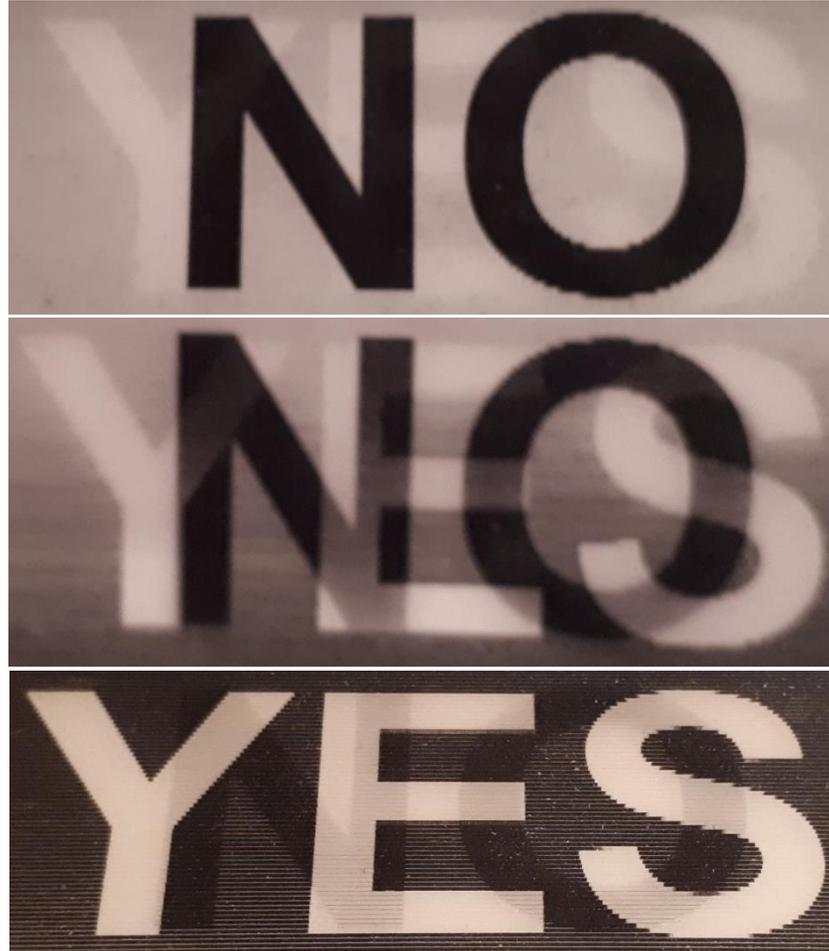




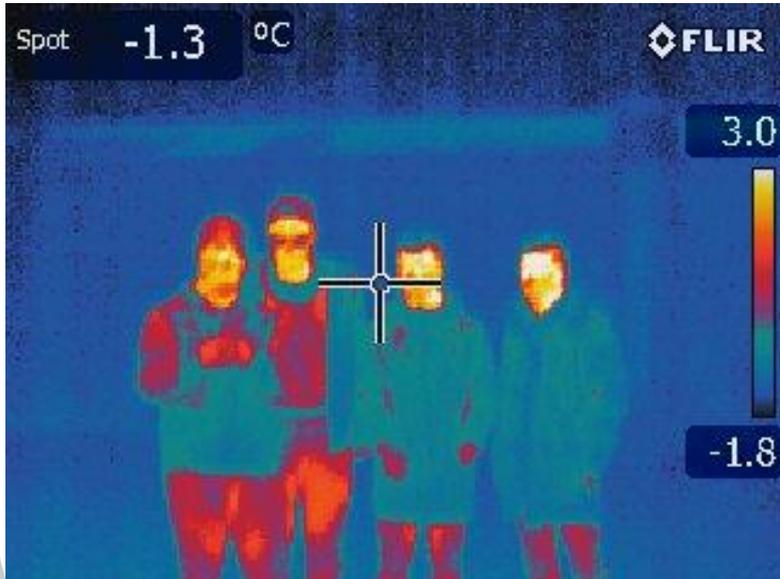
# High quality – low cost:

Infrarot-Fernerkundung am DLR und in der Schule

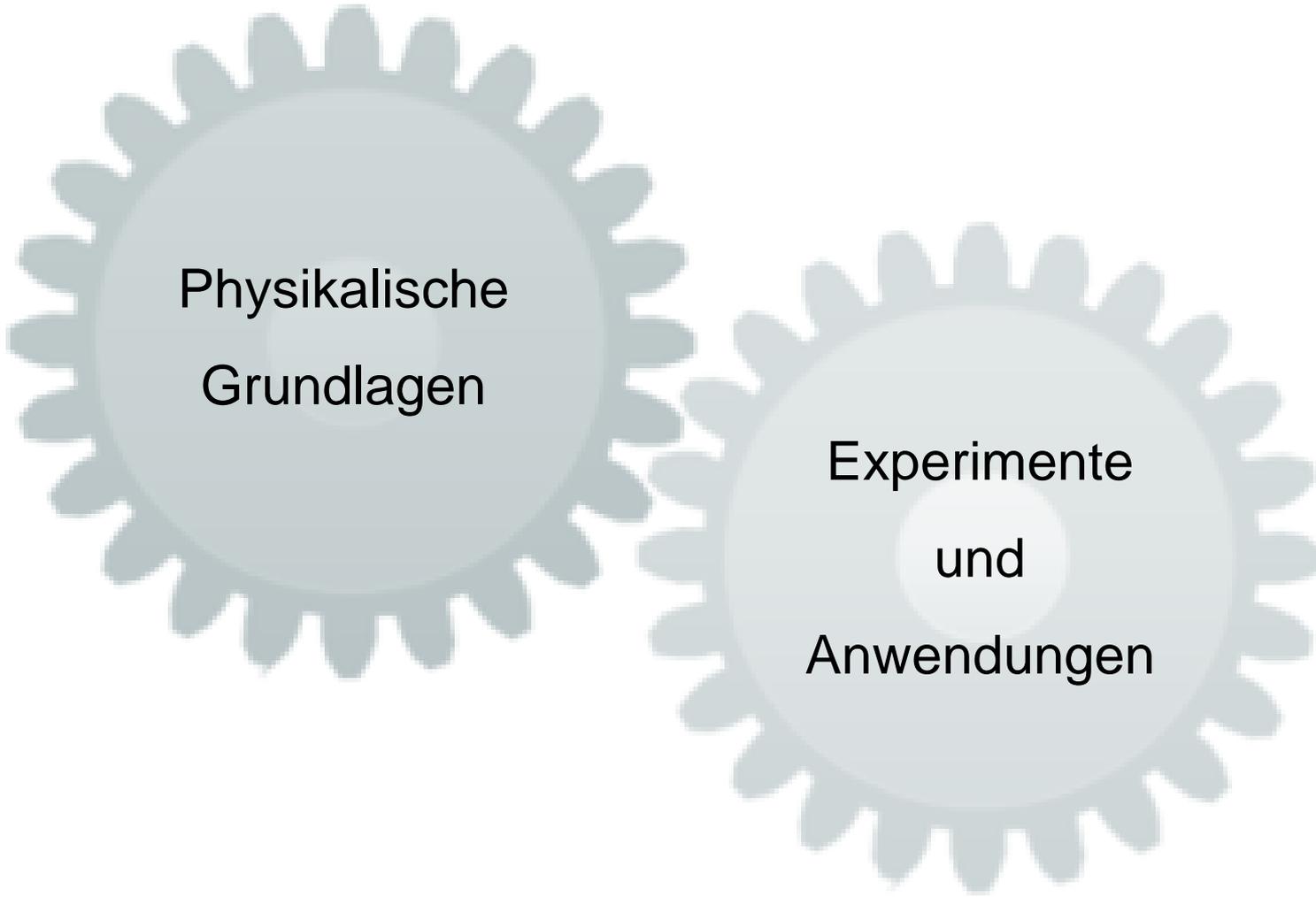
# Perspektiven



# Infrarotmesstechnik



# Konzept



Physikalische  
Grundlagen

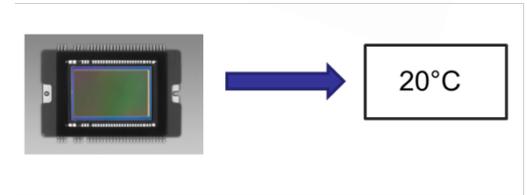
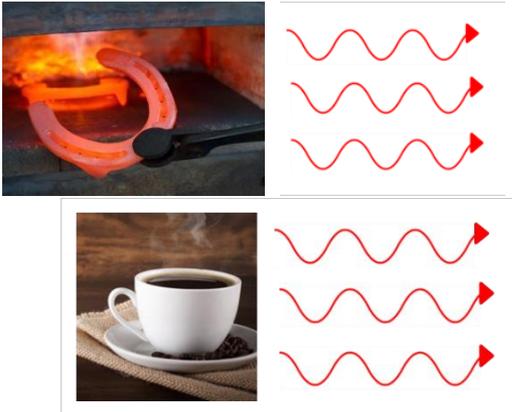
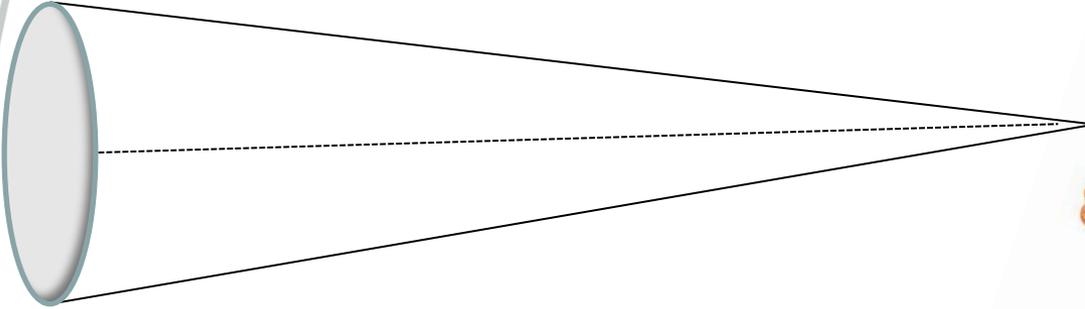
Experimente  
und  
Anwendungen

# Experimente und Anwendungen

- NIR: modifizierte Webcam
  - Pyrometer (IR-Thermometer)
    - Wärmebildkarte
      - Wärmebildkamera



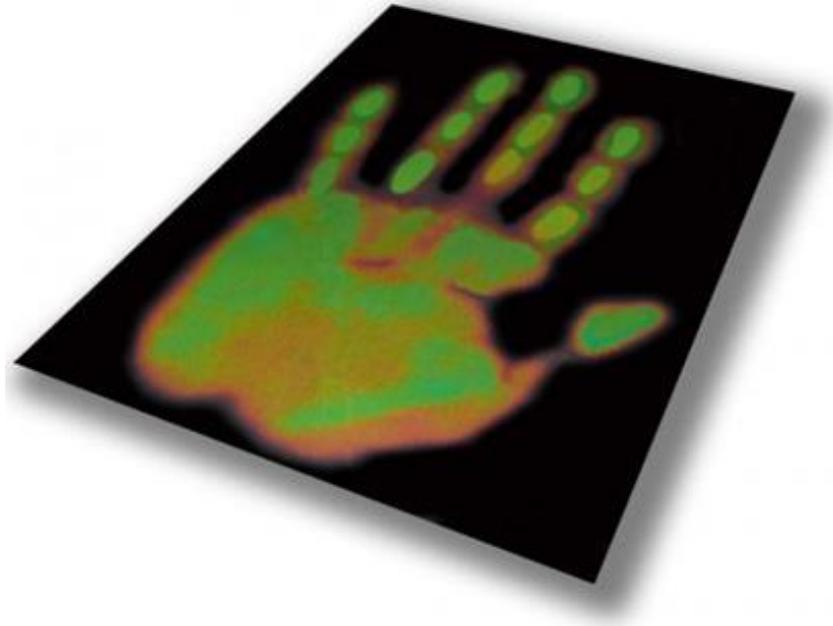
# Pyrometer



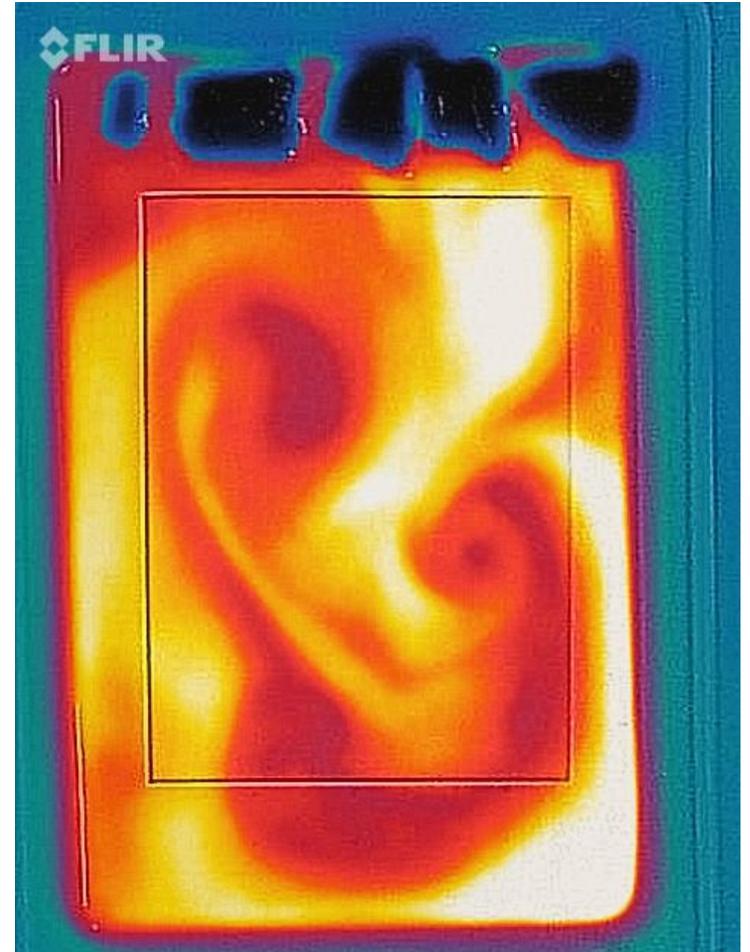
*Planck / Wien*

*Boltzmann*

# Wärmebild-Karte



# Wärmebild-Karte



# Wärmebildkamera

- Gründe für eine Temperatur-Änderung
- Wechselwirkung von Strahlung mit Materie
- Einsatzbereiche der Wärmebildkamera

