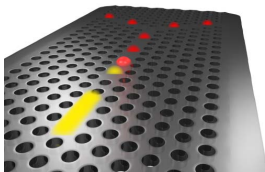


Nanofotonik og fotoniske krystaller – Tryllekunster med lys

Jakob Rosenkrantz de Lasson

 @jakobrdl
www.jakobrdl.dk
www.nanophotonics.dk



Bolsjefabrikken, 25. april 2014



 **DTU Fotonik**
Institut for Fotonik

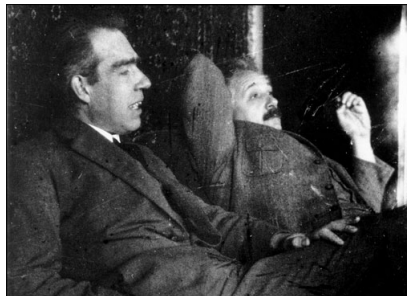


I. En appetizer til jer









II. Hvem vi er



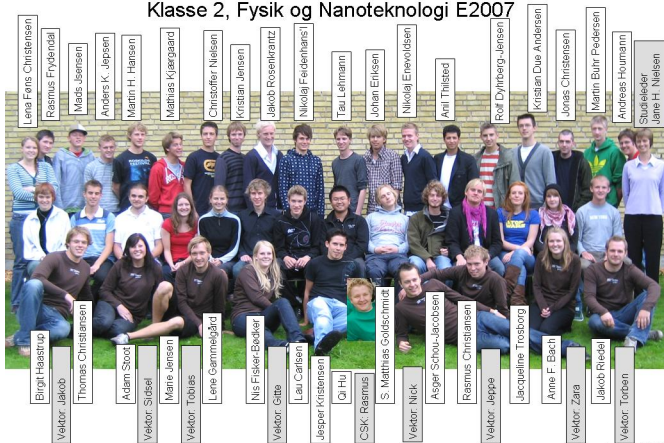


Sct. Knuds Gymnasium & HF-Kursus
3.2 - 2006

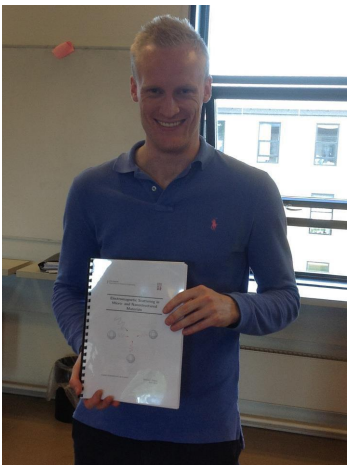
© Odense Skolefoto

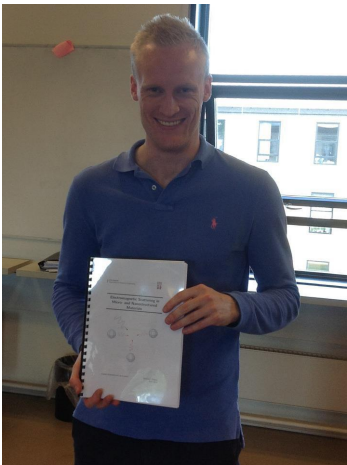


Klasse 2, Fysik og Nanoteknologi E2007



3. september 2007

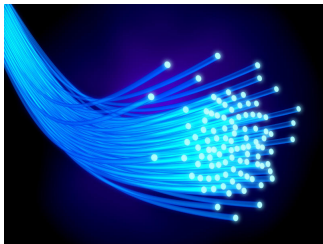






DTU Fotonik

Institut for Fotonik



III. Hvorfor der er behov for os

Google

Google

facebook®

Google



Google



Instagram



Dropbox

Google



Instagram



Google



Instagram



Dropbox



Spotify®

Google



Instagram

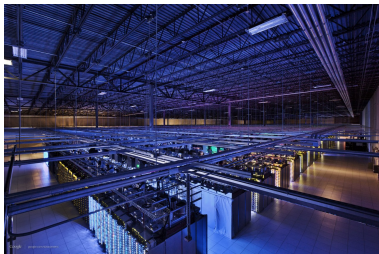


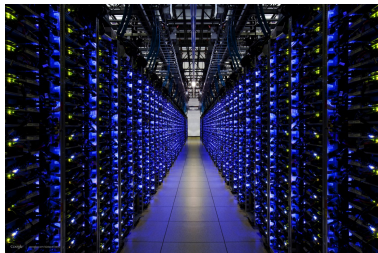
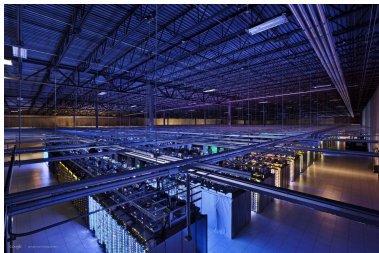
Dropbox

