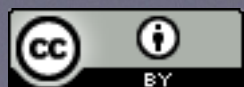


# Biosensor: Pulse Oximeter

Biophotonics Final Presentation  
20171226

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# (Pulse) Oximeter

## *Dictionary Definition*

### **Oximeter**

an instrument for measuring the proportion of oxygenated hemoglobin in the blood.

### **Pulse Oximeter**

an oximeter that measures the proportion of oxygenated hemoglobin in the blood **in pulsating vessels**, especially the capillaries of the finger or ear.





# Basic Keywords



Heart Rate -> Pulse Rate



Oxygenated & Deoxygenated Hemoglobin



Blood oxygen saturation  
Peripheral Oxygen Saturation



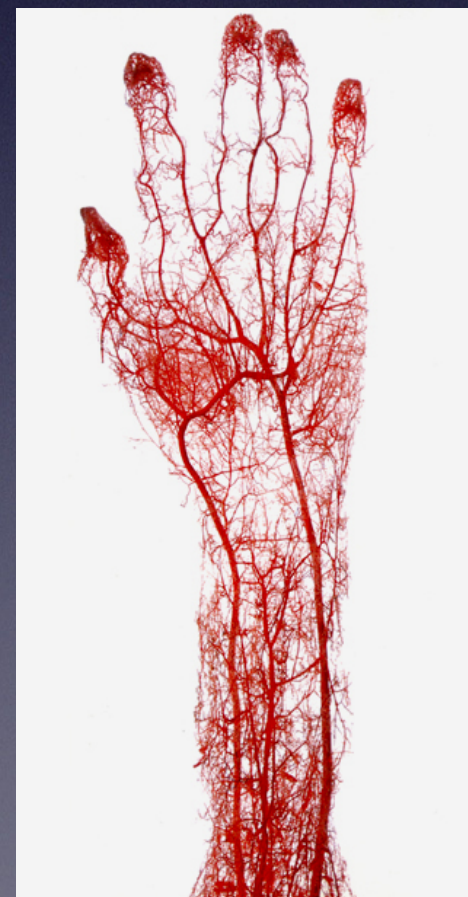
# Ideas taken from Biophotonics

- Biological tissues are **inhomogeneous**
- When light interacts with the tissue, reflection, **absorption**, and scattering will occur.
- **Biological windows**: 700 - 1,400 nm
- Pulse Oximeter: use **light** in specific wavelength to non-invasively obtain **blood oxygen saturation & pulse rate** (information).



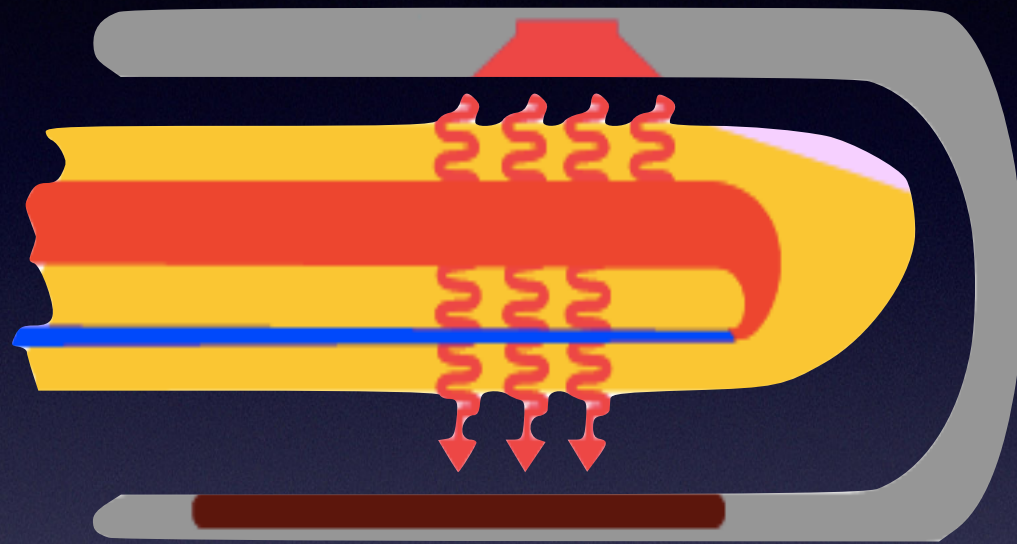
# Location to place pulse oximeter

Light cannot penetrate far into the body.  
Pulse oximeter measure the blood, find blood rich area.  
-> Find thin area where there are more blood vessels

