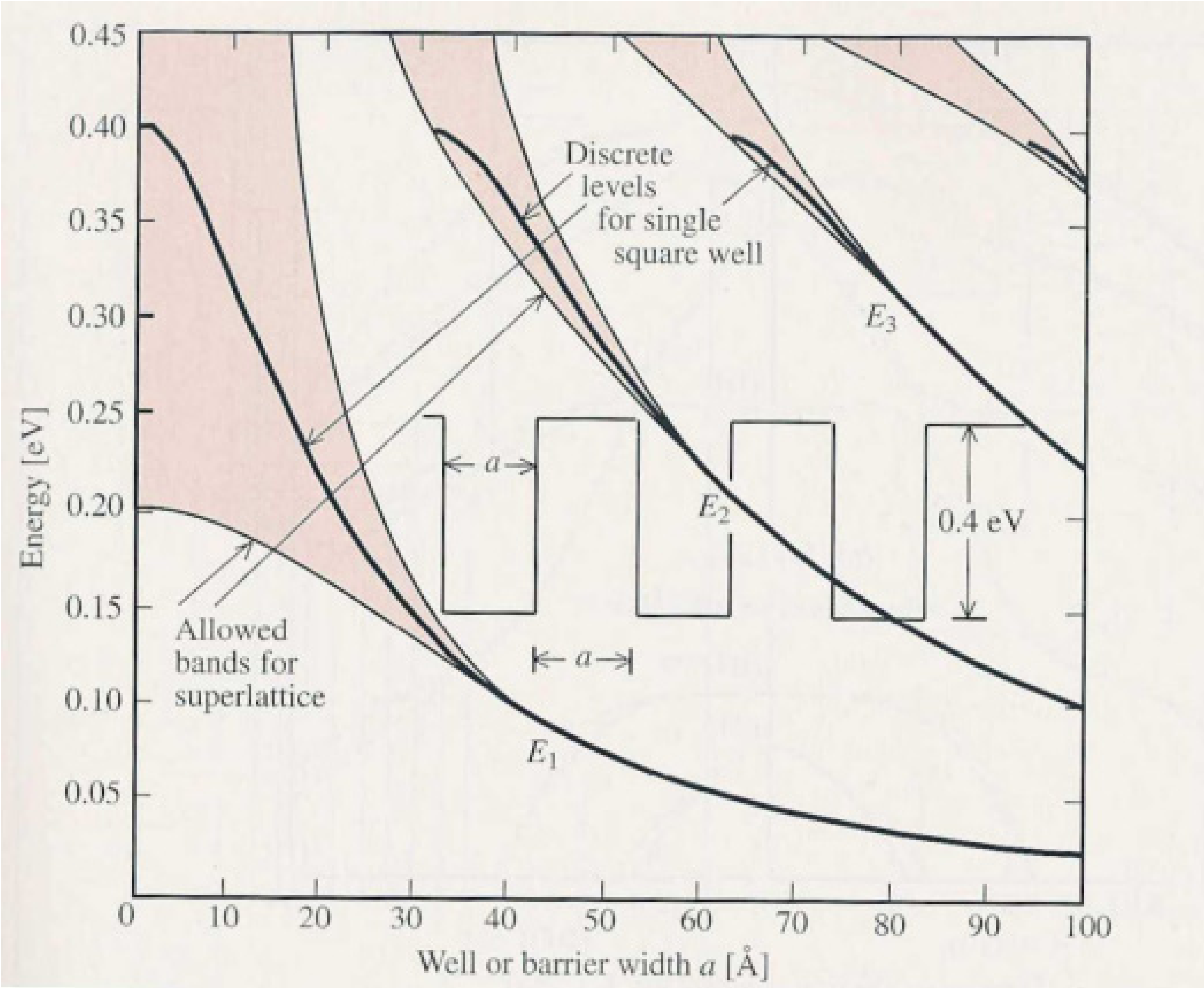
