

# Technical Optics

Klaus Boller

Pepijn Pinkse

## Applied Nanophotonics

# Light: central source of information

## Human communication

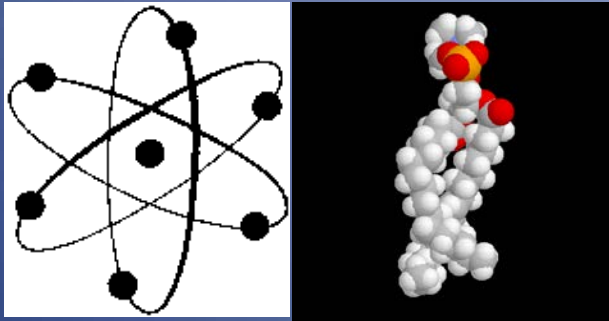


## Optical retrieval of ancient data



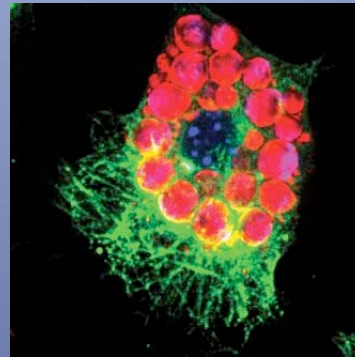
# Optical Instruments: gain knowledge about the “invisible”

Atoms & Molecules



Spectrometer

Living Cells



Microscope

Universe



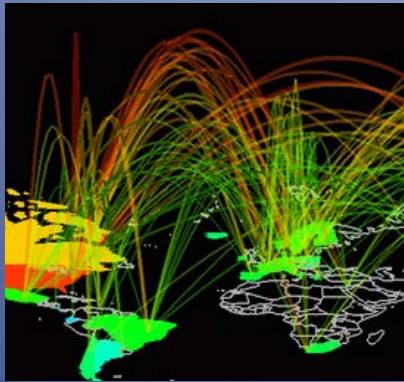
Telescope



What is this ?

# Relevance of Technical Optics

Health   Communications   Economy   Environment   Social





# Technical Optics

- I **Lectures** on the themes:  
Fourier transformations for EM waves  
e.g. holography, mode-locked lasers, images, no-go theorems
- II **TO road trip** to academic / industrial research places
- III **Student lectures** with coaching and feedback





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Lecturers: Klaus Boller



Pepijn Pinkse

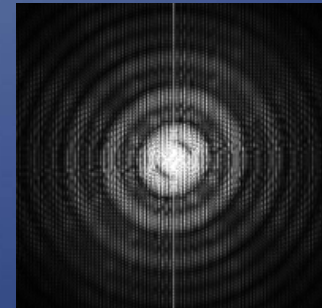
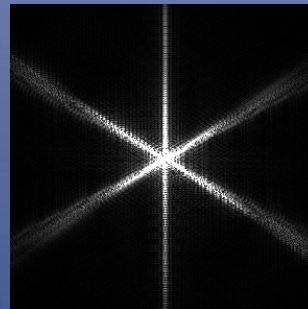
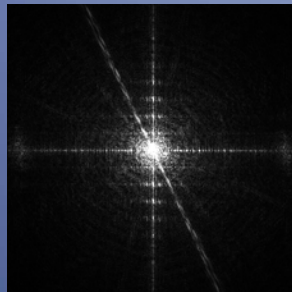
Book: Intro *Optics*, Pedrotti (Chapters 9, 21) or  
*Optics*, 5th ed. by Eugene Hecht

Grades: 60% written exam (covering topics from part I)  
20% homework  
20% presentation including annotations