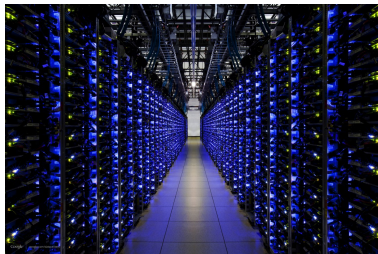
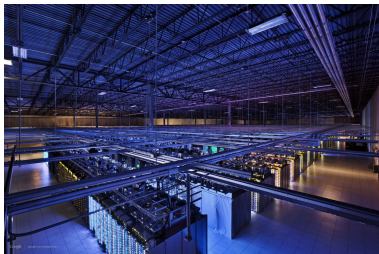


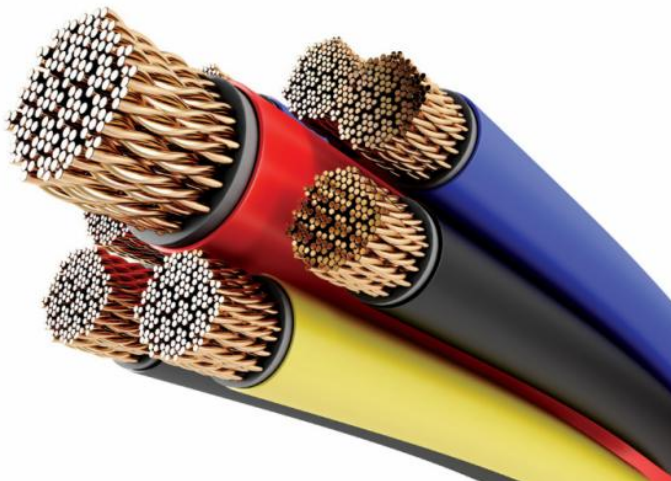
Spotify®

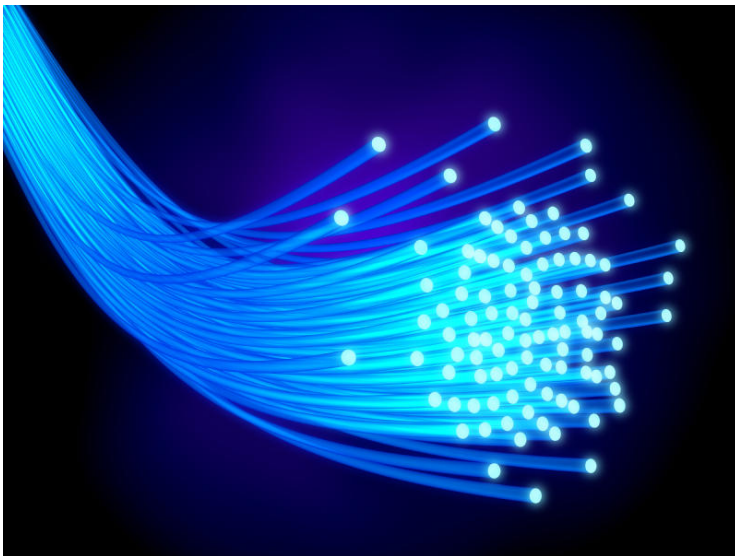
coursera













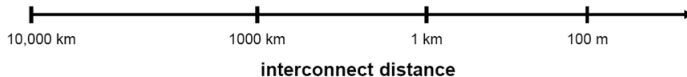
Telecommunications



Campus networks



LANs





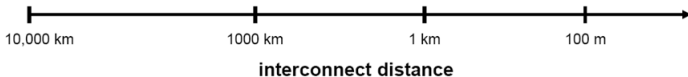
Telecommunications



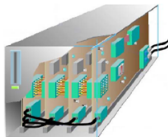
Campus networks



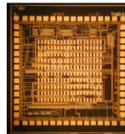
LANs



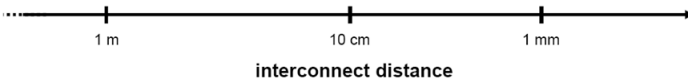
Backplanes & board-to-board



Chip-to-chip



On-chip

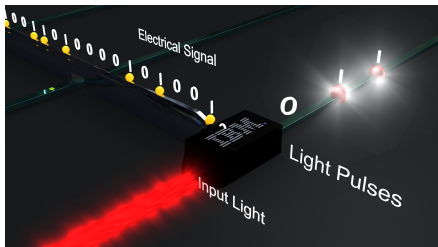


IBM: Nanophotonics Will Smash Data Center Bottlenecks

Rather than use electricity to move data between processors, IBM is preparing to use light, giving high-end customers enough power to keep pace with the growing information flowing through data centers.

