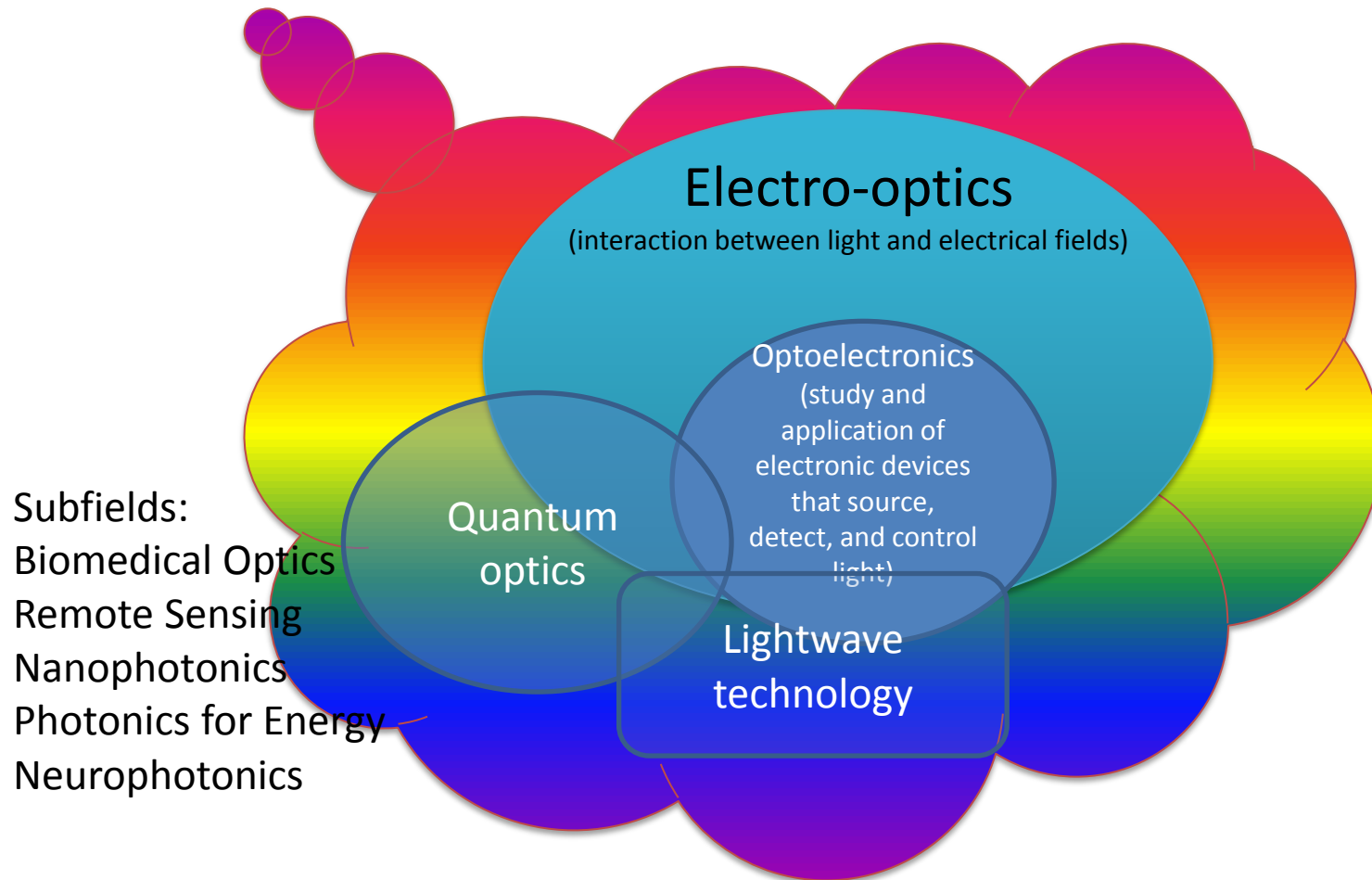


# Photonics and Electro-Optical Engineering

The science and technology of light.

Photonics encompasses the generation of light, the detection of light, the management of light through guidance, manipulation, and amplification, and most importantly, the utilization of light as a tool for the benefit of mankind



# Photonics and Electro-Optical Engineering

Photonics is an **enabling technology**<sup>1</sup> with general-purpose characteristics applications in :

- Communications, information processing and data storage
- Health and medicine
- Energy
- Defense and homeland security
- Advanced manufacturing
- Advanced metrology

<sup>1</sup> **enabling general-purpose technology** – technology that advances foster innovations across a broad spectrum of applications in a diverse array of economic sectors.