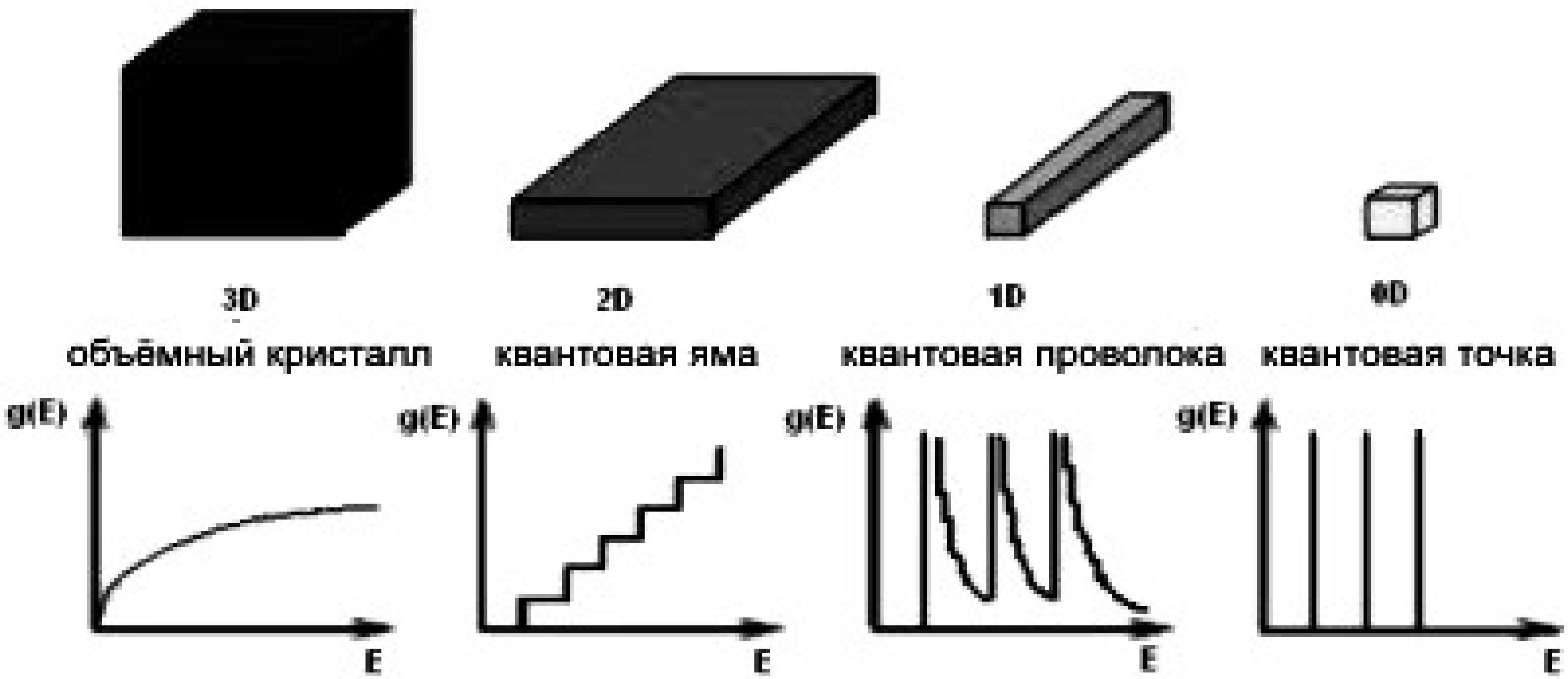
QW $\Rightarrow$ SL