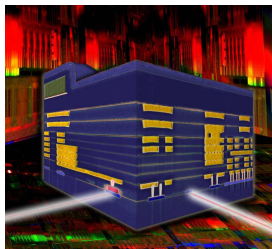
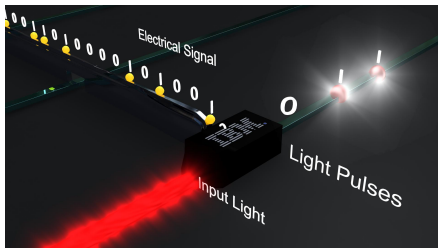
IBM: Nanophotonics Will Smash Data Center Bottlenecks

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IBM: Nanophotonics Will Smash Data Center Bottlenecks

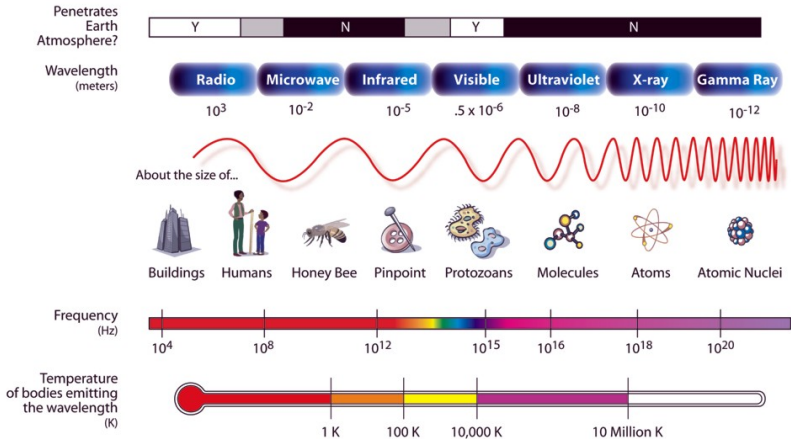
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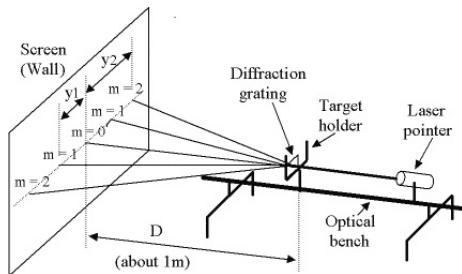
IV. Hvad lys er

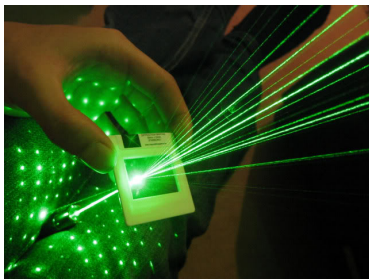
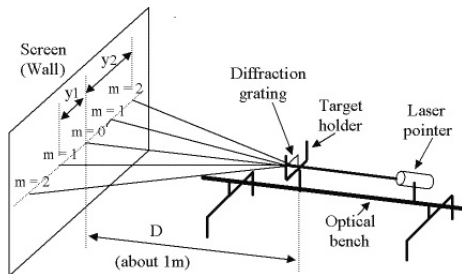


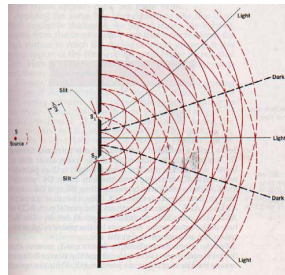
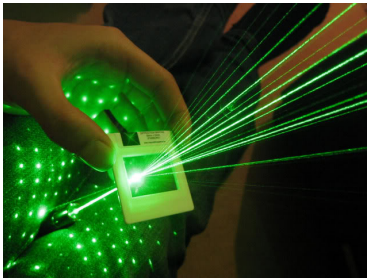
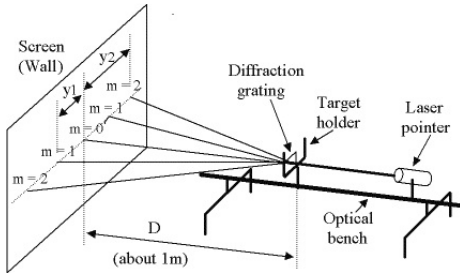
THE ELECTROMAGNETIC SPECTRUM