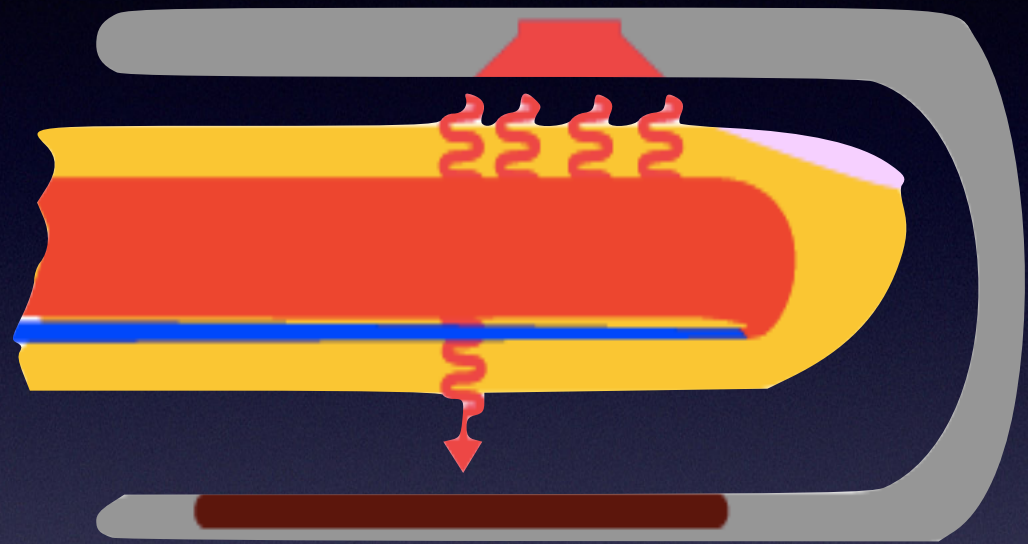




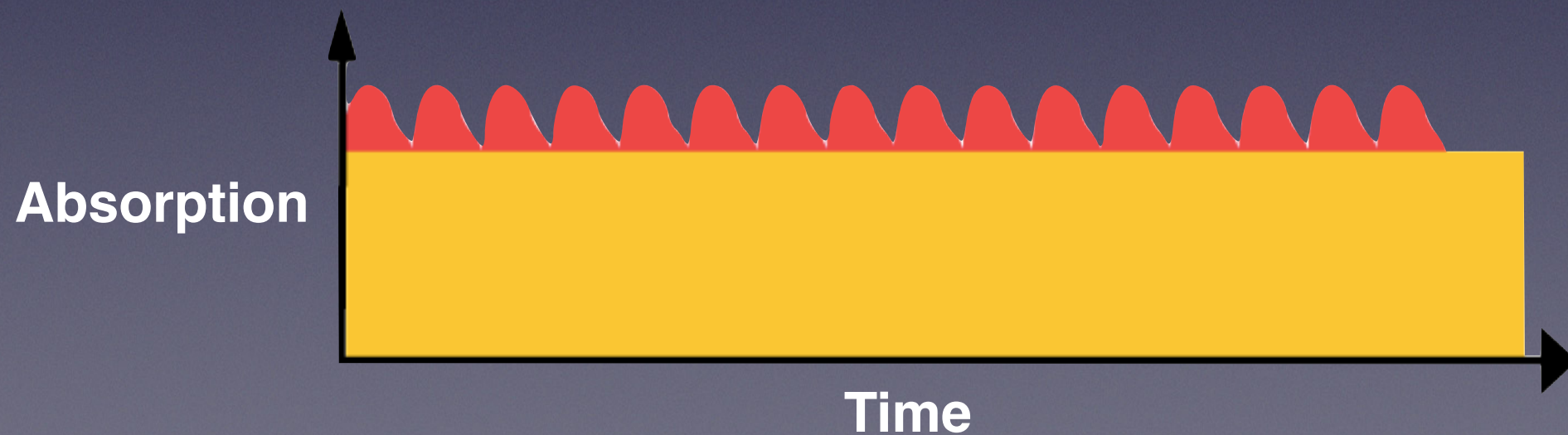
# How to measure pulse