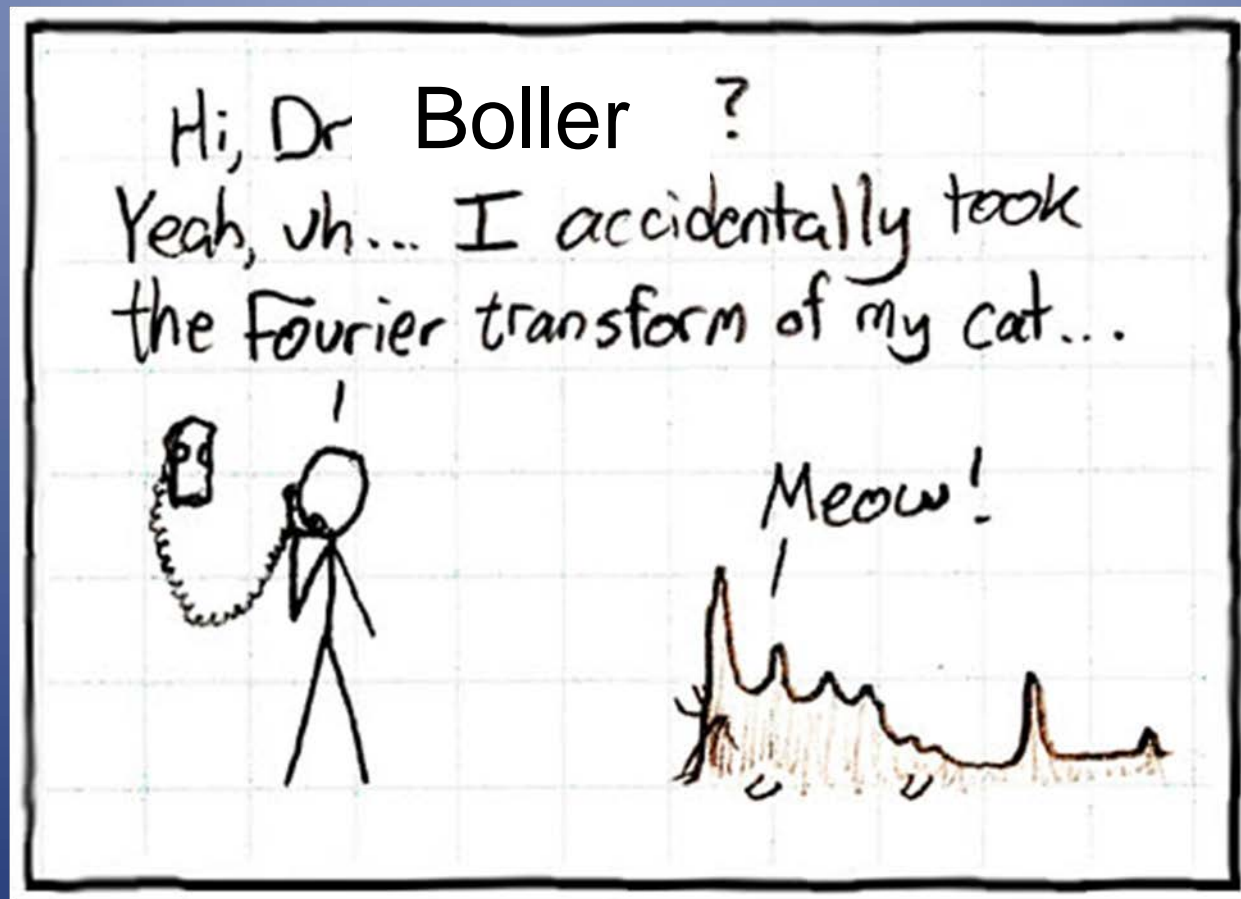
The bridging item:

# Fourier transforms — *live*





The bridging item:  
Fourier transforms — *live*



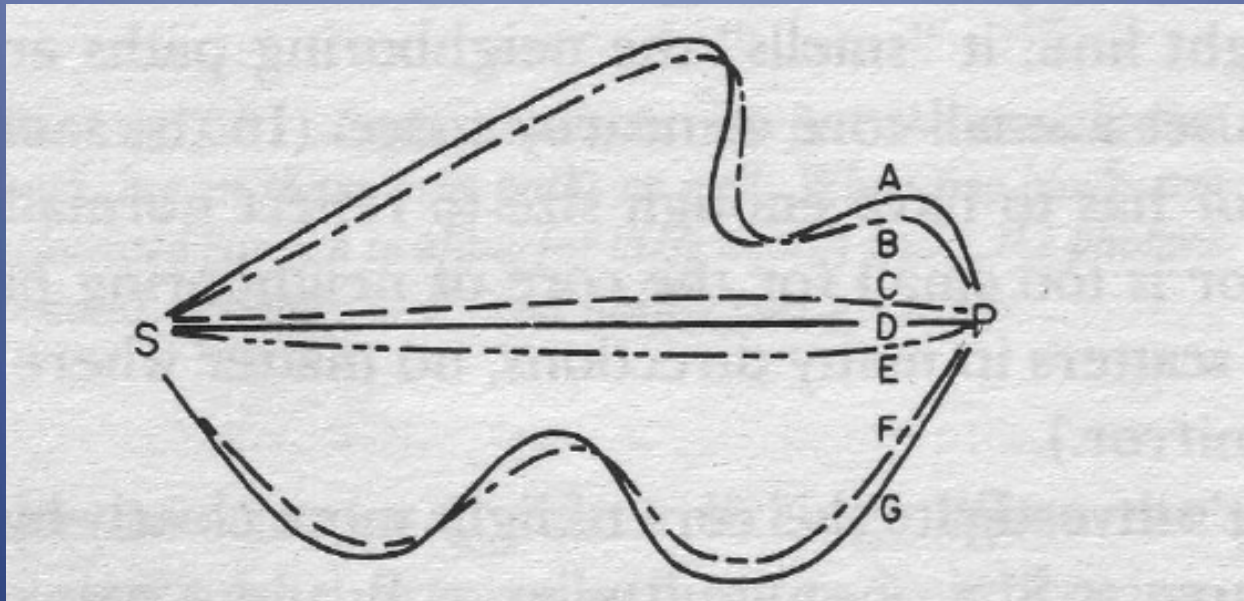
# Diffraction of waves



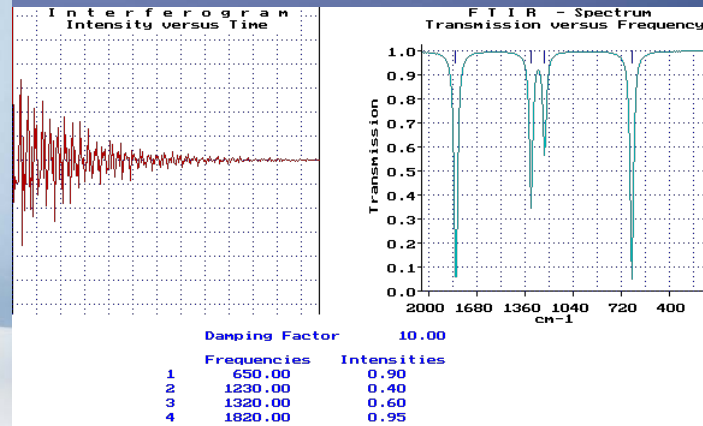
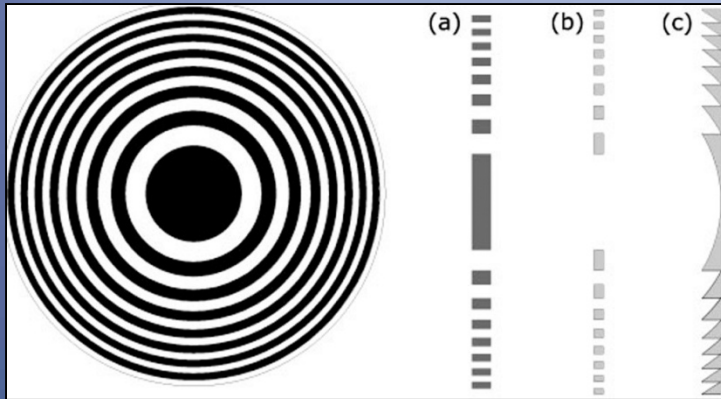
# Diffraction of light vs photons: which path do they take?

“A Strange Theory of Light”

