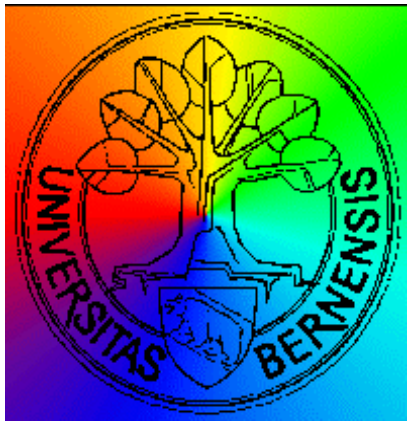


# Biomedical Photonics

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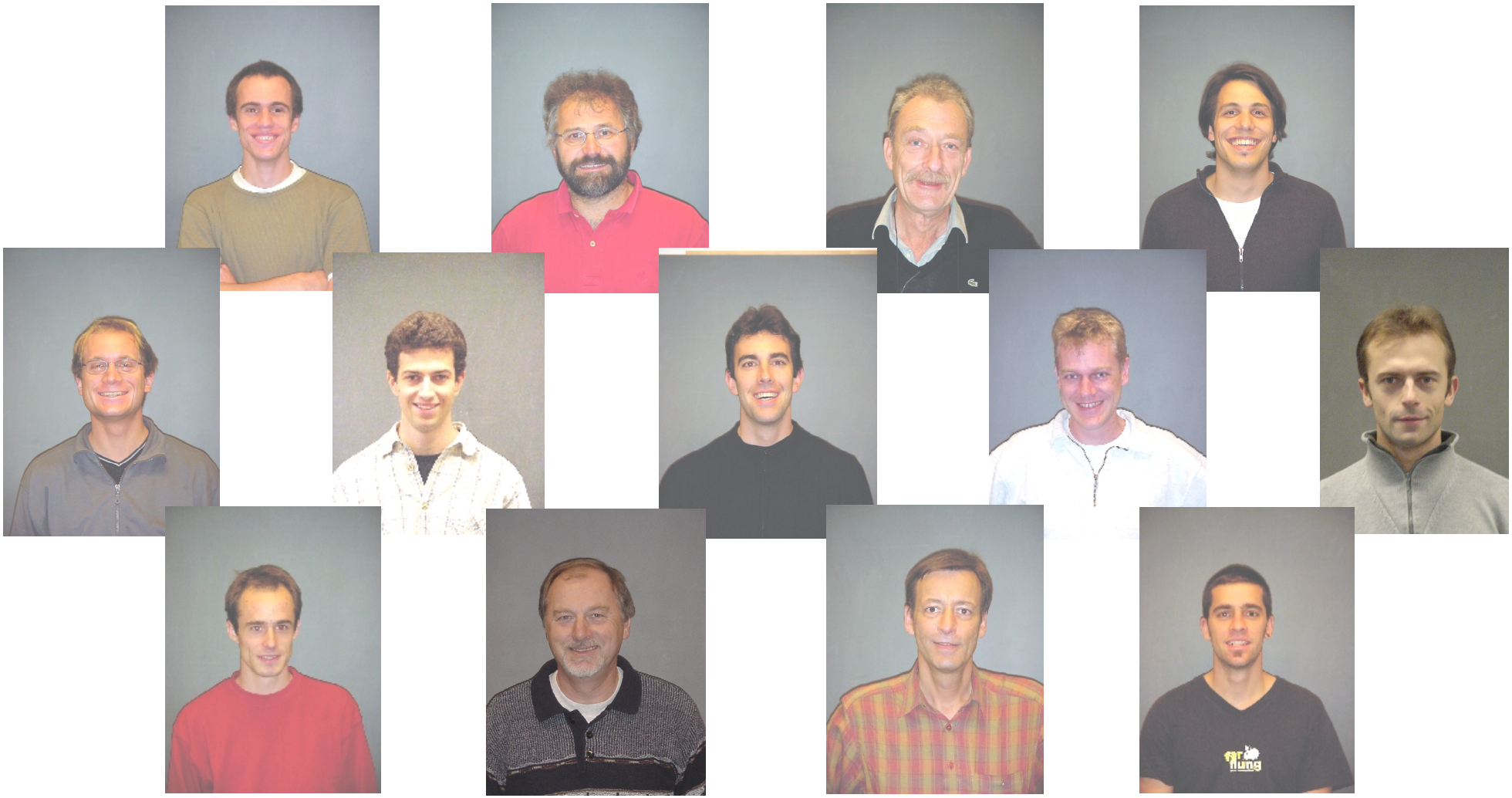
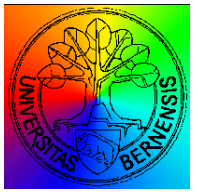
Proff. Martin Frenz and J. Ricka