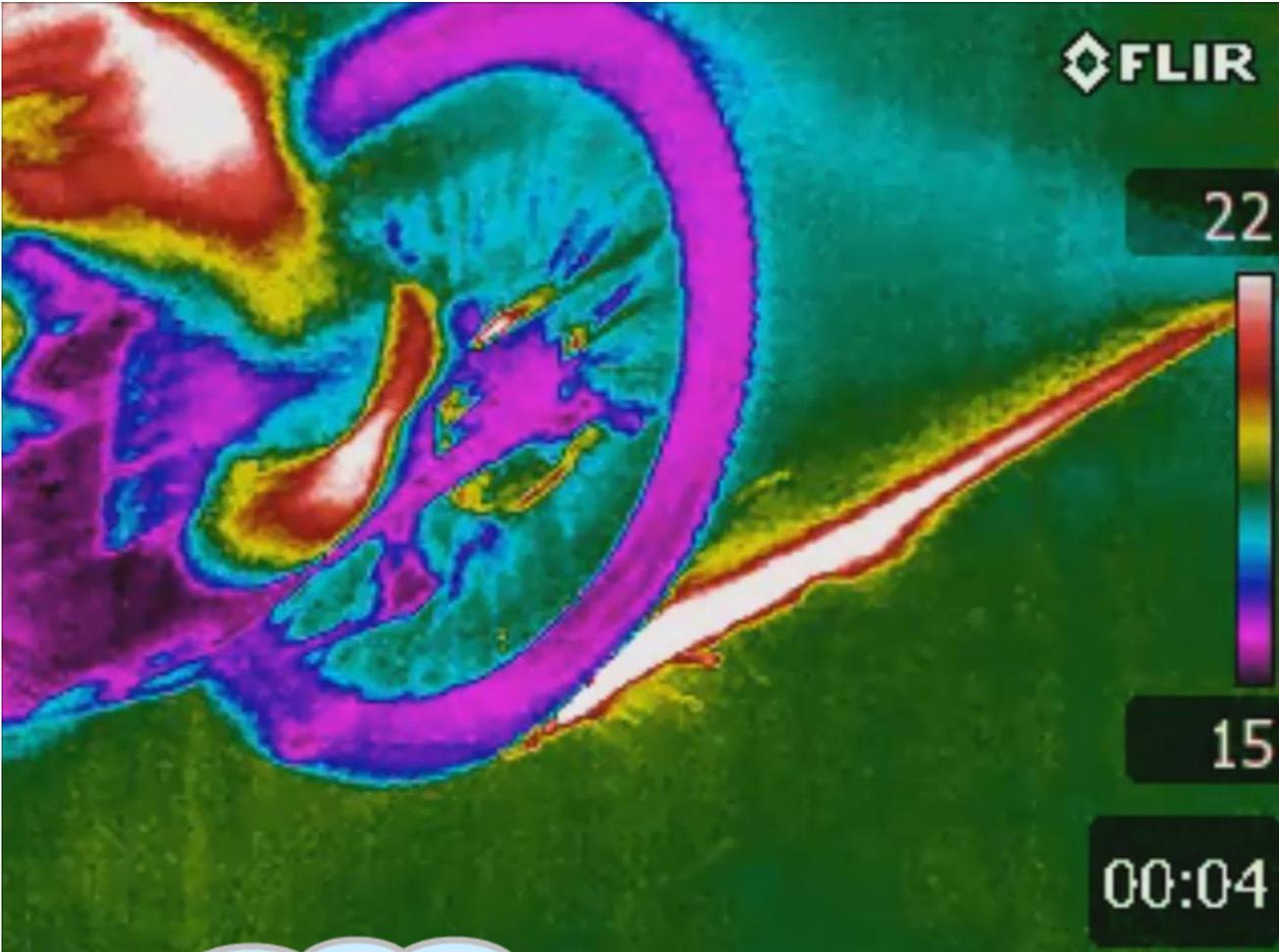


# Reibung



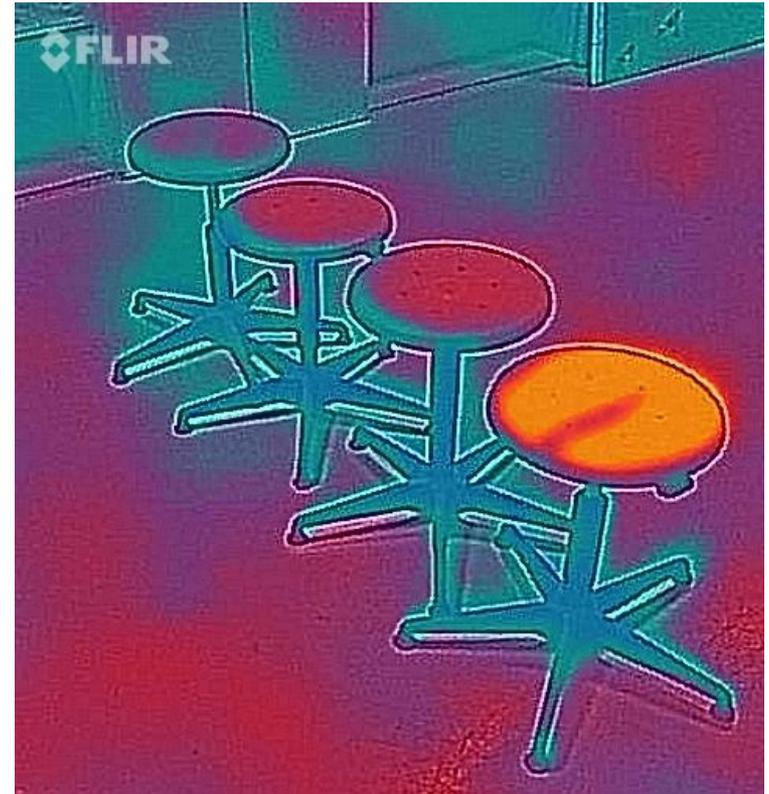
*Energieumwandlung*

# Reibung



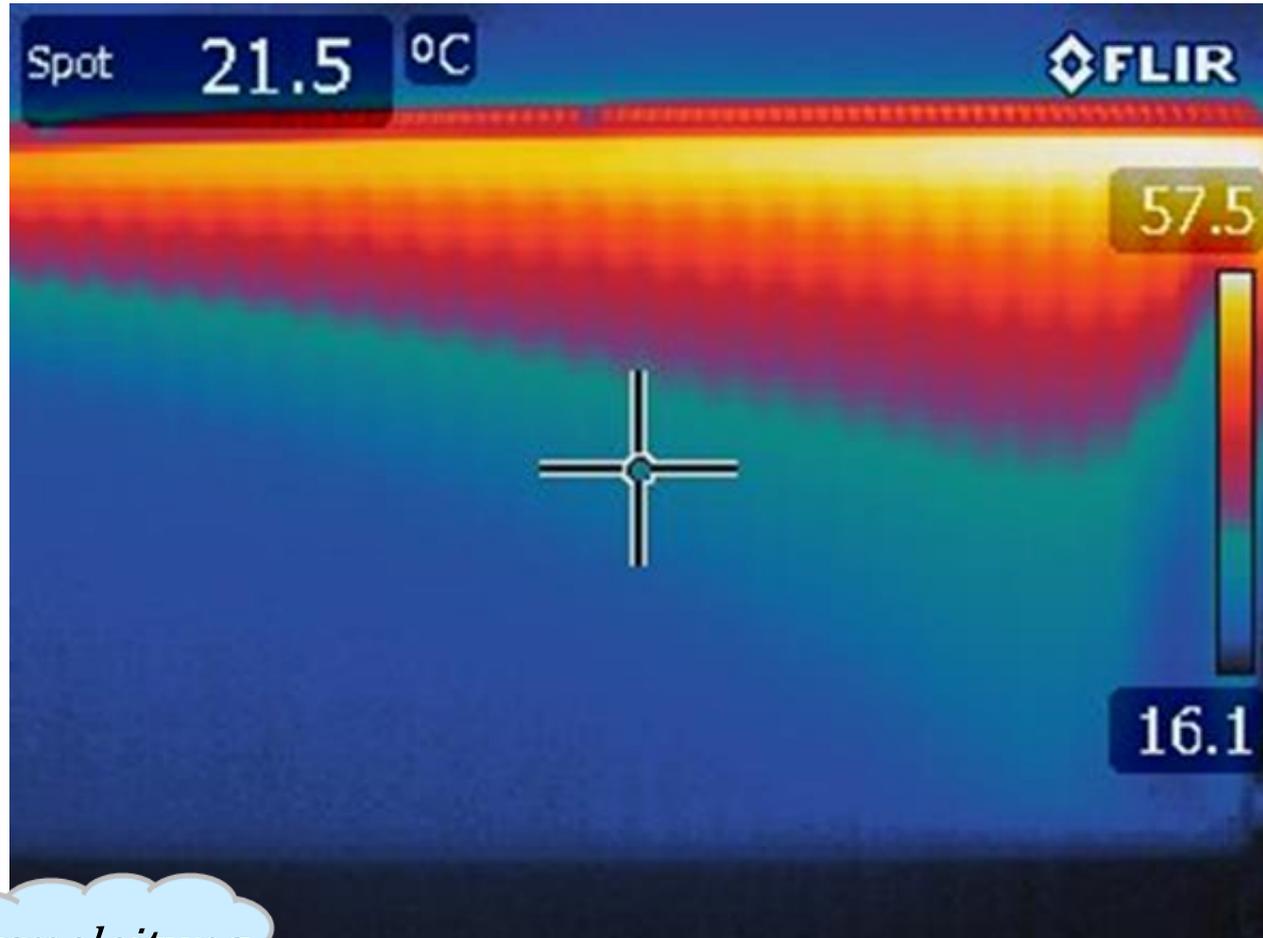
*Energieumwandlung*

# Wärmeübertragung durch Kontakt



*Wärmeleitung*

# Wärmeübertragung durch Kontakt

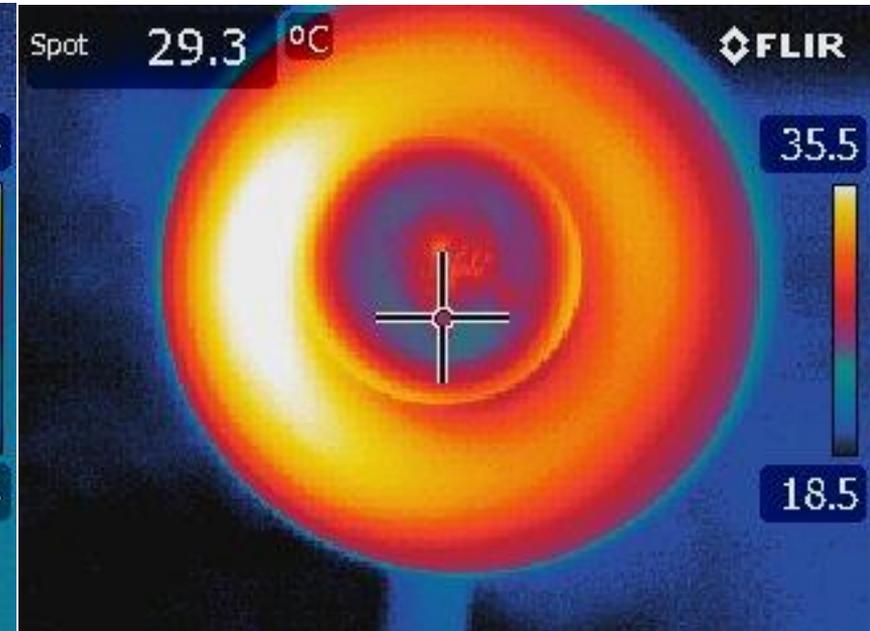


*Wärmeleitung*