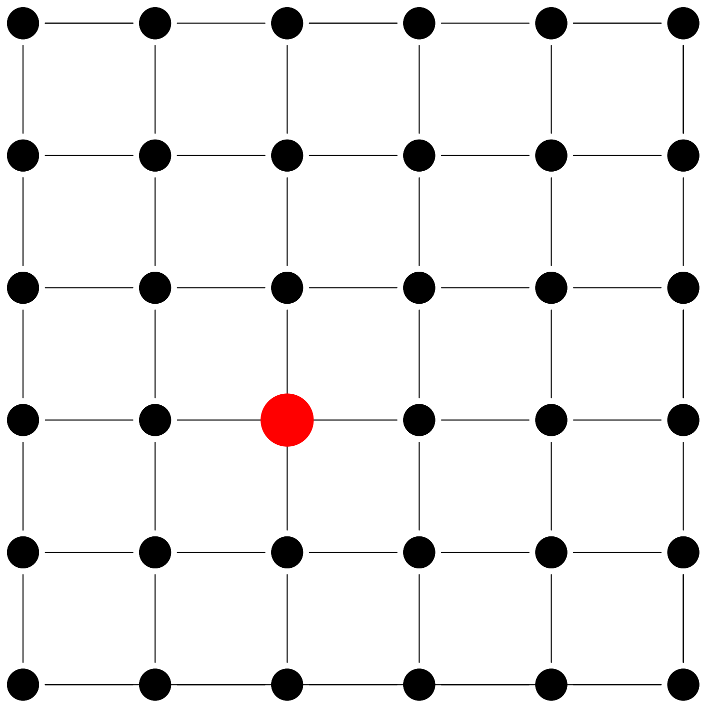


Density of states

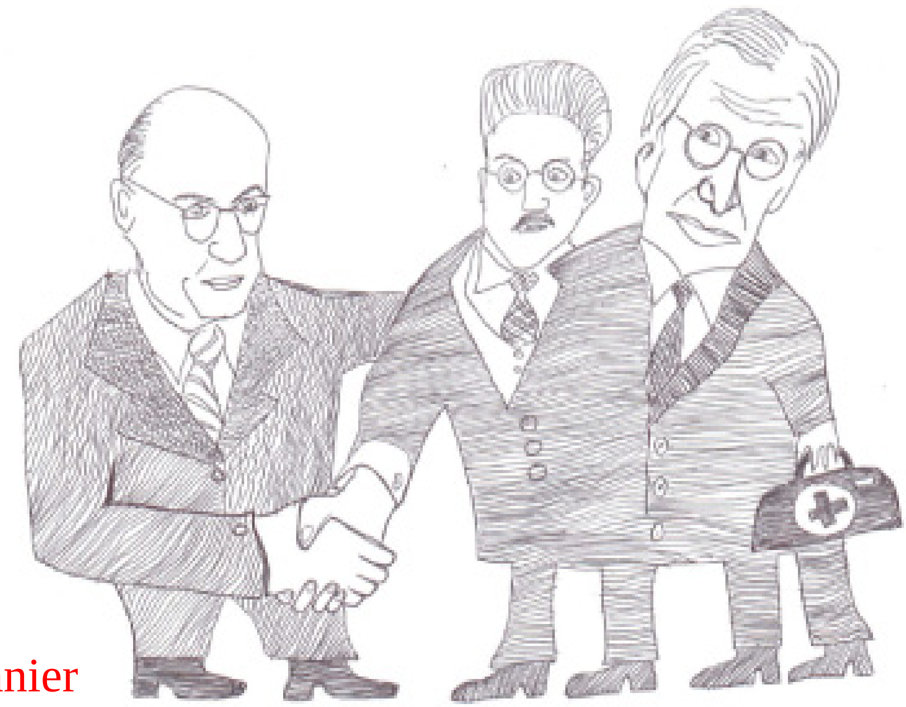


EXCITON

The main property of an exciton is it mobility



Exciton theory



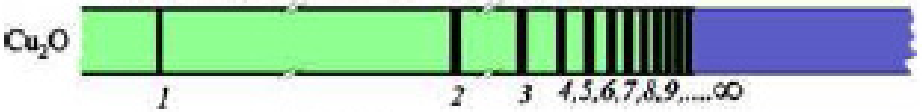
Frenkel | Mott | Wannier

Yakov Il'ich **Frenkel** (1894–1952), Sir Nevill. Francis **Mott** (1905–1996) and Grégory **Wannier** (1911–1983) gave their name to the two main categories of excitons.