frenz@iap.unibe.ch,

# Biomedizinische Photonik






# Therapeutic applications

„Light used as carrier of energy “

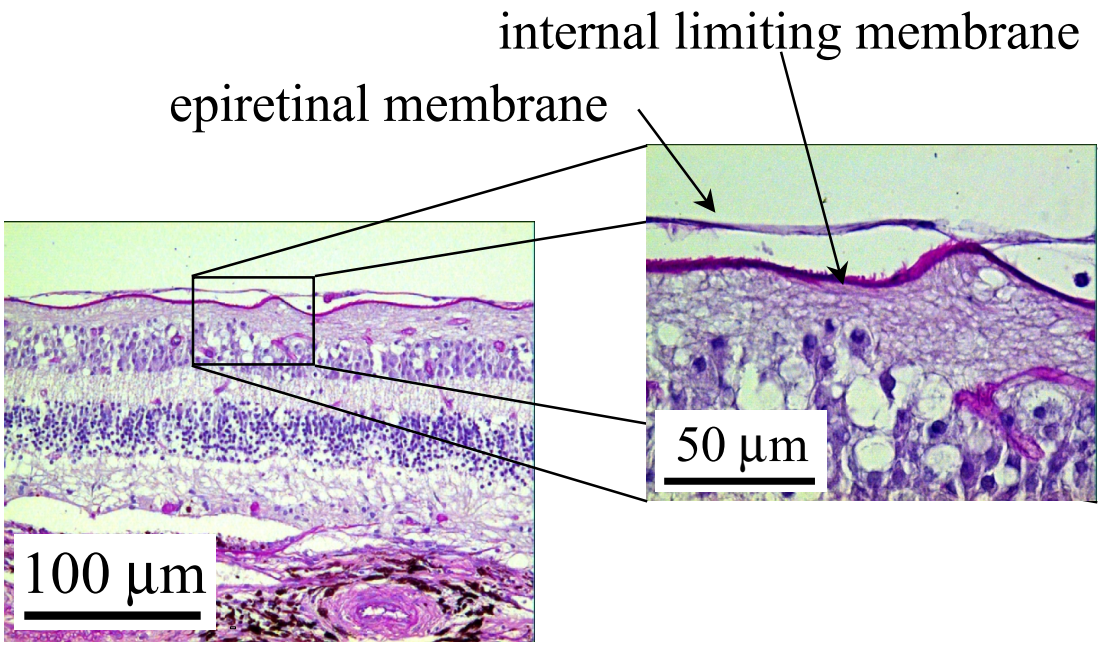
# Diagnostic applications

„Light used as carrier of information“

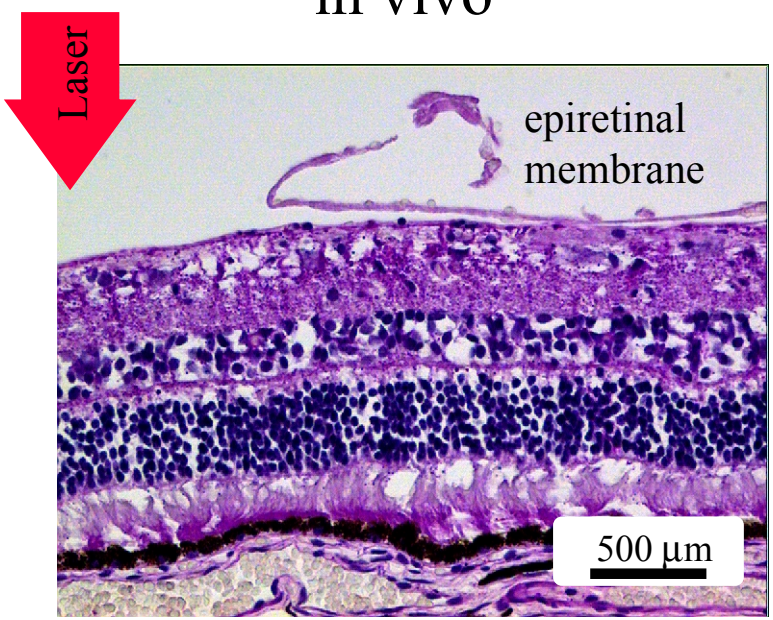
# Running projects

University of Bern
Biomedical Photonics

- ablation of epiretinal membranes of the eye