# Wirkungen von elektrischem Strom



LED

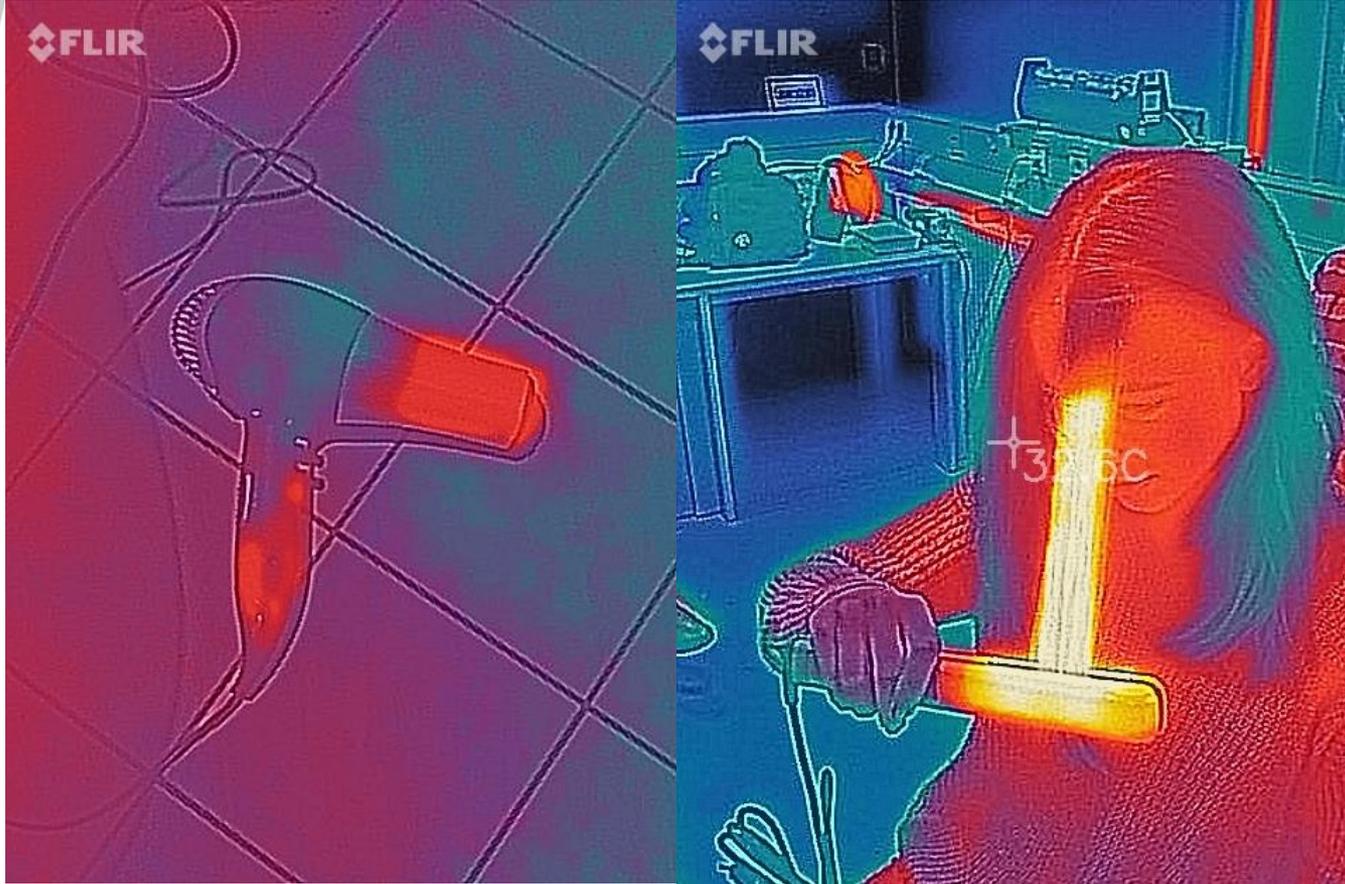


Glühlampe

*Energieumwandlung*

*Wirkungen von el. Strom*

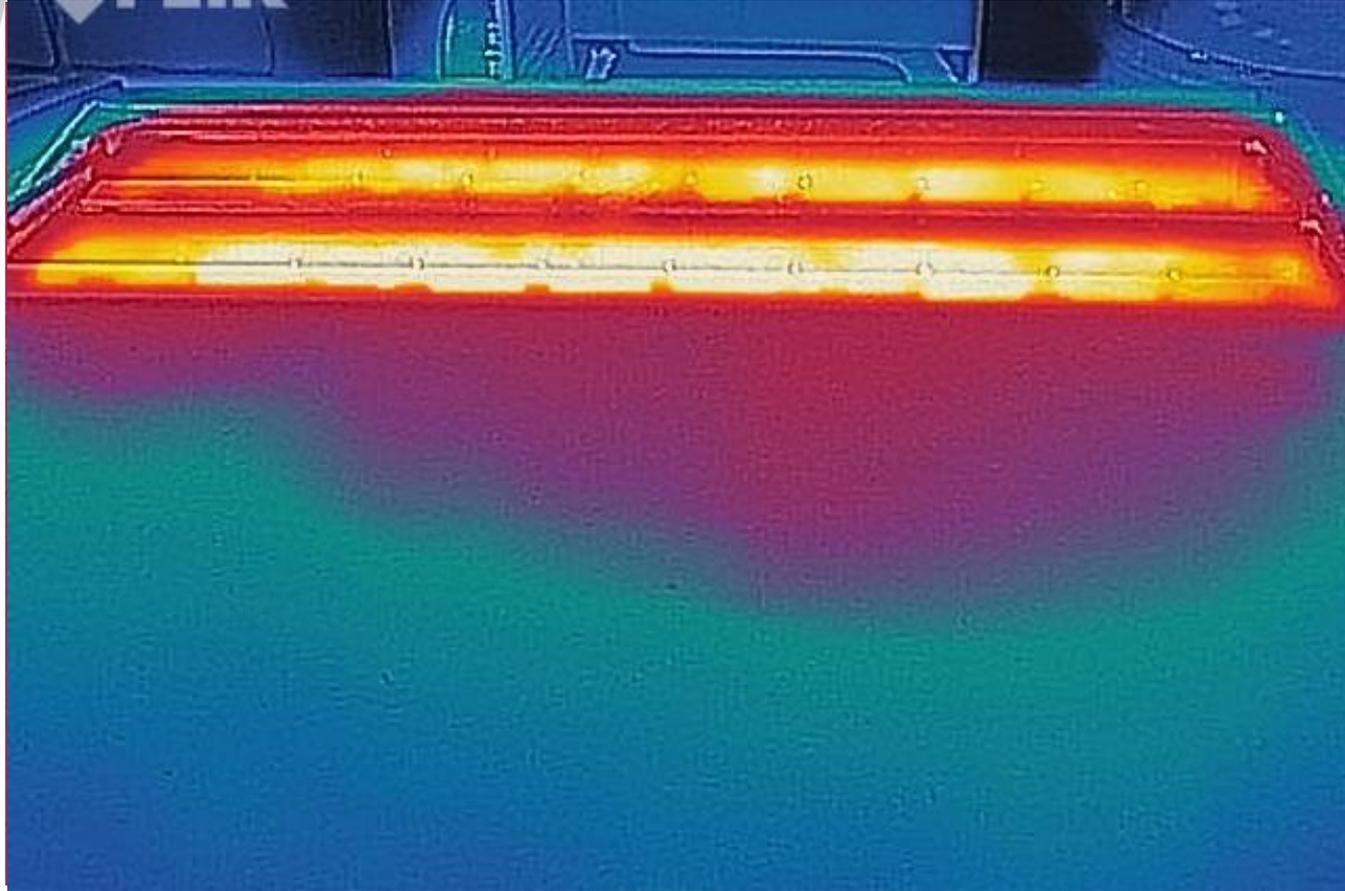
# Wärmewirkung von el. Strom



*Energieumwandlung*

*Wirkungen von el. Strom*

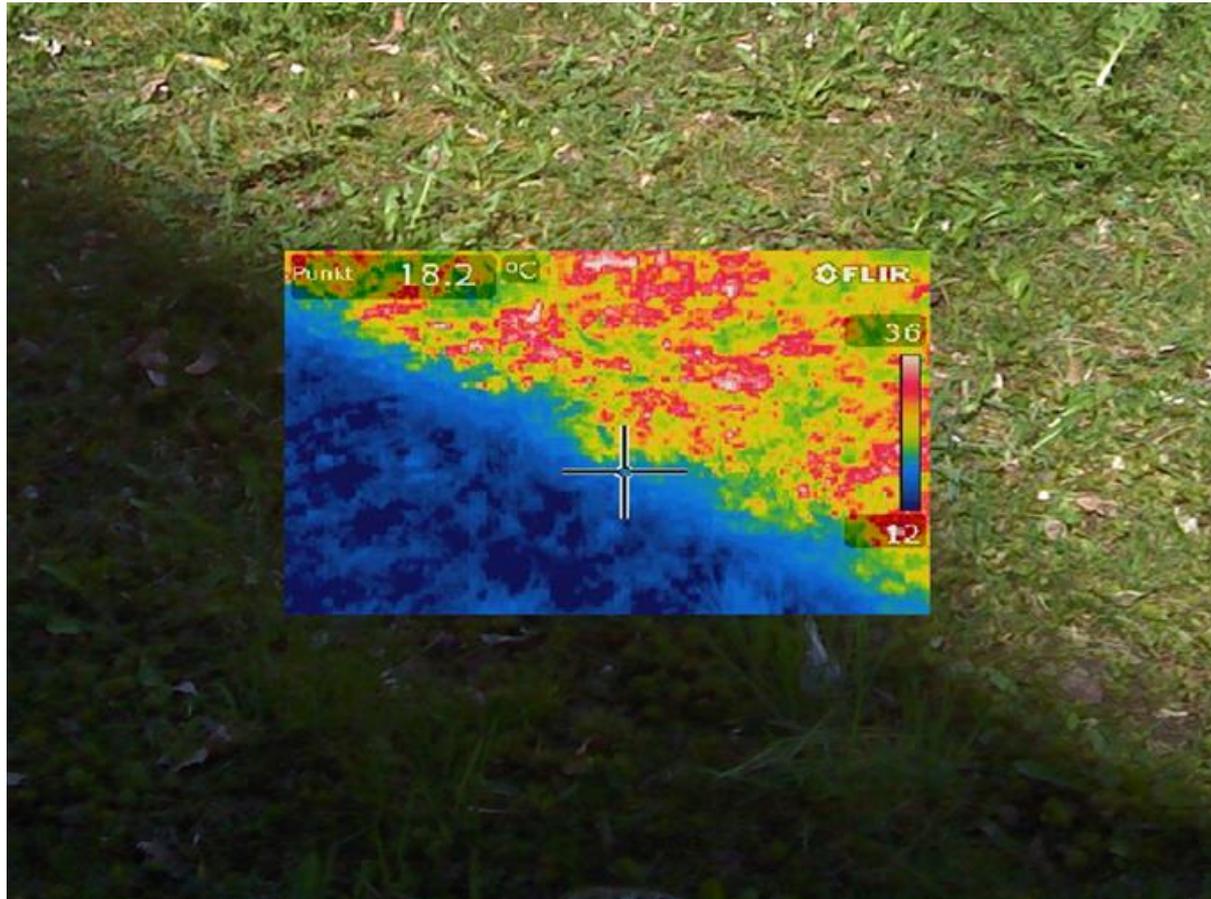
# Wärmewirkung von el. Strom



*Energieumwandlung*