by Richard Feynman

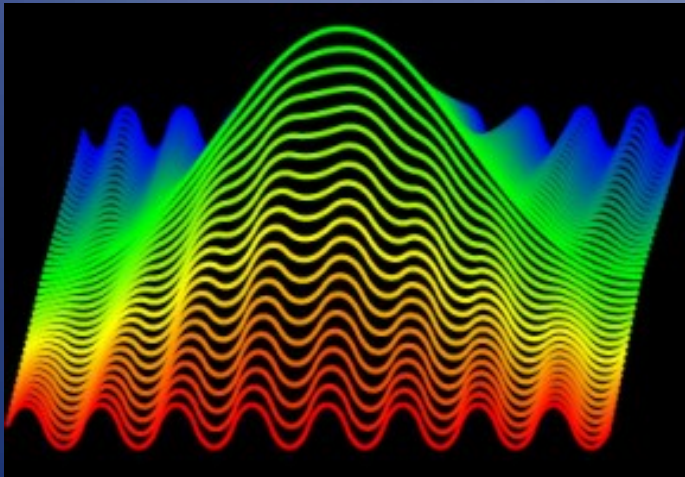


# Applications of FT in optics



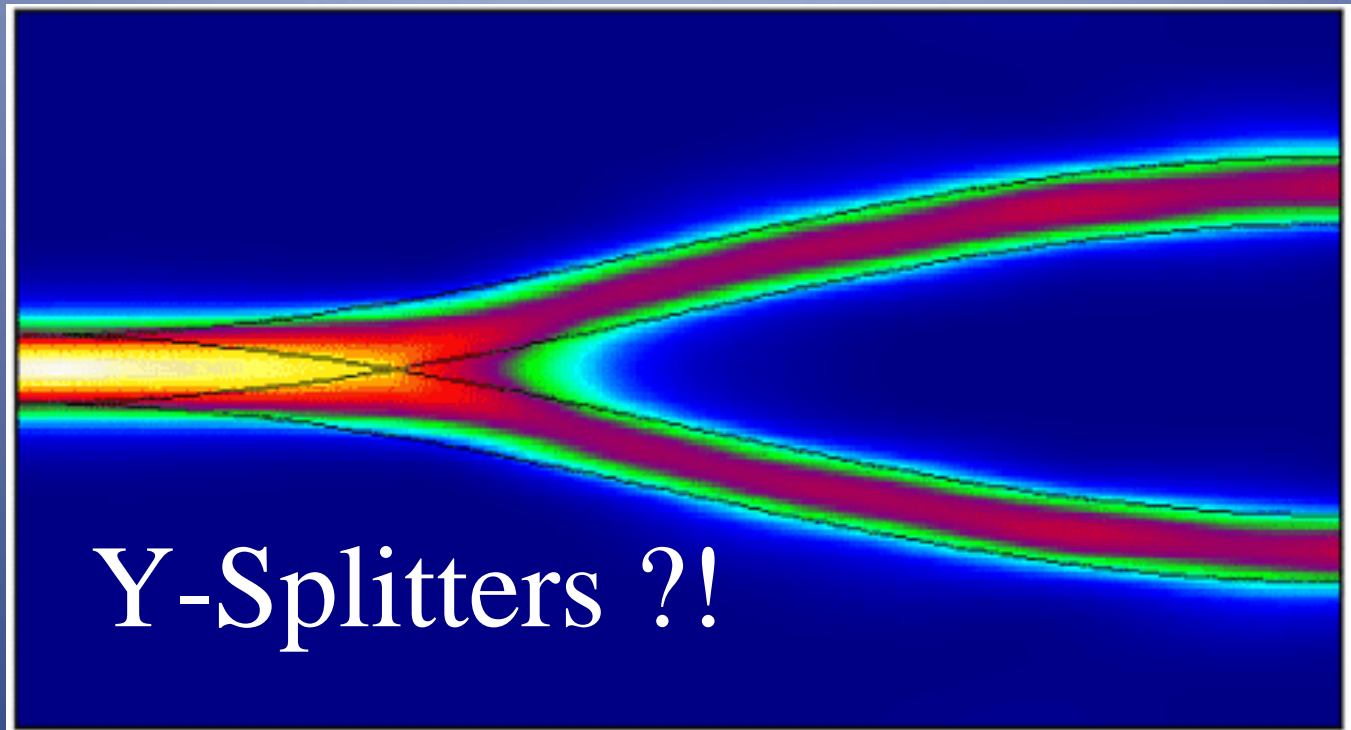


Can this  
be true ?



Shape light in time

# No-go Theorems



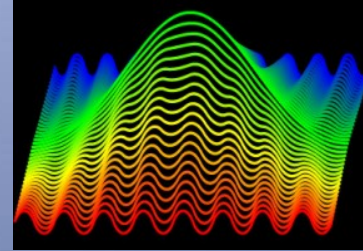
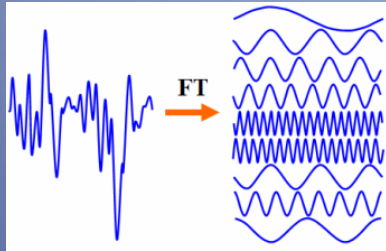
Time-reversal, Etendue, Phase-Space arguments

Shape wavefronts  
through “stuff” !



# To be achieved

## 1. Understand more of the beauty of light



## 2. Follow up great Dutch scientists



## 3. Prepare for your next adventures and jobs



# Look beyond Technical Optics:

- Internship
- MSc project
- PhD ?

## Elective courses

Laser Physics, Wave Optics, Quantum Optics, Nanophotonics, Nanooptics, Nonlinear Optics, etc...

# Applied NanoPhotonics



COPS LPNO OS MACS BMPI XUV NBP



# Begin with serious fun in optics & photonics

Examples of recent ANP collaborative highlights

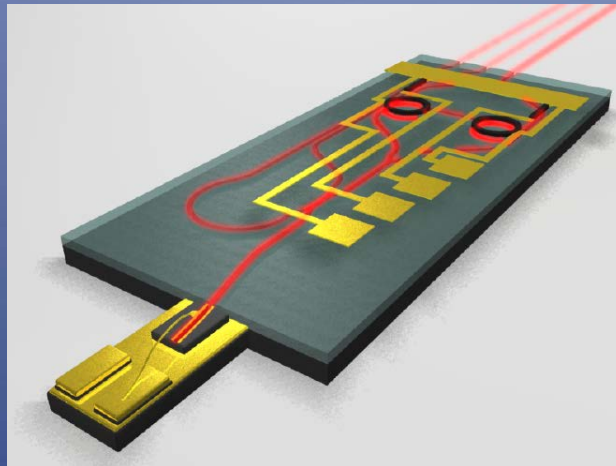


see-through



COPS & NBP

Lowest linewidth



LPNO & OS

Quantum photonic processor



LPNO & COPS