Experimental observation, 1956

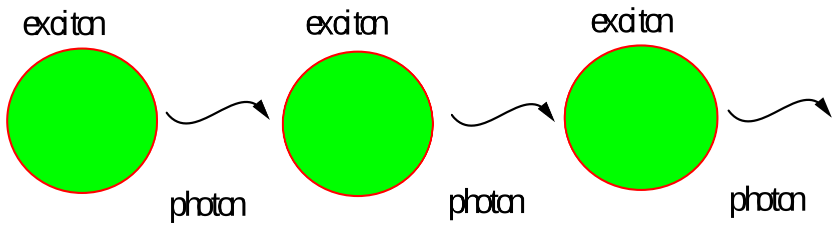
Evgeny Gross



$$E_n = 2{,}17244 - \frac{0{,}0972}{n_0^2}; \quad n_0 = 2,3,\ldots$$

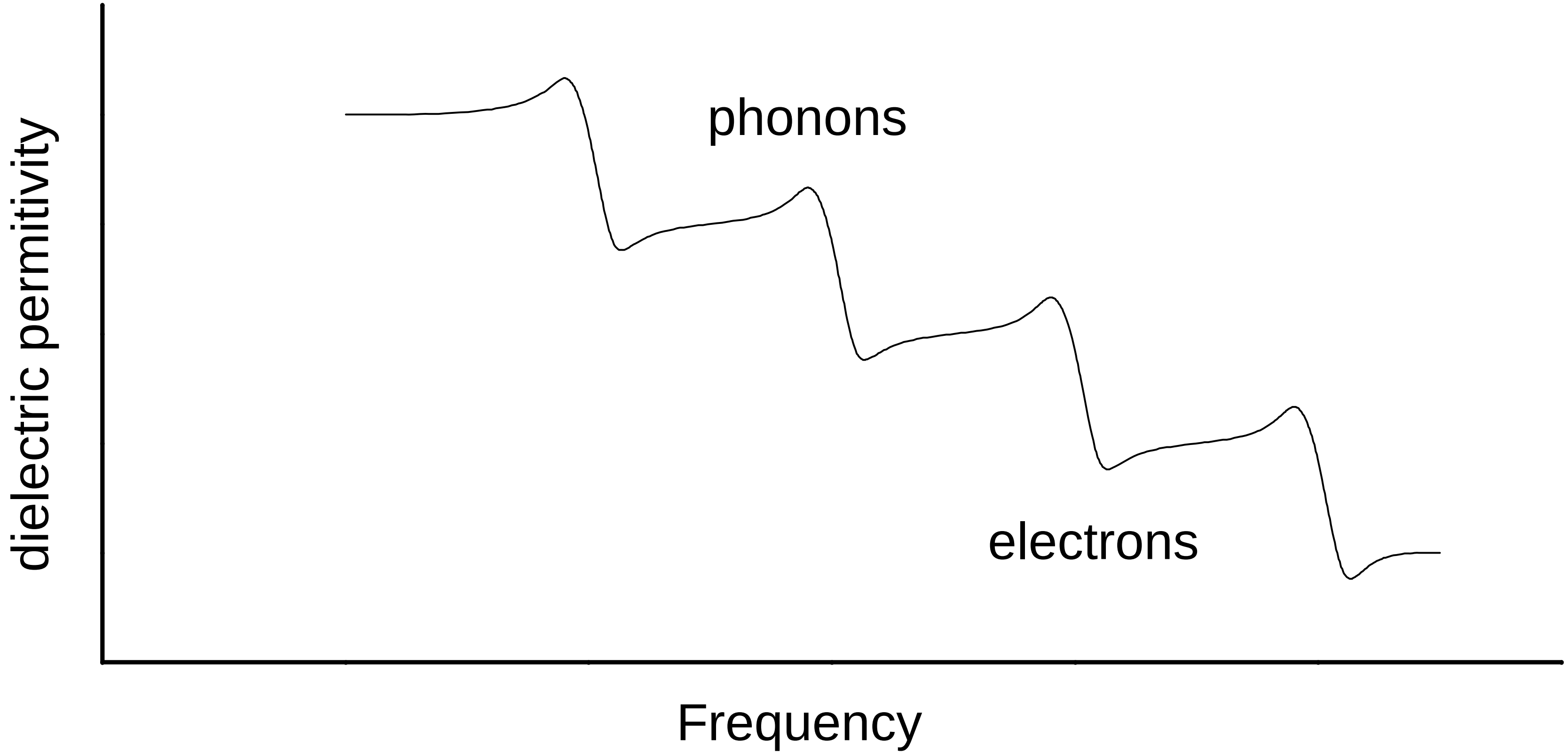
Exciton polaritons. Mixed exciton photon states