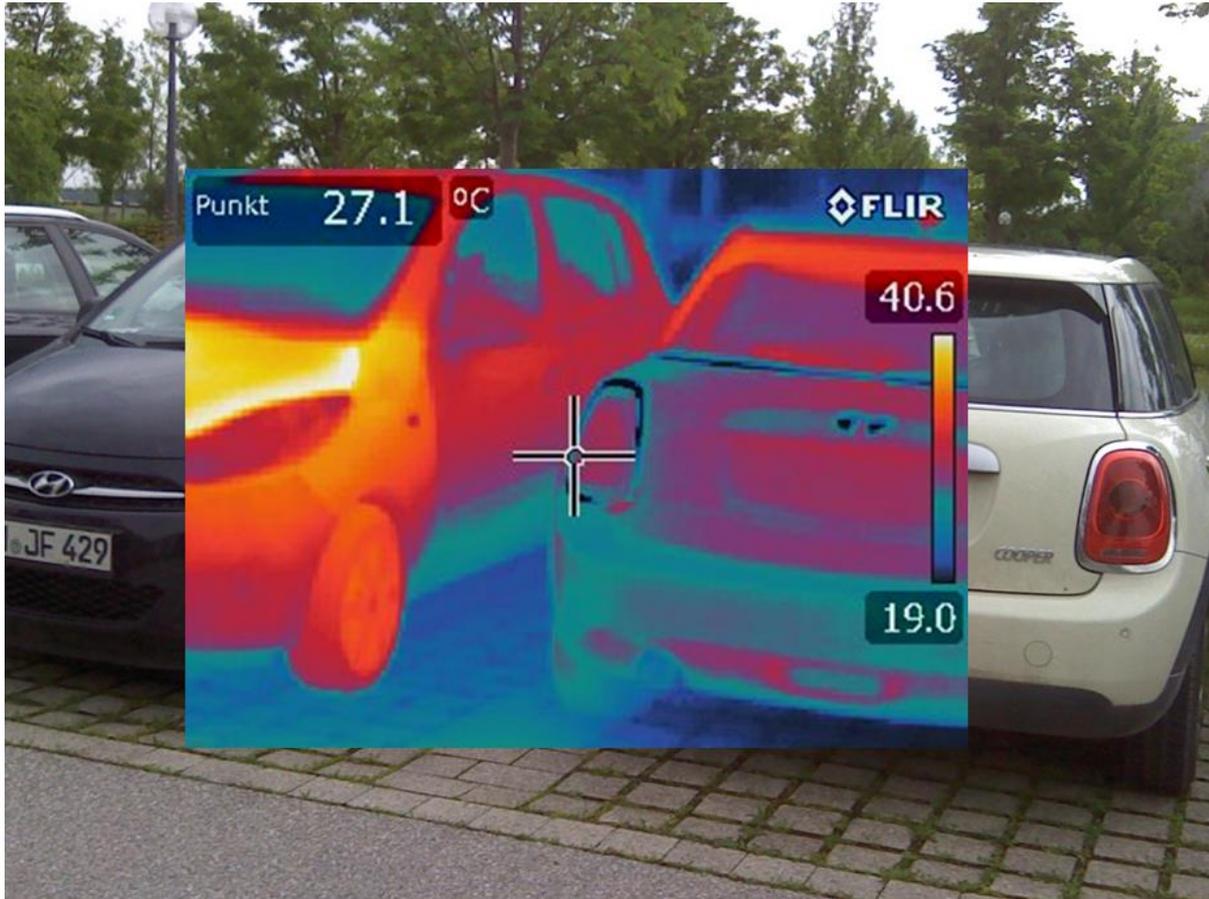
*Wirkungen von el. Strom*

# Temperaturerhöhung durch Absorption von Strahlung



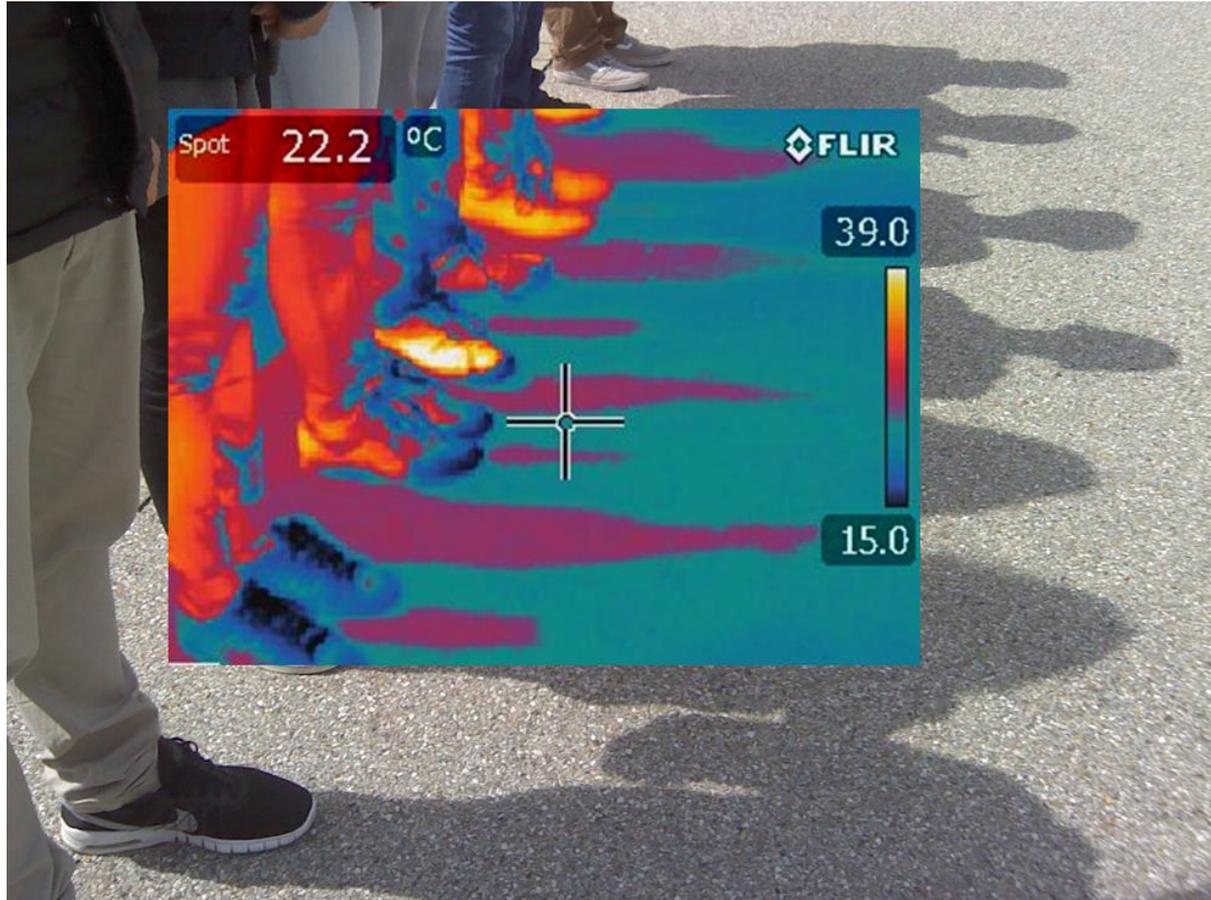
*Strahlung als Energietransport*

# Temperaturerhöhung durch Absorption von Strahlung



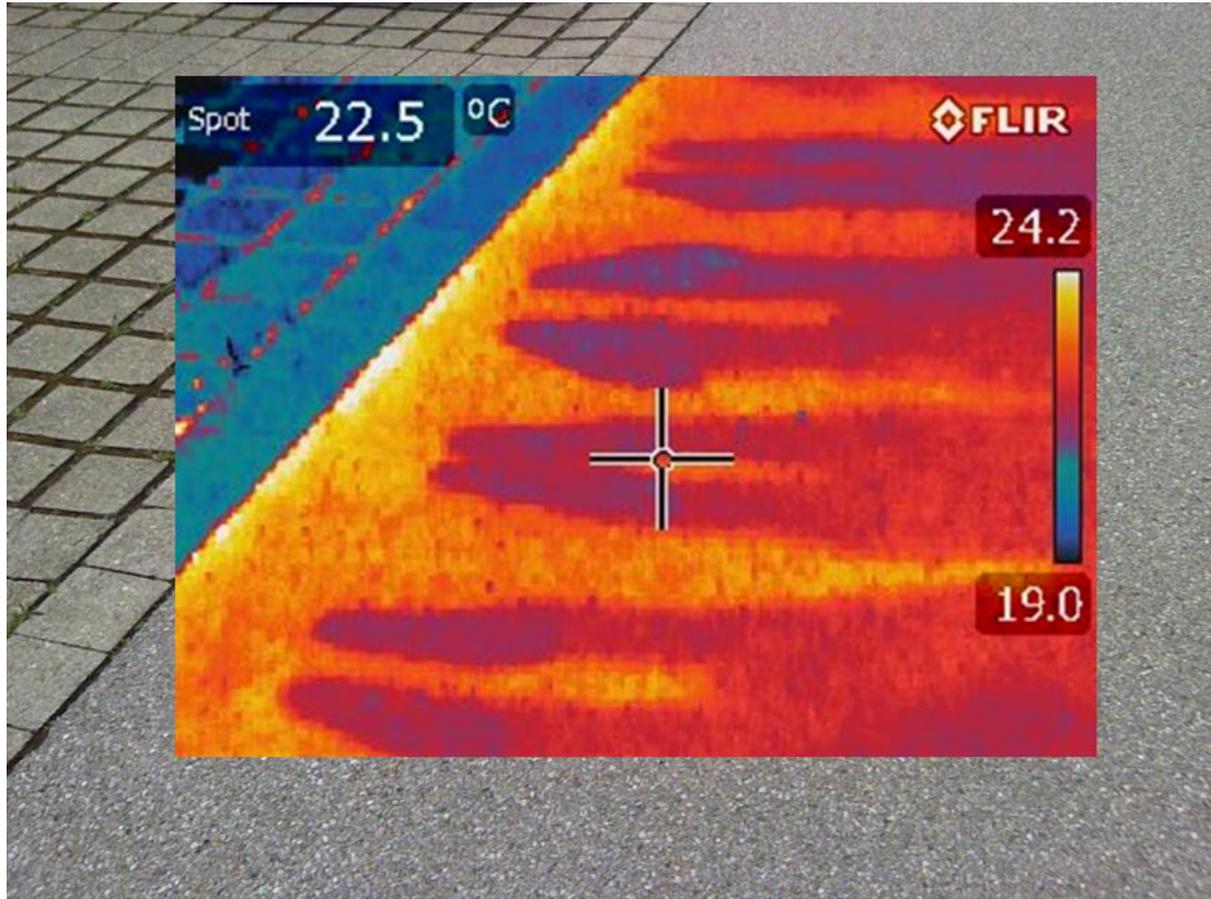
*Strahlung als Energietransport*