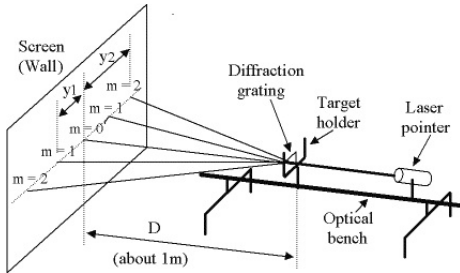




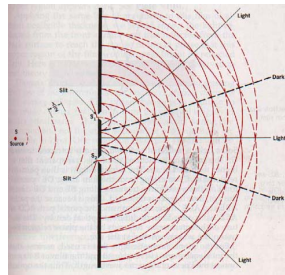
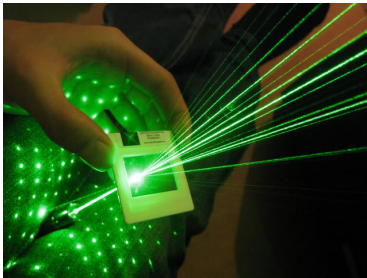


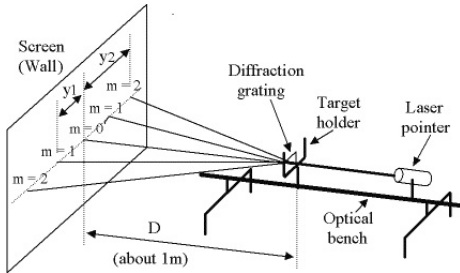






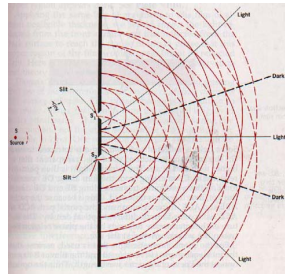
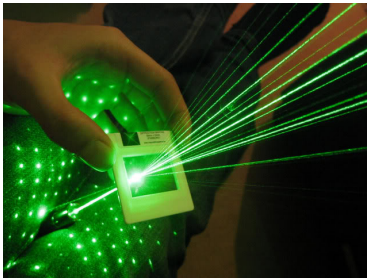
$$m\lambda = 2d \sin(\theta)$$

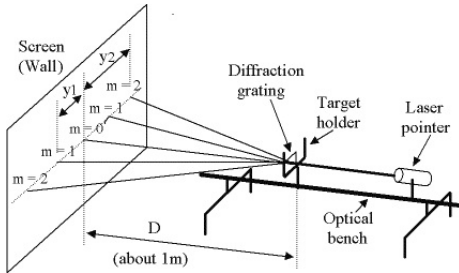




$$m\lambda = 2d \sin(\theta)$$

$$\frac{m}{2} \frac{\lambda}{d} = \sin(\theta)$$



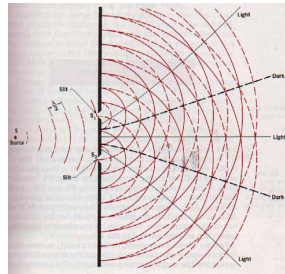
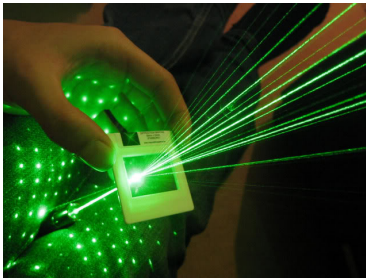


$$m\lambda = 2d \sin(\theta)$$

$$\frac{m}{2} \frac{\lambda}{d} = \sin(\theta)$$

$\lambda/d \ll 1$: Lys som stråler

$\lambda/d \simeq 1$: Lys som bølger



V. Hvad vi gør

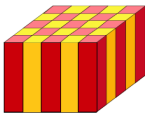
1-D



periodic in
one direction

(a)

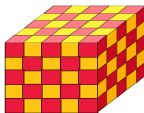
2-D



periodic in
two directions

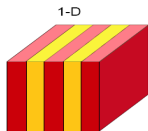
(b)

3-D



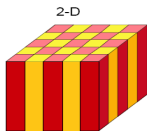
periodic in
three directions

(c)



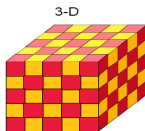
periodic in
one direction

(a)



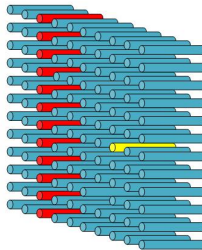
periodic in
two directions

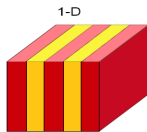
(b)



periodic in
three directions

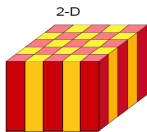
(c)