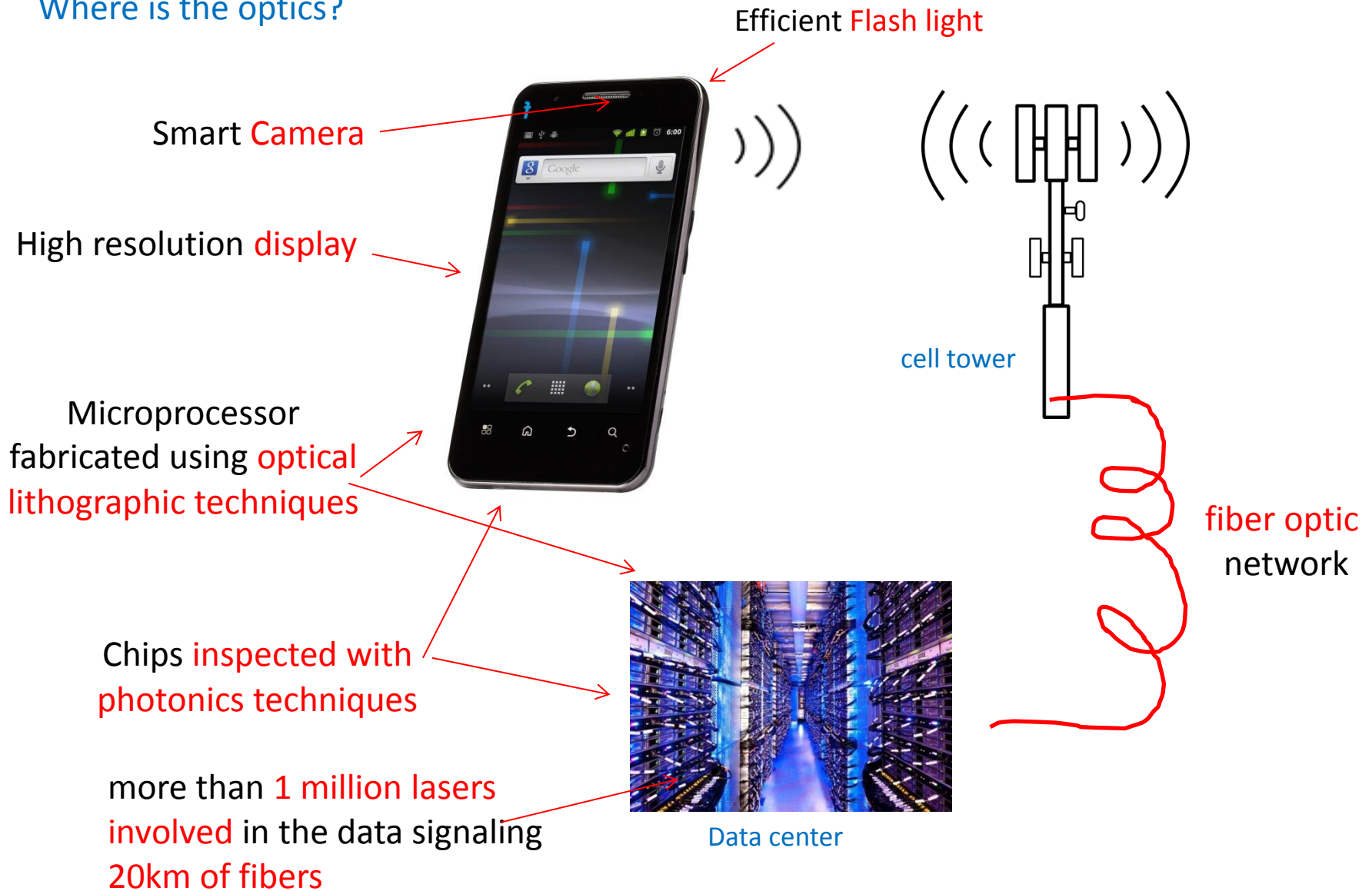
Other examples of general-purpose enabling technologies are the transistor and the integrated circuit.

# Photonics engineering –an enabling technology

Not always seen but it is ubiquitous .

Consider for example using a smartphone to perform an Internet search.

Where is the optics?



# Photonics and Electro-Optical Engineering in the 21st century

The term of **photonics** was coined in analogy with electronics:

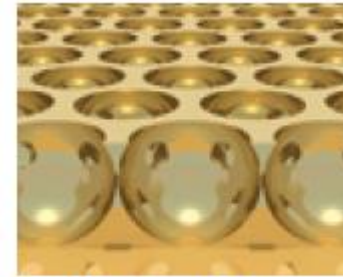
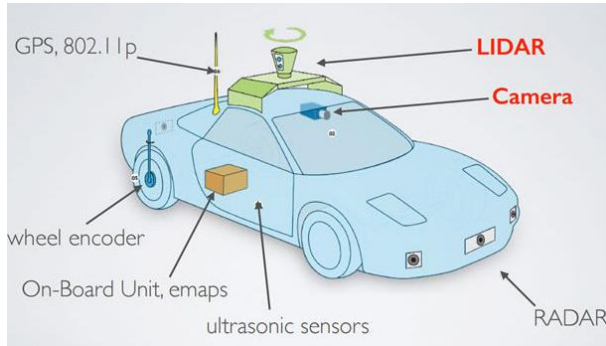
- Electronics involves the control of electric-charge flow (in vacuum or matter);
- Photonics involves the control of photons (in free space and matter)

It is expected that the 21st century will depend as much on photonics as the 20th century depended on electronics<sup>1</sup>.

<sup>1</sup>US National Research Council report : “Optics and Photonics: Essential Technologies for Our Nation”, National Academy Press 2013.

# Photonics-the enabling technology of the 21'st century

## Immersive reality

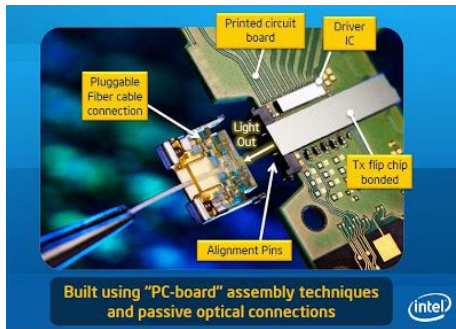
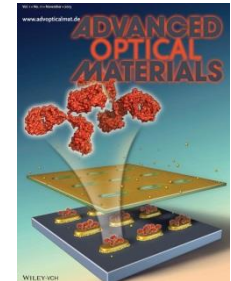


J. Baumberg/University of Cambridge

A 'nanovoid' plasmonic surface for biosensing



solar energy harvesting



Memory storage: Hundreds of TB memory on  $\text{cm}^2$  with unlimited lifetime