# Temperaturerhöhung durch Absorption von Strahlung



*Strahlung als Energietransport*

# Temperaturerhöhung durch Absorption von Strahlung

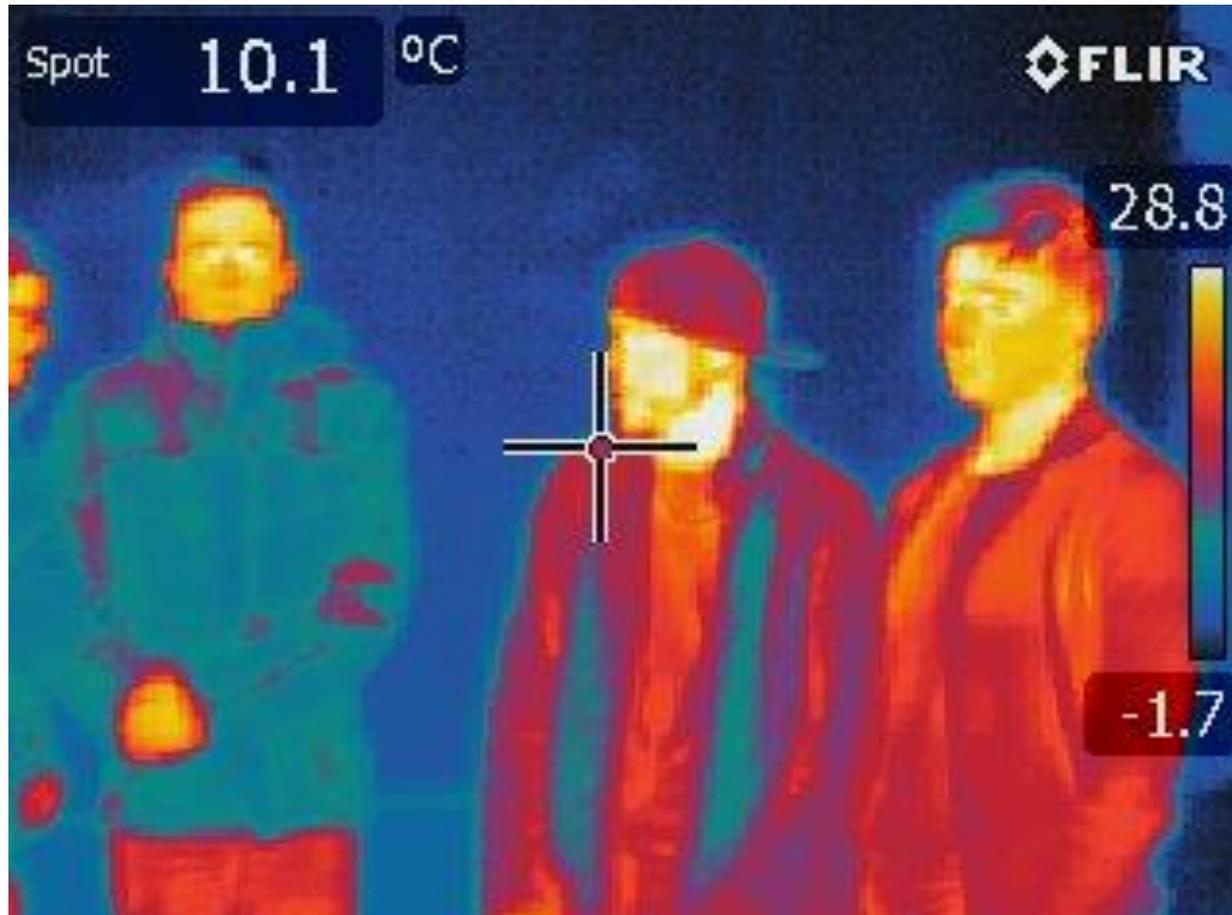


*Strahlung als Energietransport*

# Reflexion – Transmission - Absorption



# Reflexion – Transmission - Absorption



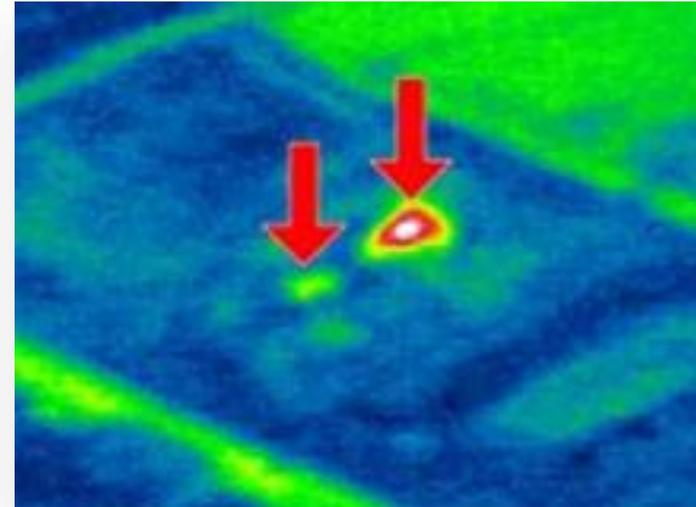