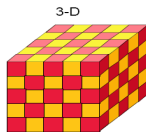
periodic in
one direction

(a)



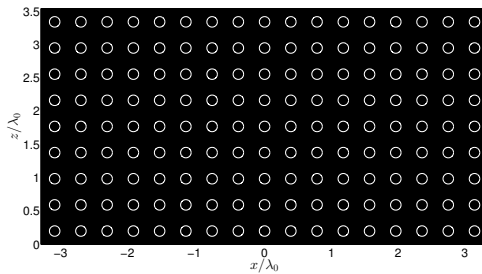
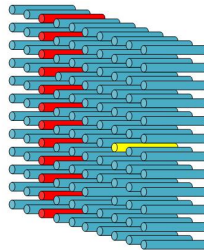
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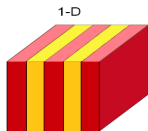
(b)



periodic in
three directions

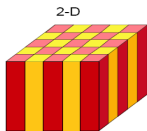
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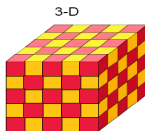
periodic in
one direction

(a)



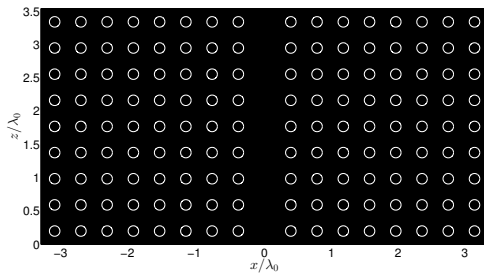
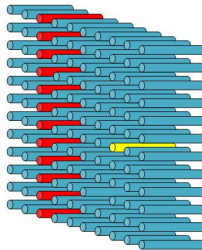
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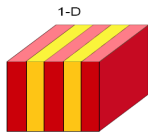
(b)



periodic in
three directions

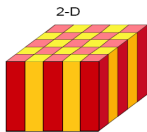
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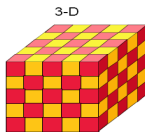
periodic in
one direction

(a)



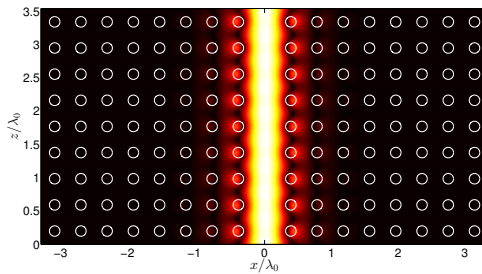
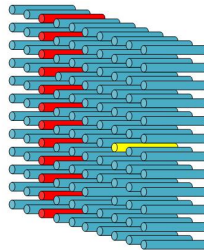
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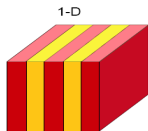
(b)



periodic in
three directions

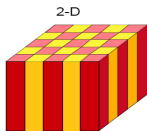
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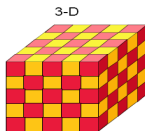
periodic in
one direction

(a)



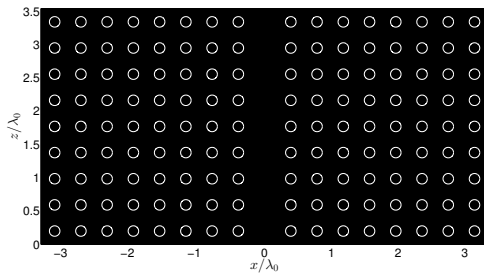
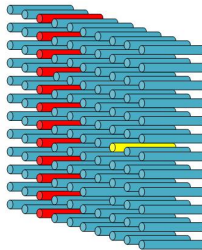
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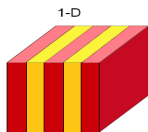
(b)



periodic in
three directions

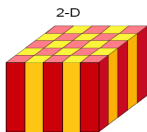
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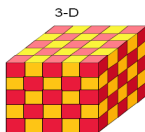
periodic in
one direction

(a)



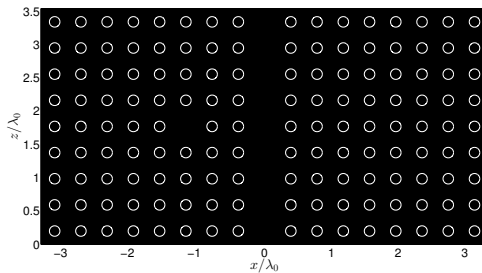
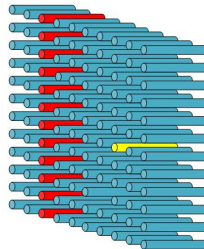
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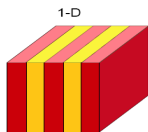
(b)



periodic in
three directions

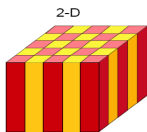
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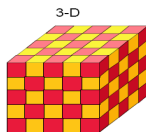
periodic in
one direction