Chain of photon absorptions and emissions



Exciton = dielectric response of crystals

Dielectric function



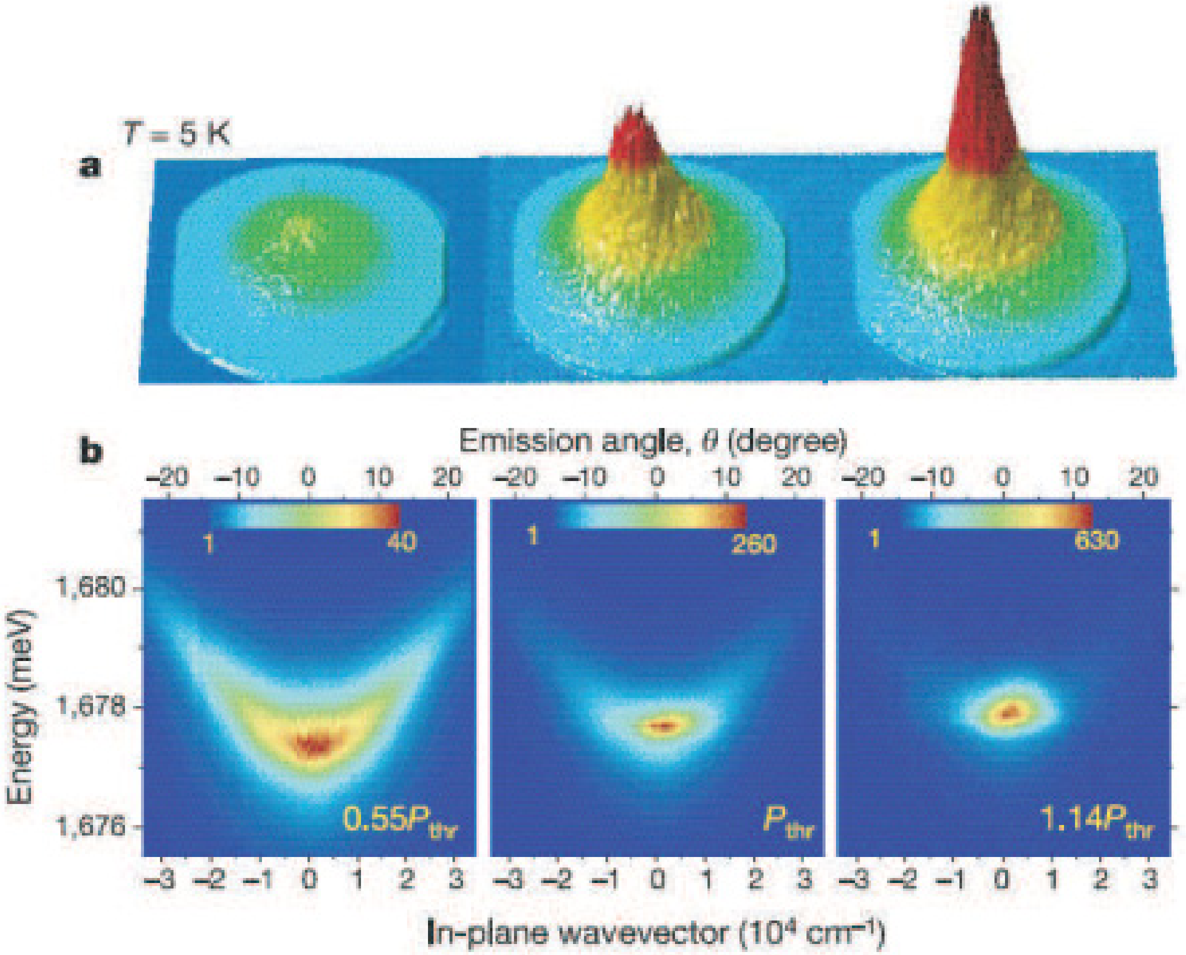
Vol 443|28 September 2006|doi:10.1038/nature05131