rate



Less blood

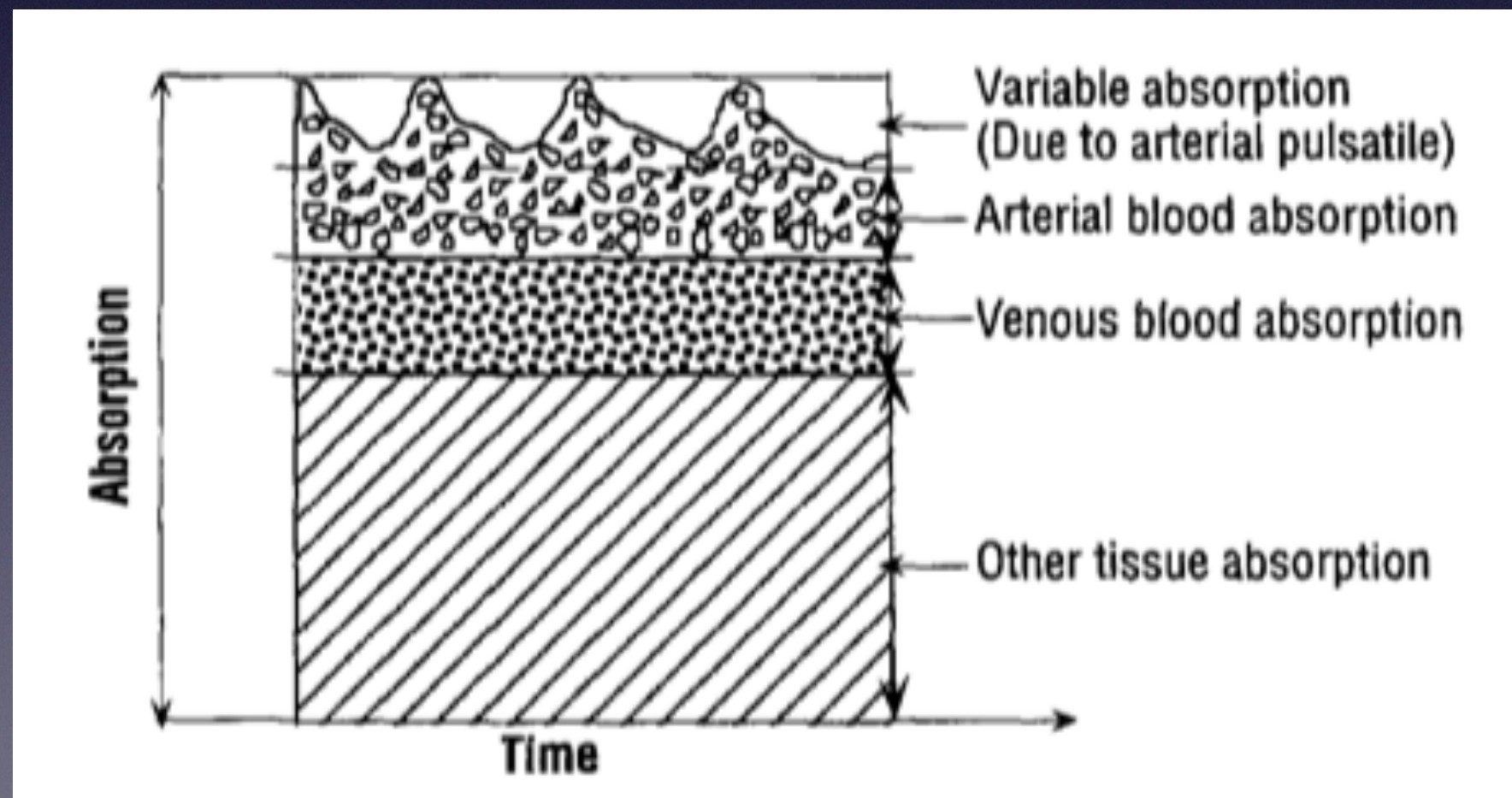
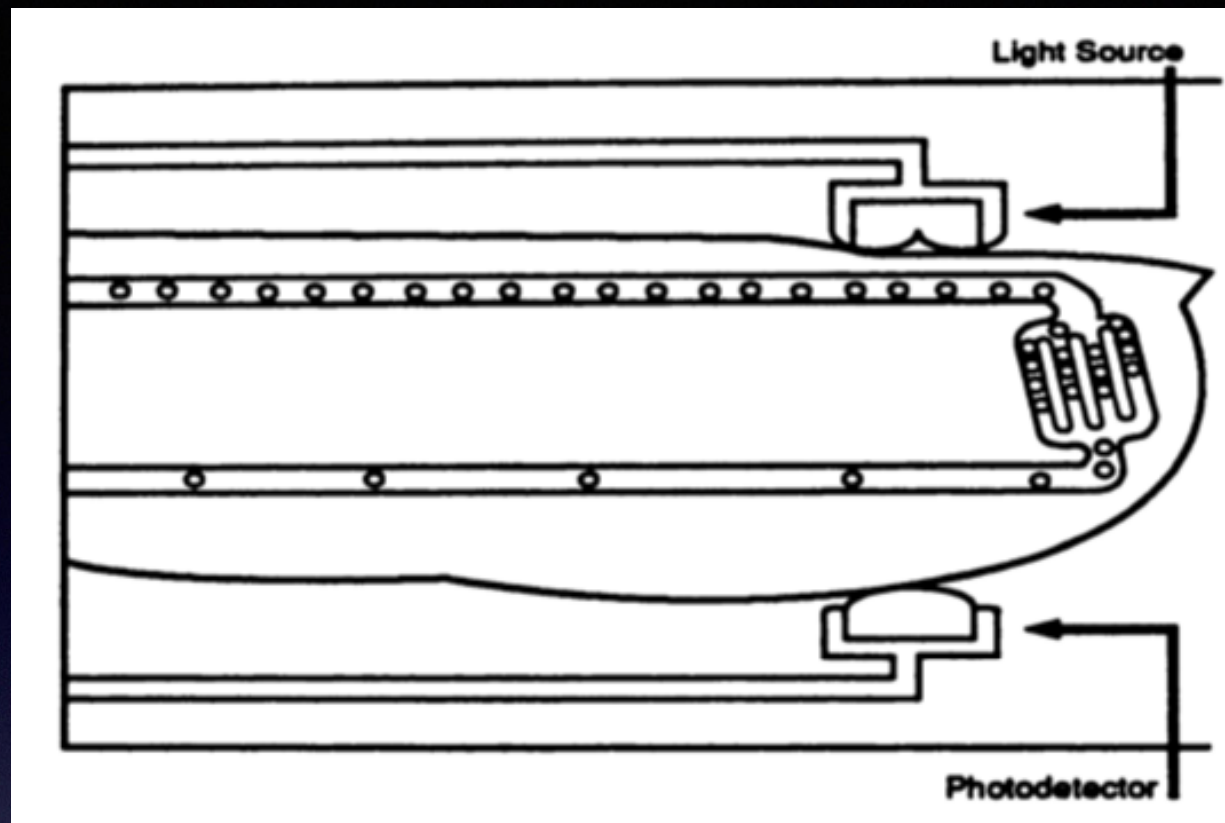