(a)



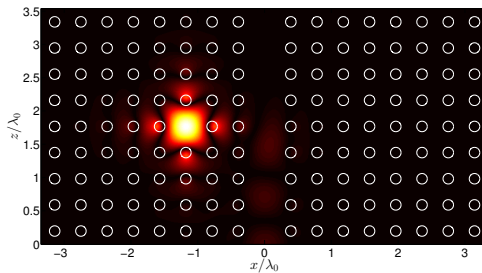
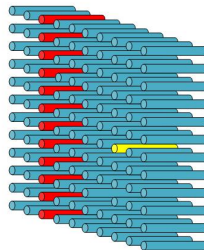
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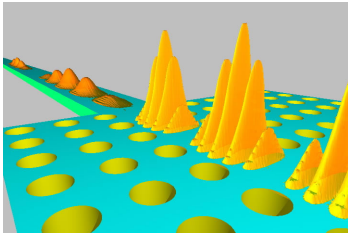
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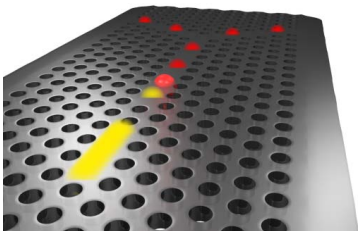
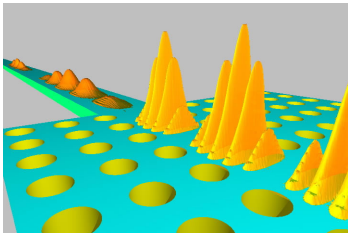


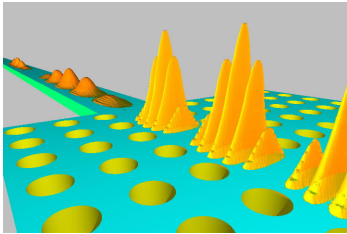
periodic in
three directions

(c)

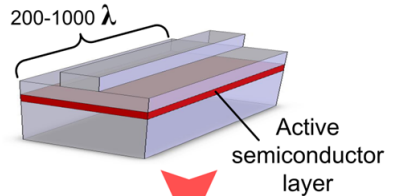




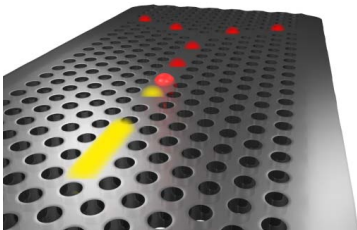
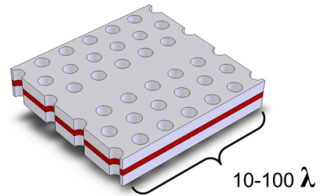


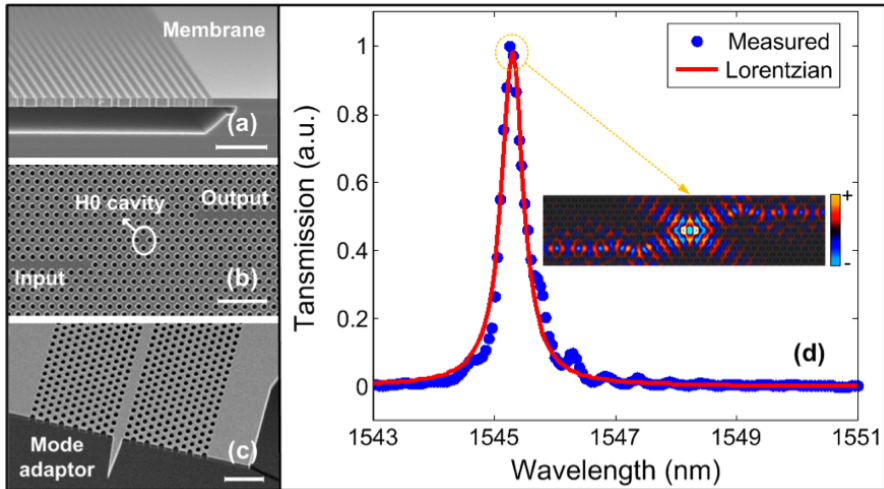


Standard Optical Waveguide

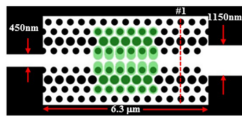


Photonic Crystal Waveguide

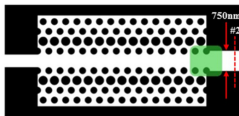




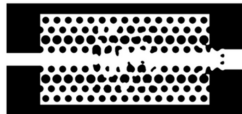
[Yi Yu *et al.*, Opt. Express **21**, 31047 (2013)]