nature

ARTICLES

Bose–Einstein condensation of exciton polaritons

J. Kasprzak[1], M. Richard[2], S. Kundermann[2], A. Baas[2], P. Jeambrun[2], J. M. J. Keeling[3], F. M. Marchetti[4], M. H. Szymańska[5], R. André[1], J. L. Staehli[2], V. Savona[2], P. B. Littlewood[4], B. Deveaud[2] & Le Si Dang[1]



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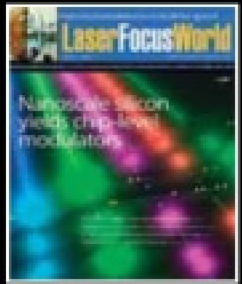
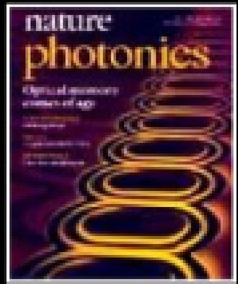
IBM Silicon Nanophotonics – Scientific Impact (2003-2010)

2005
Slow Light



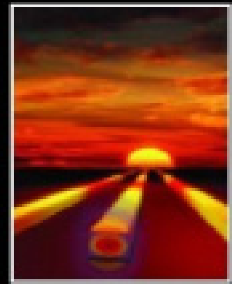
2006
Si Modulator



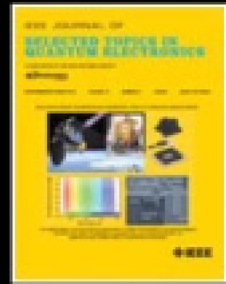
2007
Optical Buffer

2008
Si Switch

2009
APD Detector



2010
Amplifier



2010
Ge Receiver

Journal papers:	**>60 (including 5 Nature, 6 Invited)**
Conferences:	**>250 (including >100 Invited/Plenary)**
Citation index:	**>4000**
Patents:	**>30**

Fundamental scientific work laid down solid foundation for technology development