in vivo

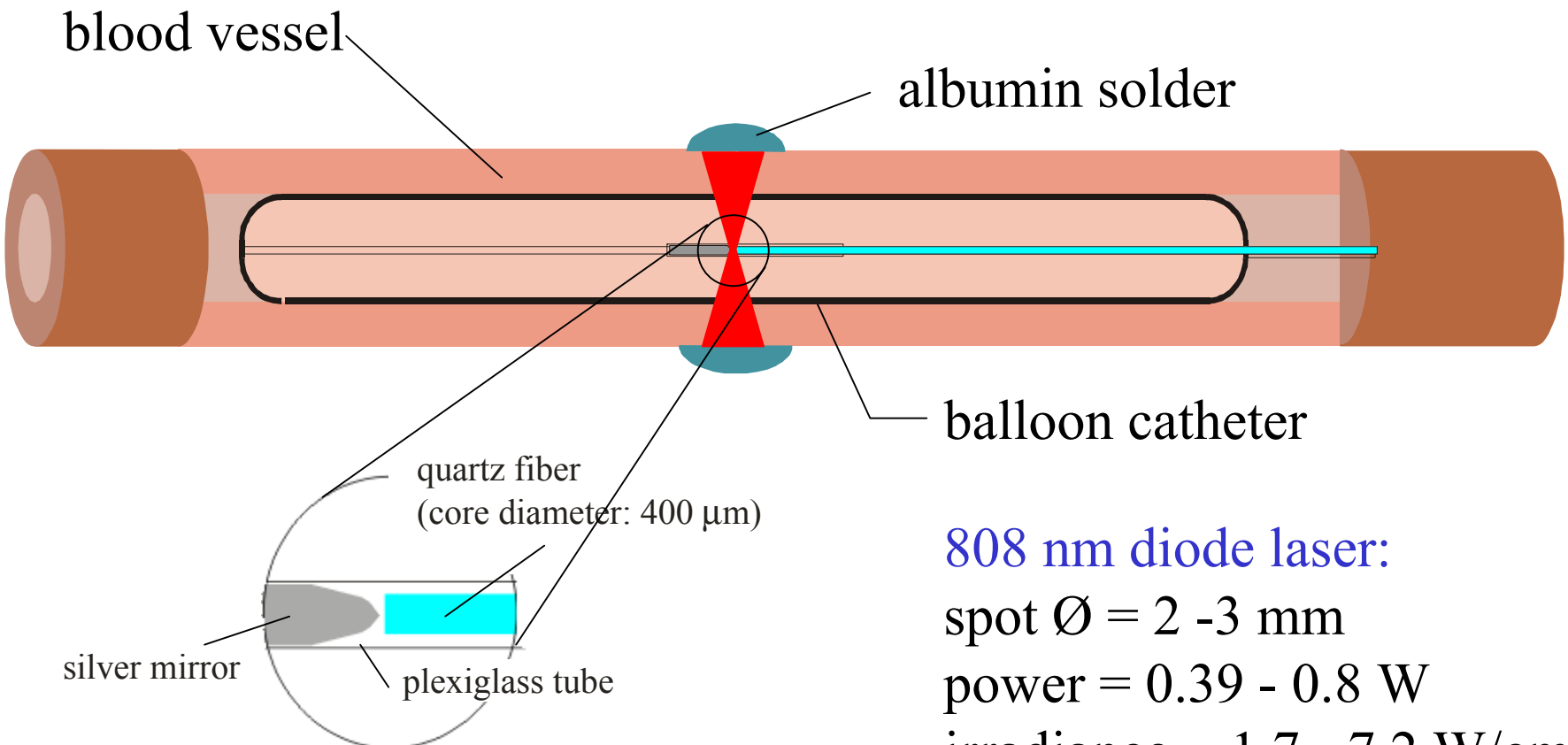



**precise ablation is possible with an Erbium laser !**

# Running projects

University of Bern
Biomedical Photonics

- ablation of epiretinal membranes of the eye
- laser-assisted soldering of blood vessels




808 nm diode laser:
spot Ø = 2 -3 mm
power = 0.39 - 0.8 W
irradiance = 1.7 - 7.2 W/cm$^2$