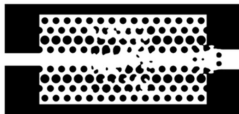
(a)



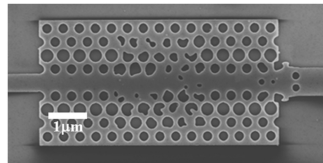
(b)



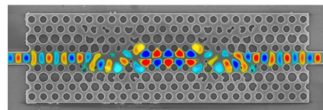
(c)



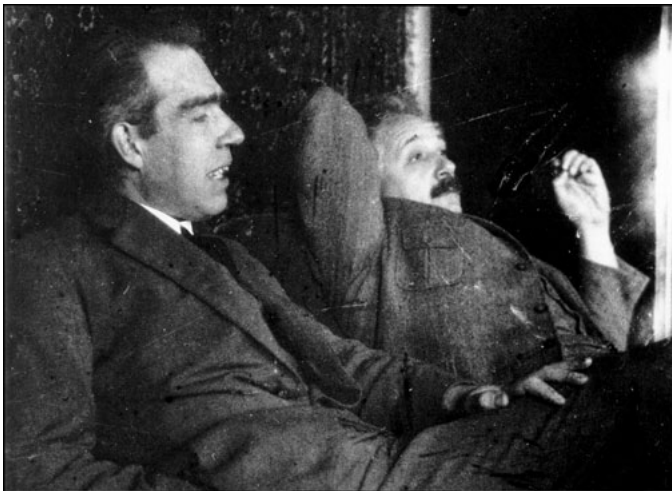
(d)

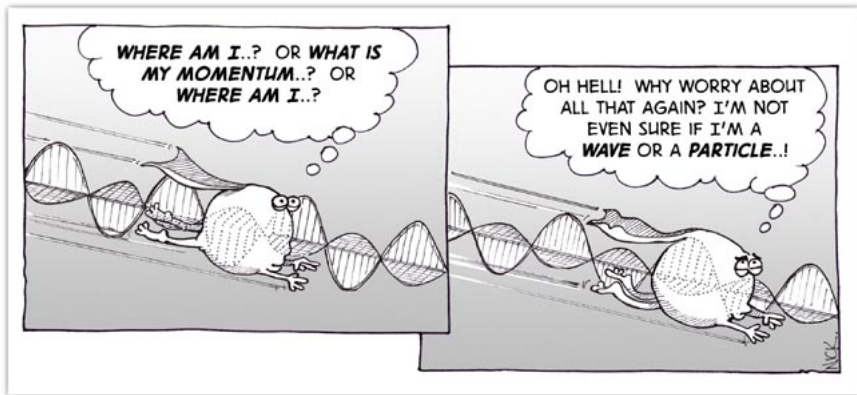


(a)



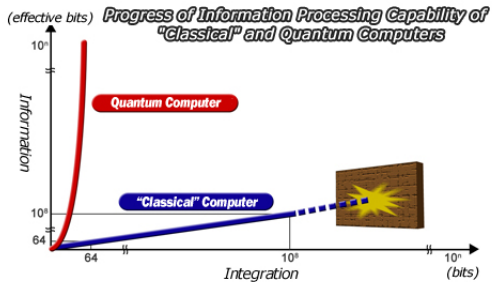
(b)



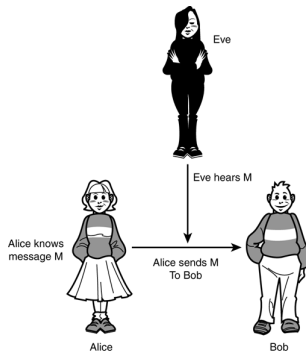
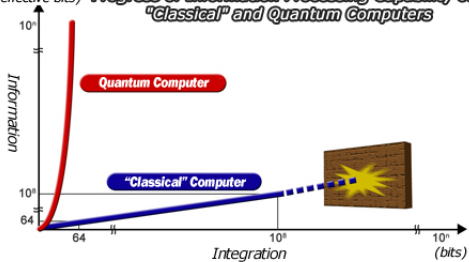


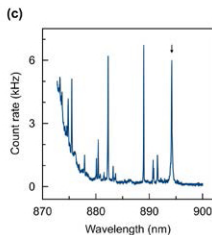
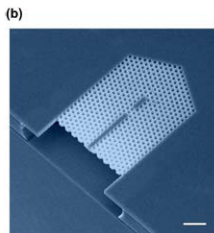
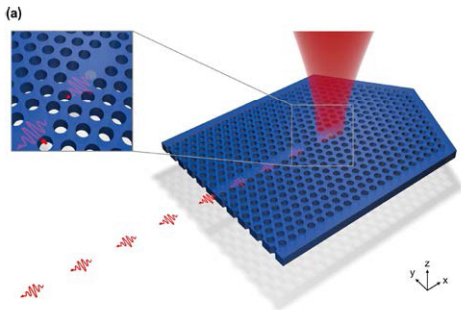
Photon self-identity issues

LIGHT IS A
WAVE!