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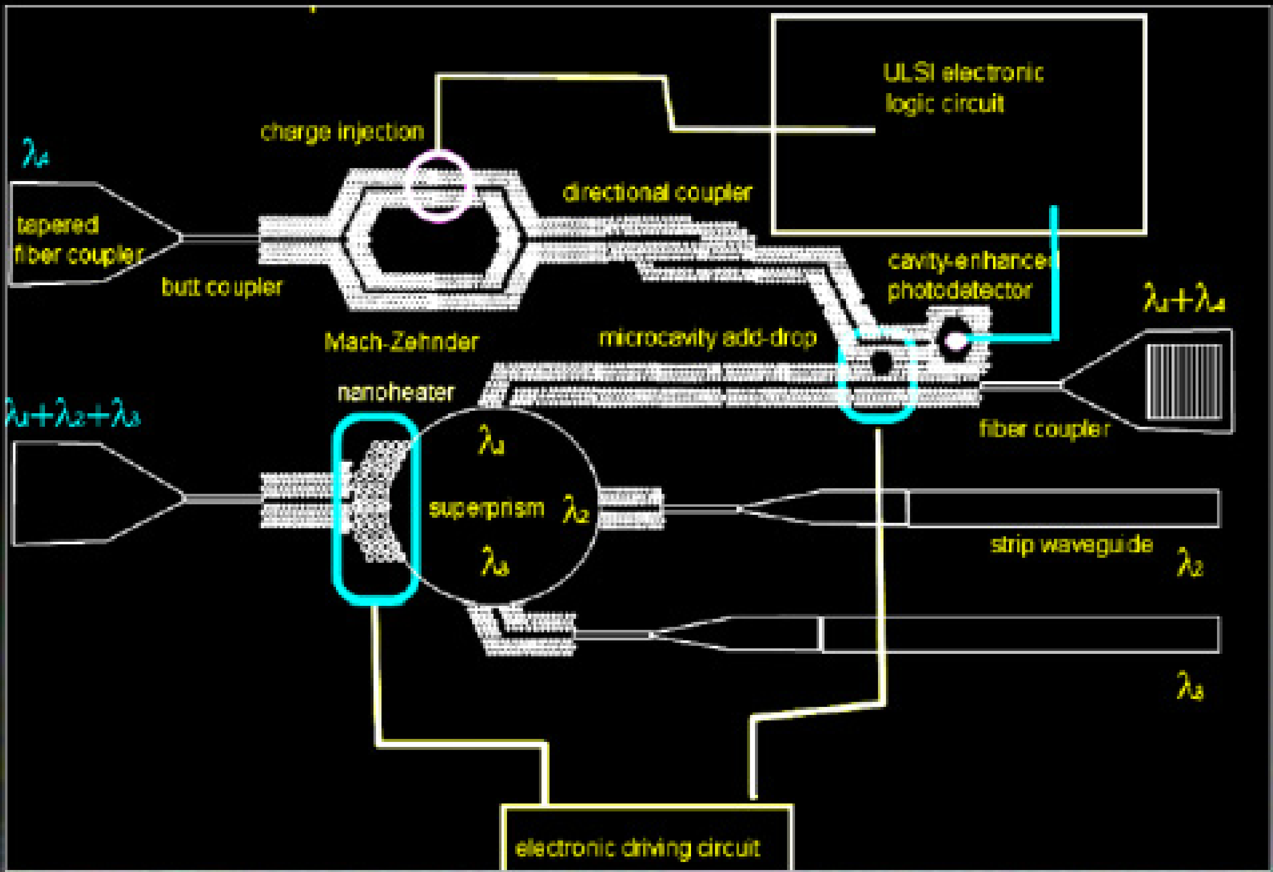
Nanophotonics Toolbox (circa 2002)