# Running projects

University of Bern
Biomedical Photonics

- ablation of epiretinal membranes of the eye
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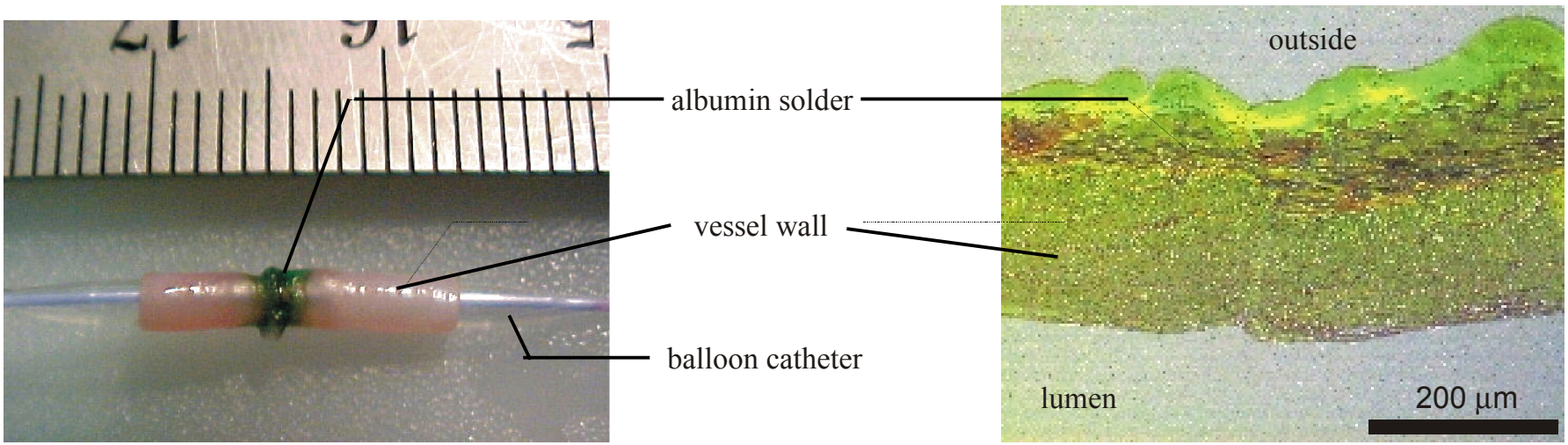
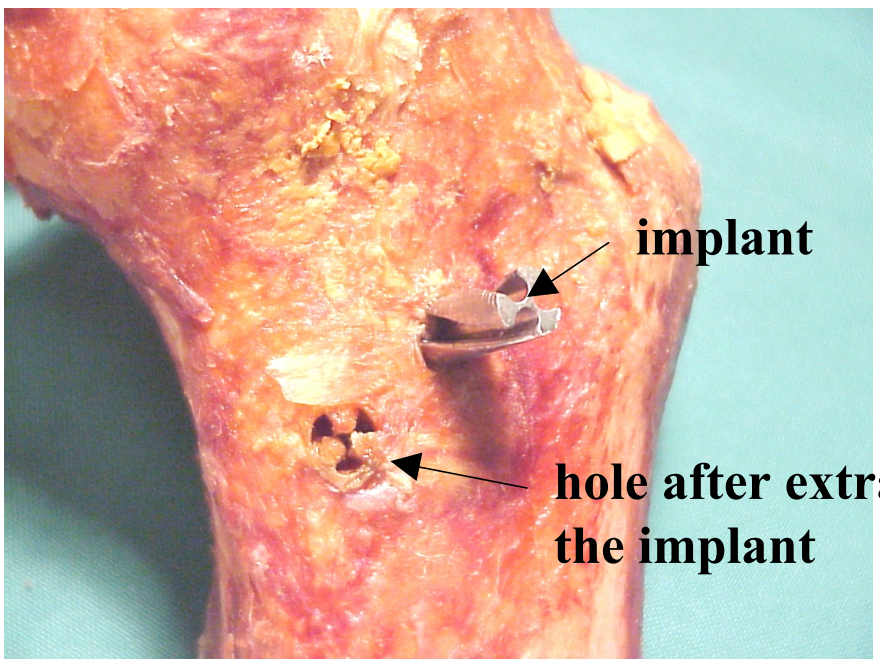