More blood





# *Inhomogeneity of human finger*

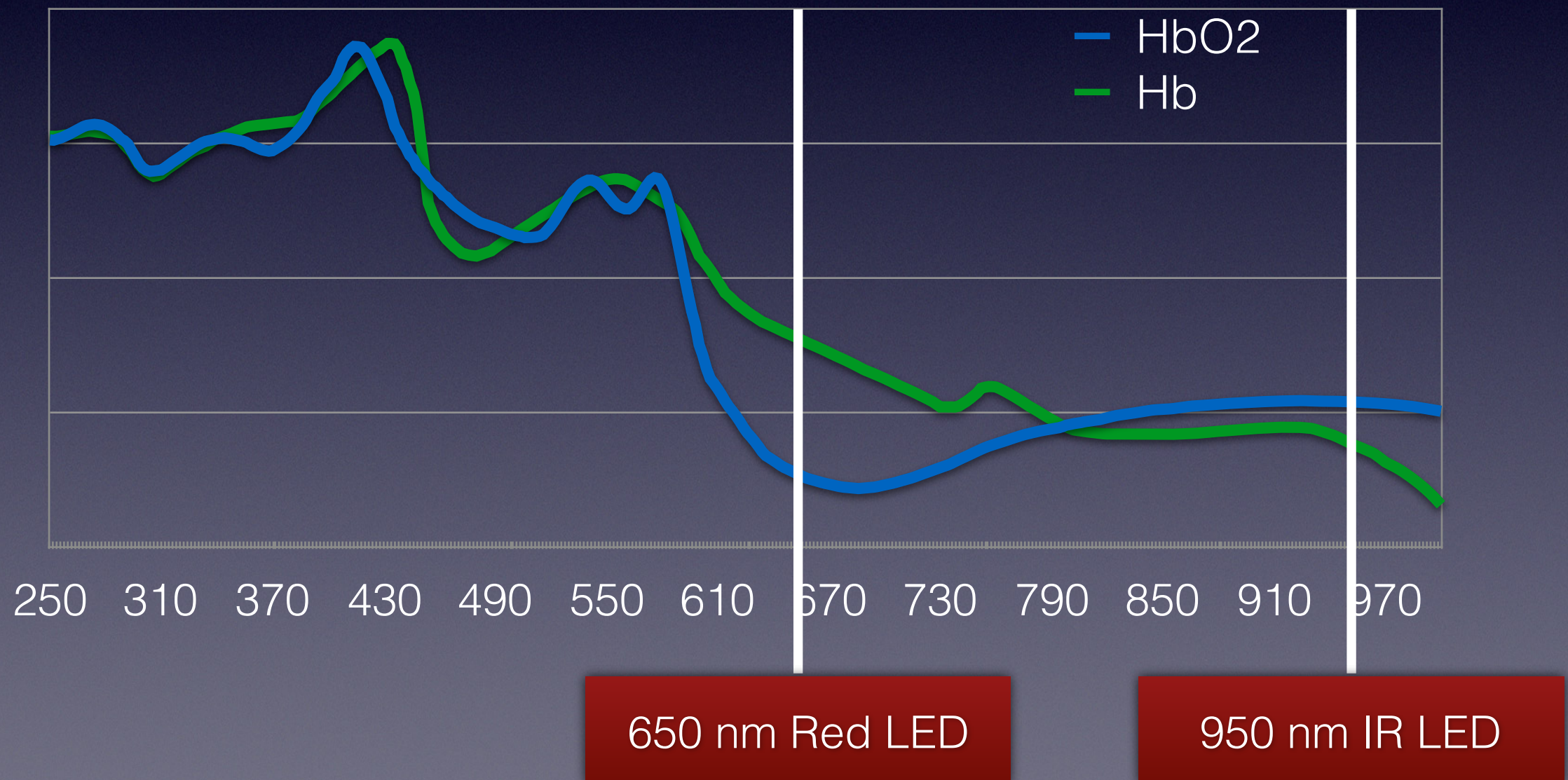