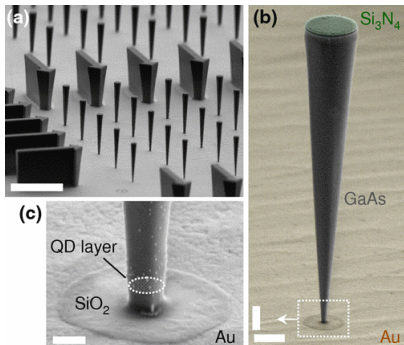


(effective bits) *Progress of Information Processing Capability of
"Classical" and Quantum Computers*





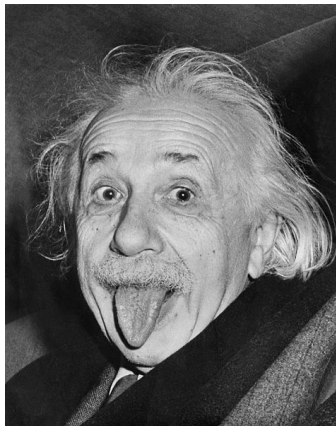
[Schwagmann *et al.*, Opt. Express **20**, 28614 (2012)]

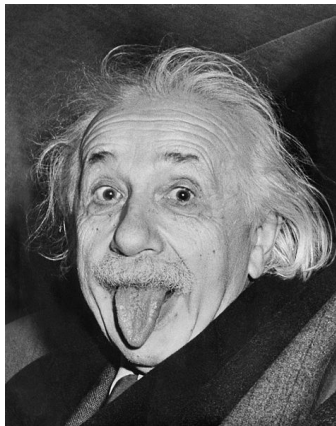


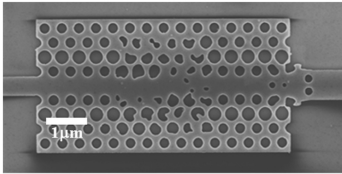
[Munsch *et al.*, Phys. Rev. Lett. **110**, 177402 (2013)]

[Claudon *et al.*, Nat. Photon. **4**, 174 (2010)]

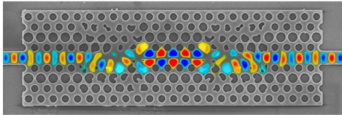
VI. Afrundingen



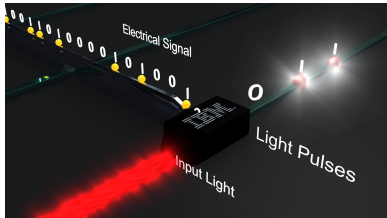


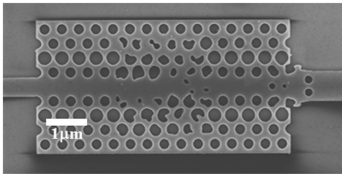


(a)

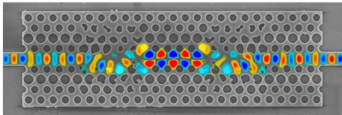


(b)

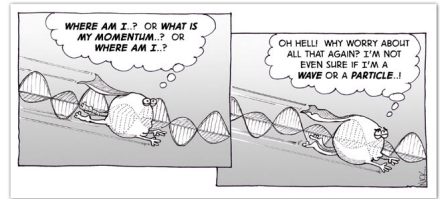
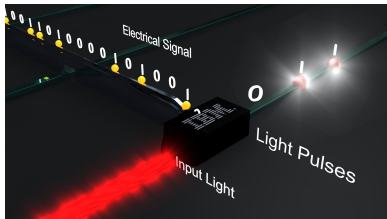




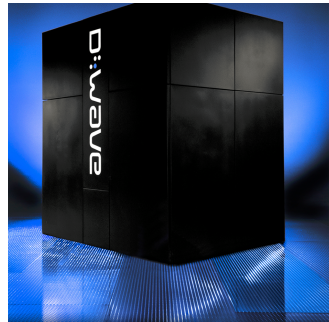
(a)



(b)



Photon self-identity issues



Tak for opmærksomheden!