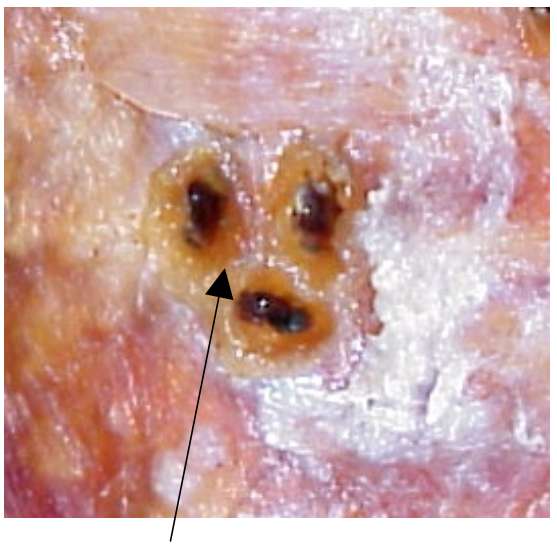

first in-vivo results are very promising !

# Running projects

University of Bern
Biomedical Photonics

- ablation of epiretinal membranes of the eye
- laser-assisted soldering of cartilage and blood vessels
- fixation of specially designed orthopedic protheses

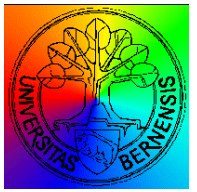


**Erbium laser drilled holes**

# Running projects



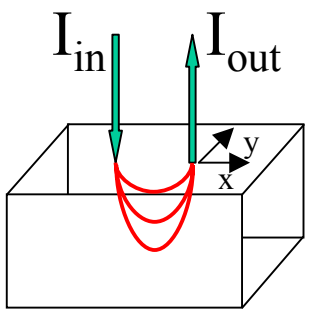



- ablation of epiretinal membranes of the eye
- laser-assisted soldering of cartilage and blood vessels
- fixation of specially designed orthopedic protheses
- nanosurgery and two-photon microscopy using fs-pulses

# Running projects

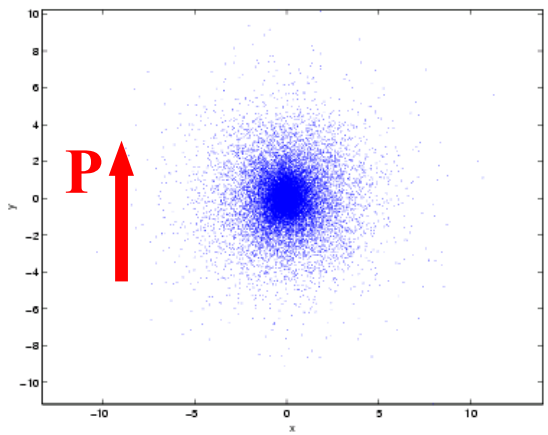
University of Bern
Biomedical Photonics

- ablation of epiretinal membranes of the eye
- laser-assisted soldering of cartilage and blood vessels
- fixation of specially designed orthopedic protheses
- nanosurgery and two-photon microscopy using fs-pulses
- light propagation in tissue