# Reflexion – Transmission - Absorption

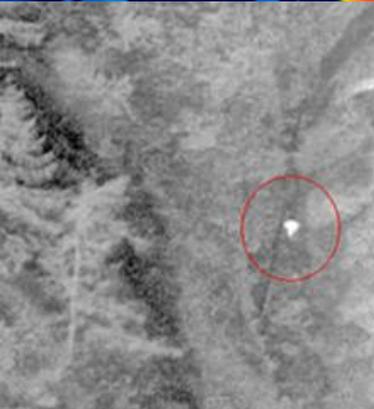
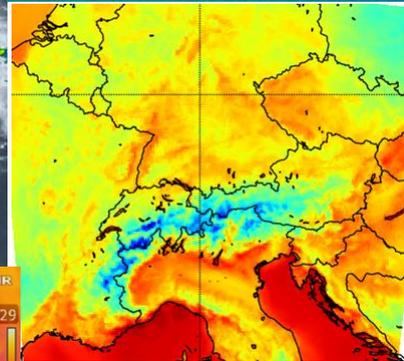
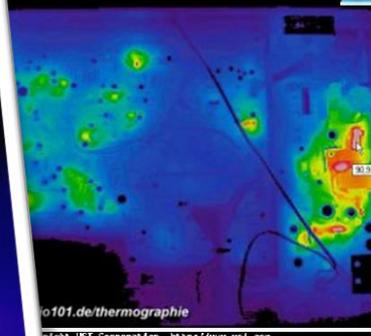
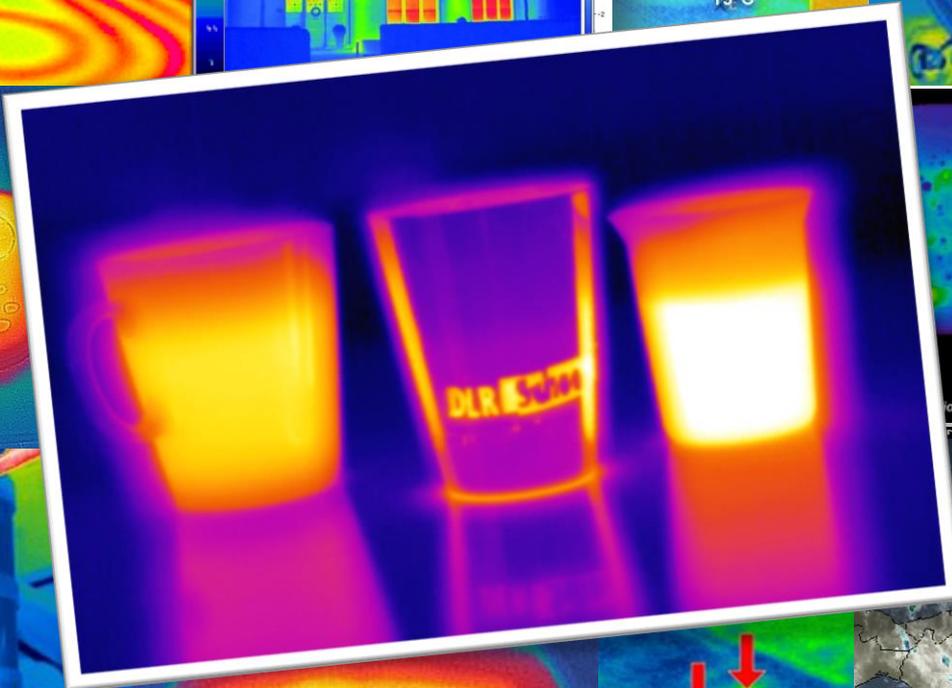
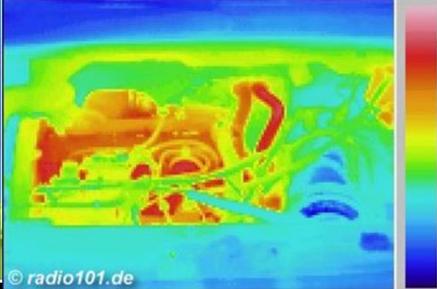
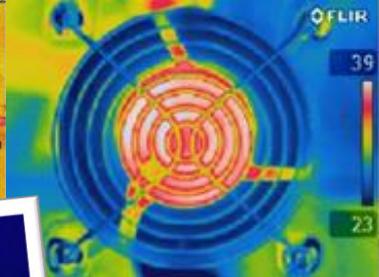
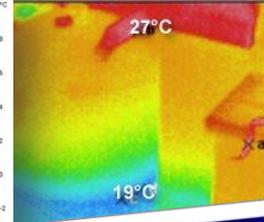