# How to measure SpO<sub>2</sub>

## *Wavelength Used*

HbO<sub>2</sub> and Hb light absorption in different wavelength





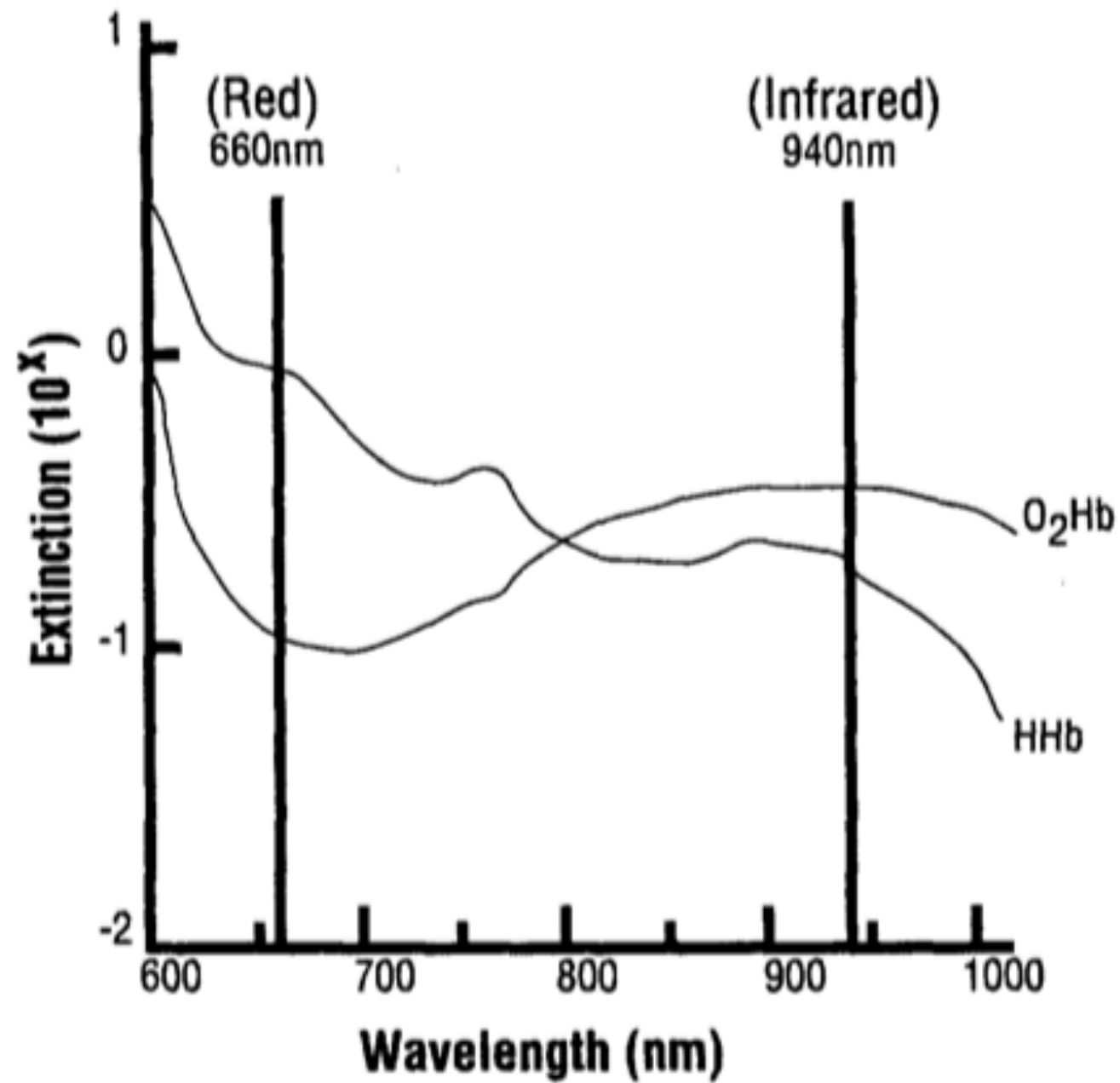
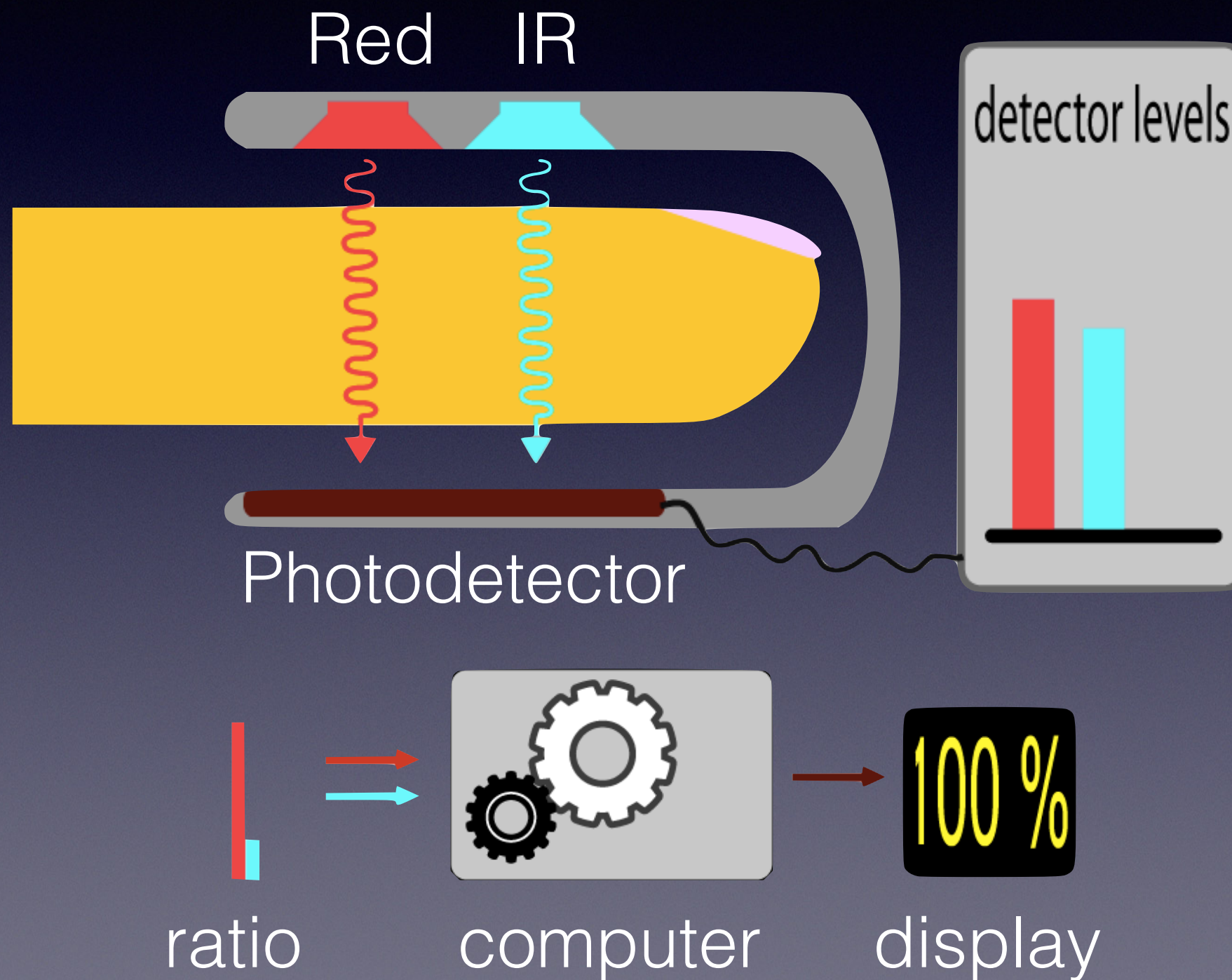