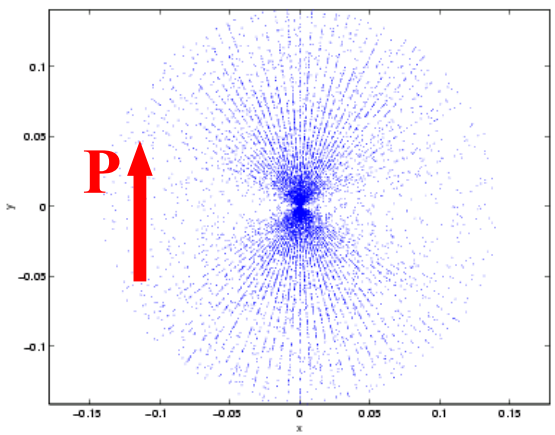



experiment

macroscopically




microscopically



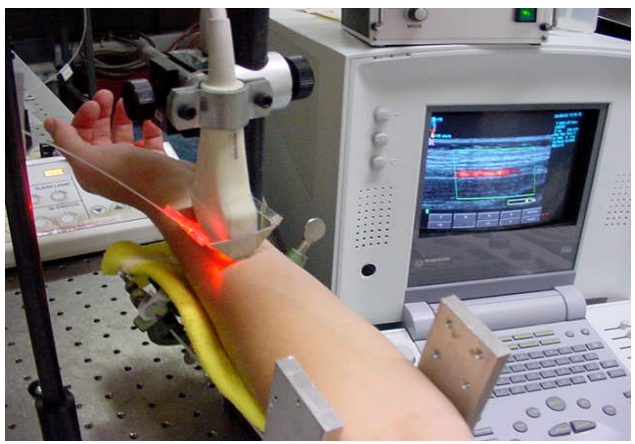

simulations

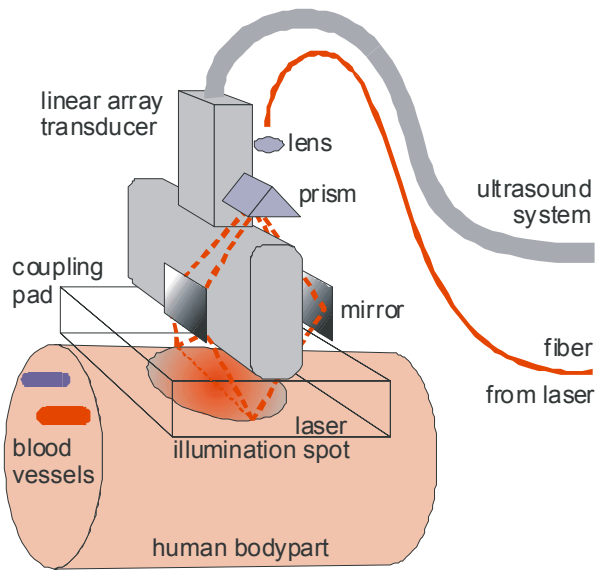
determination of glucose !

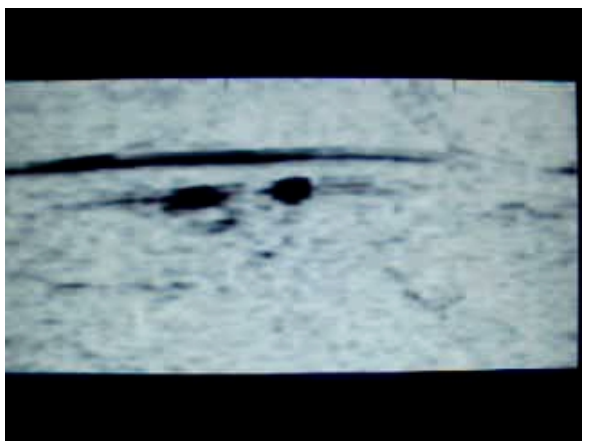
# Running projects

University of Bern
Biomedical Photonics

- ablation of epiretinal membranes of the eye
- laser-assisted soldering of cartilage and blood vessels
- fixation of specially designed orthopedic protheses
- nanosurgery and two-photon microscopy using fs-pulses
- light propagation in tissue
- optoacoustic imaging and tissue characterization

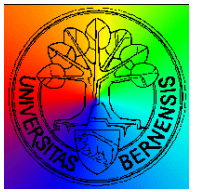




# Running projects






- ablation of epiretinal membranes of the eye
- laser-assisted soldering of cartilage and blood vessels
- fixation of specially designed orthopedic protheses
- nanosurgery and two-photon microscopy using fs-pulses
- light propagation in tissue
- evanescent field microscopy