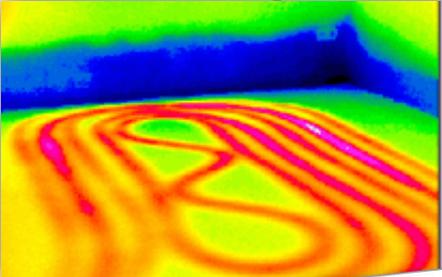


# Das IR-Orakel

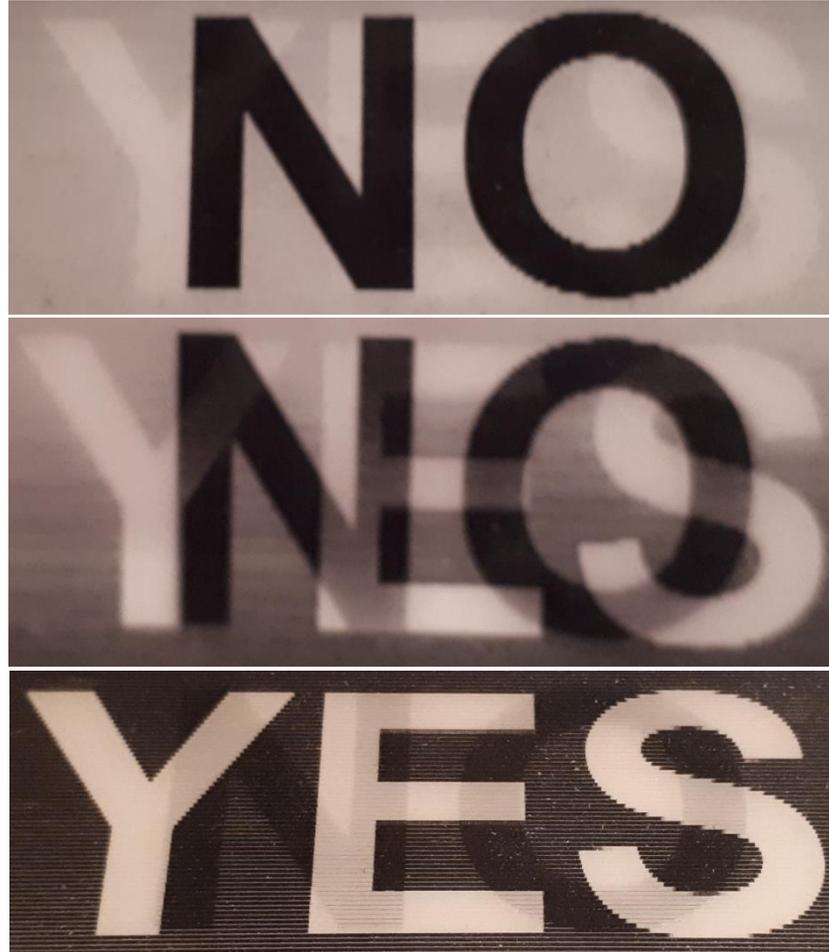


# Anwendung: DLR-Wildretter

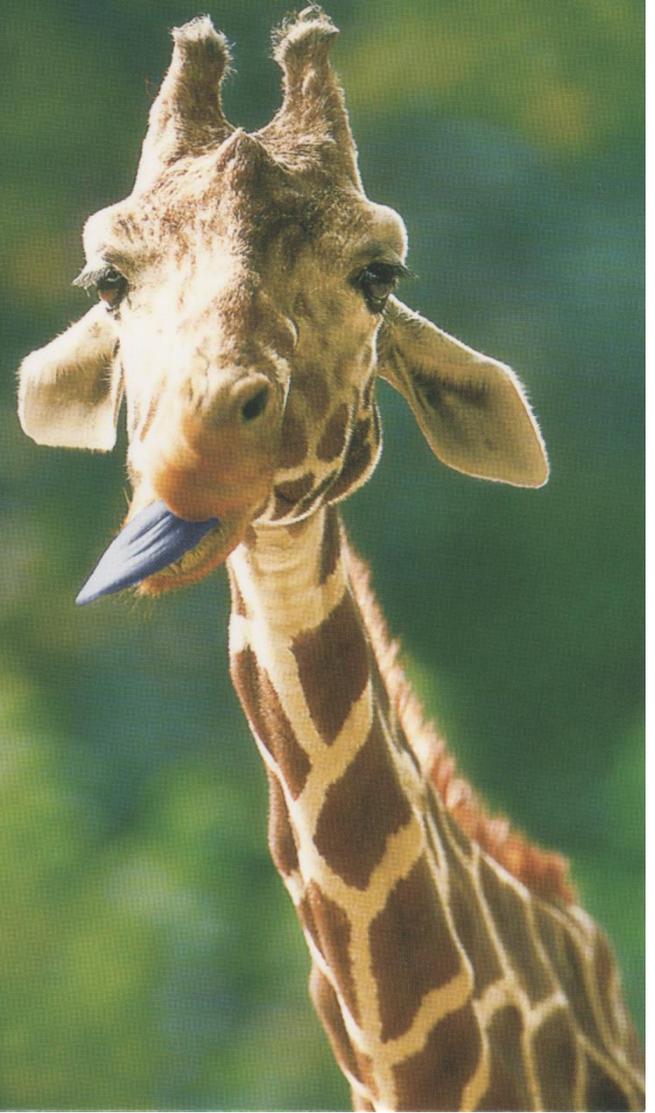




# Perspektiven



Es ist nicht notwendig  
verrückt zu sein,  
aber es hilft.



Es ist nicht notwendig  
verrückt zu sein,  
aber es hilft.