IBM



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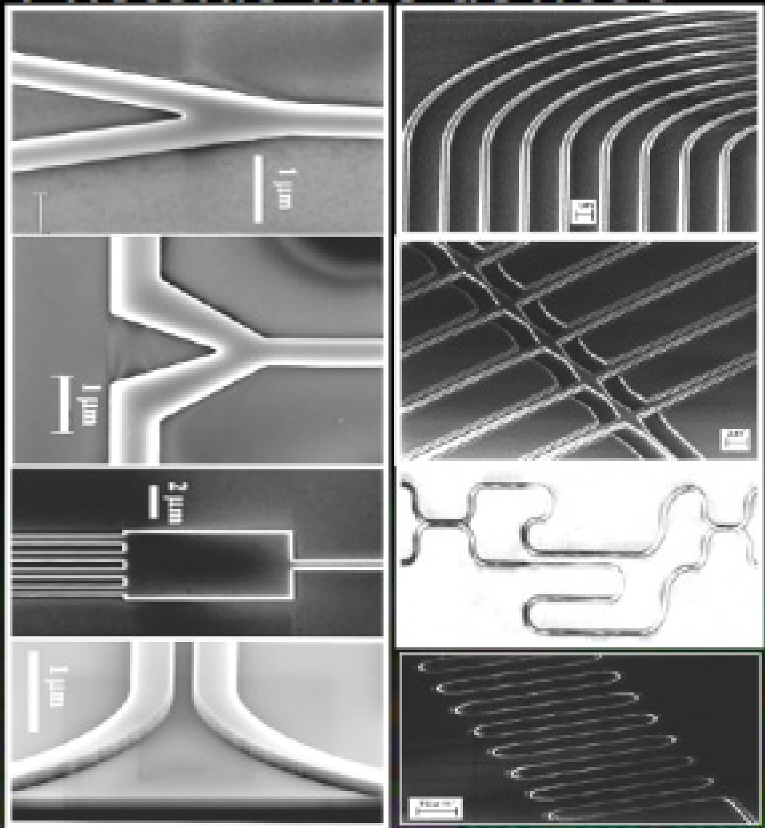
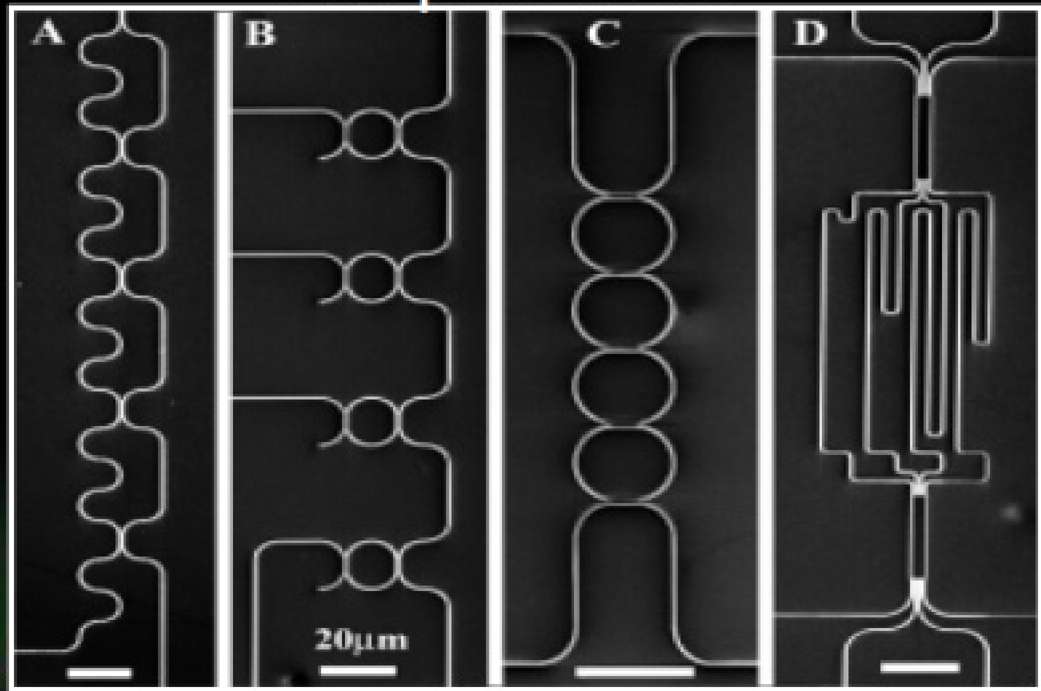
Photonic wire devices



Compact WDM



Footprint is as small as $0.03mm^2$

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Reasons for nano

Wishes for devices

- as small as possible
- as fast as possible
- low operating costs, small consumption
- cheap

Which applications

- fast electronics: high frequency GHz
  - mobile telephones, satellite receivers (TV), computers
- optoelectronics : current ⇔ light
  - lasers, LED, telecommunications (light through fibres)
  - solar cells, photocells, light detectors