# Evanescent field microscopy

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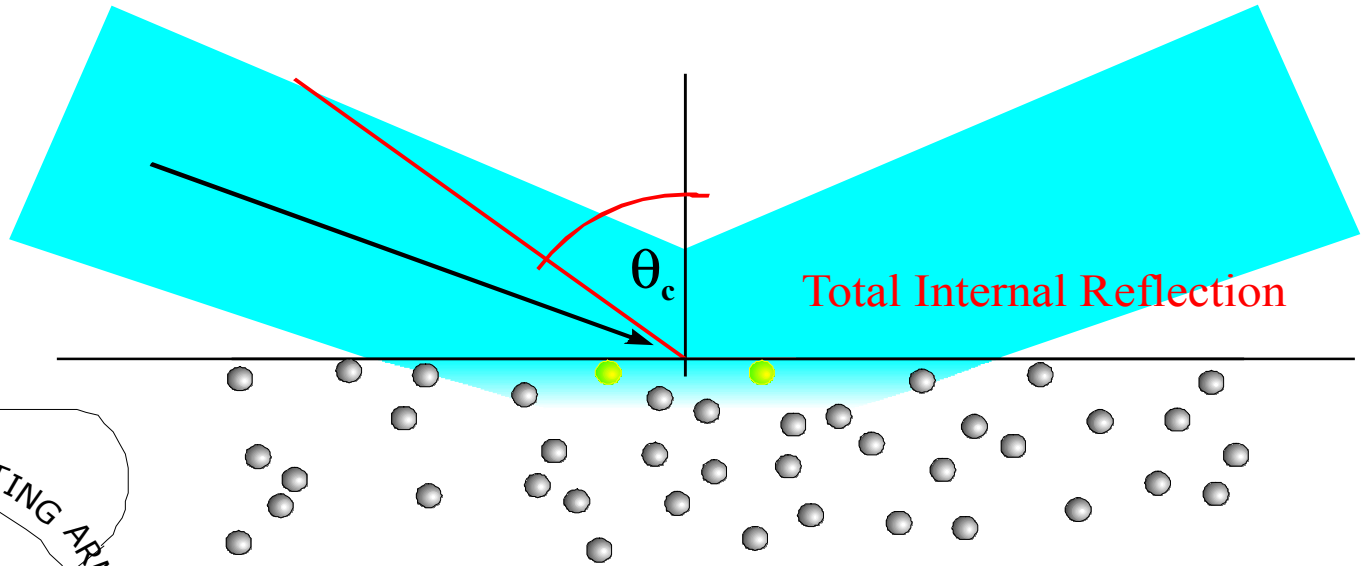
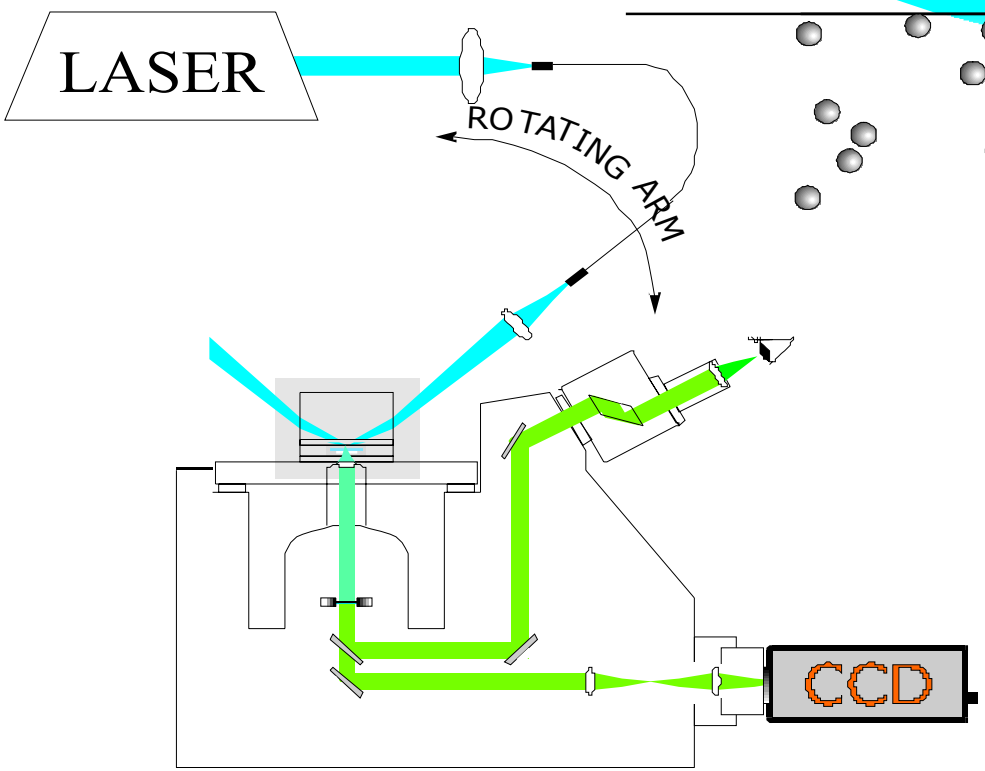
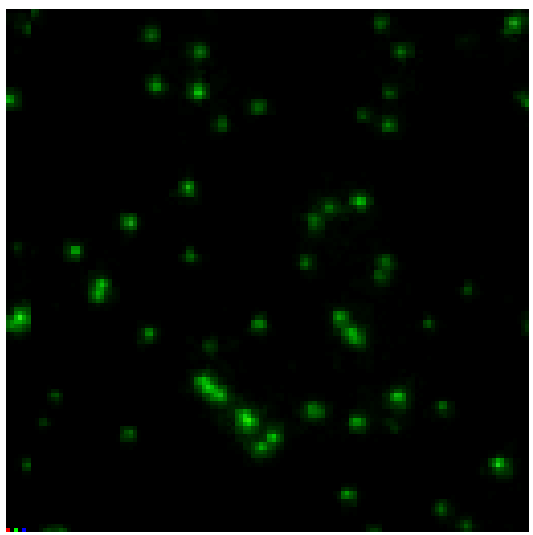
Biomedical Photonics

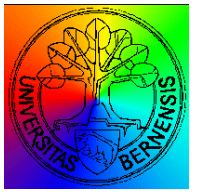


# Running projects

University of Bern
Biomedical Photonics




- ablation of epiretinal membranes of the eye
- laser-assisted soldering of cartilage and blood vessels
- fixation of specially designed orthopedic protheses
- nanosurgery and two-photon microscopy using fs-pulses
- light propagation in tissue
- optoacoustic imaging
- endoscopic determination of ciliary beat frequency and mucociliary clearance

# Cilia

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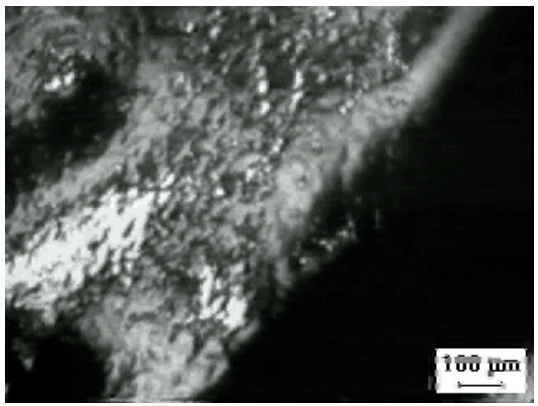
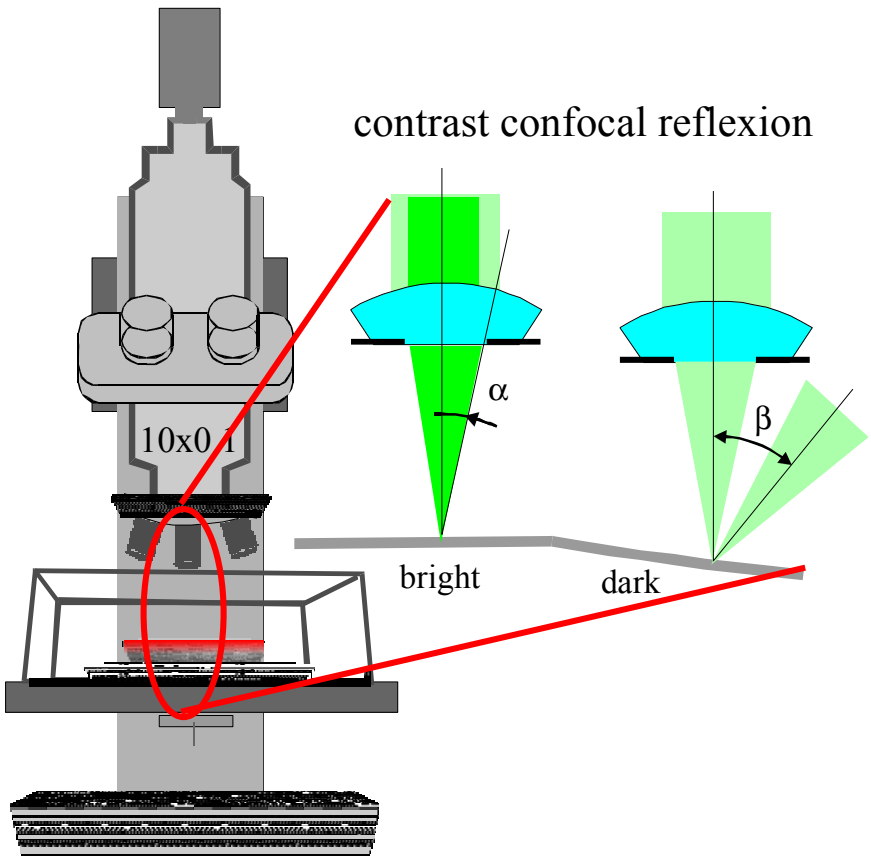
Biomedical Photonics

goal: - determination of ciliary beat frequency and mucus transport in-vivo
- development of fiber-bronchoscope




CBF = 17 Hz
metachronale λ = 100 µm
transport v = 90 µm/s