FIGURE 1. Hemoglobin extinction curve of oxyhemoglobin ( $HbO_2$ ) and reduced hemoglobin ( $Hb$ ). (Courtesy of Ohmeda, Louisville, CO.)

(Sinex, James E, 1999)



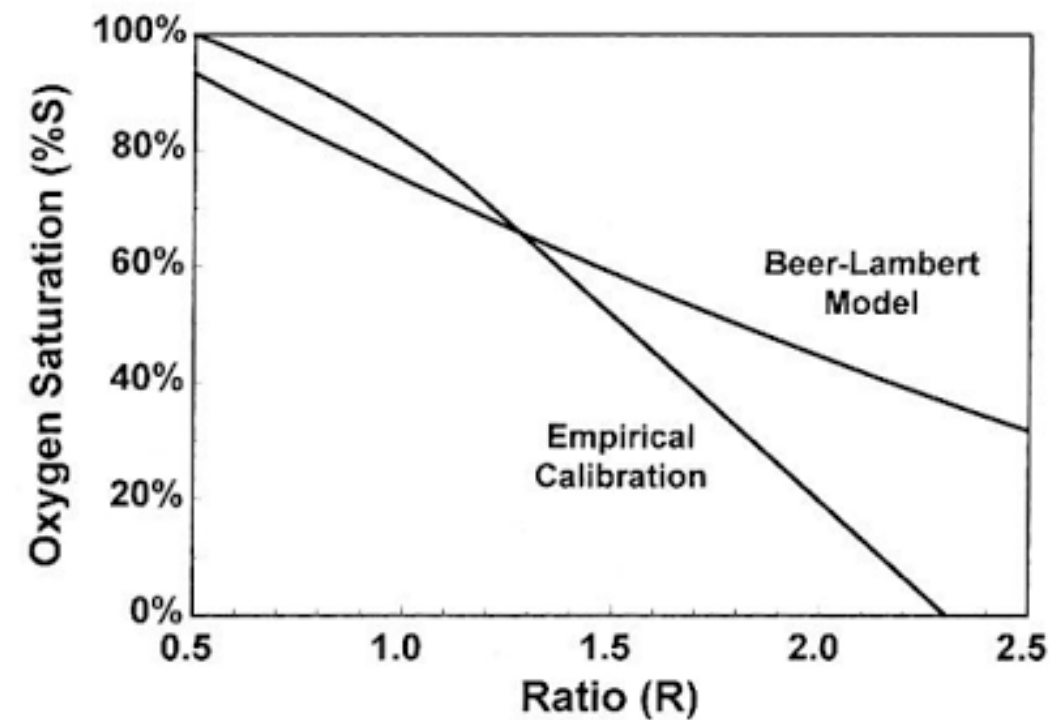
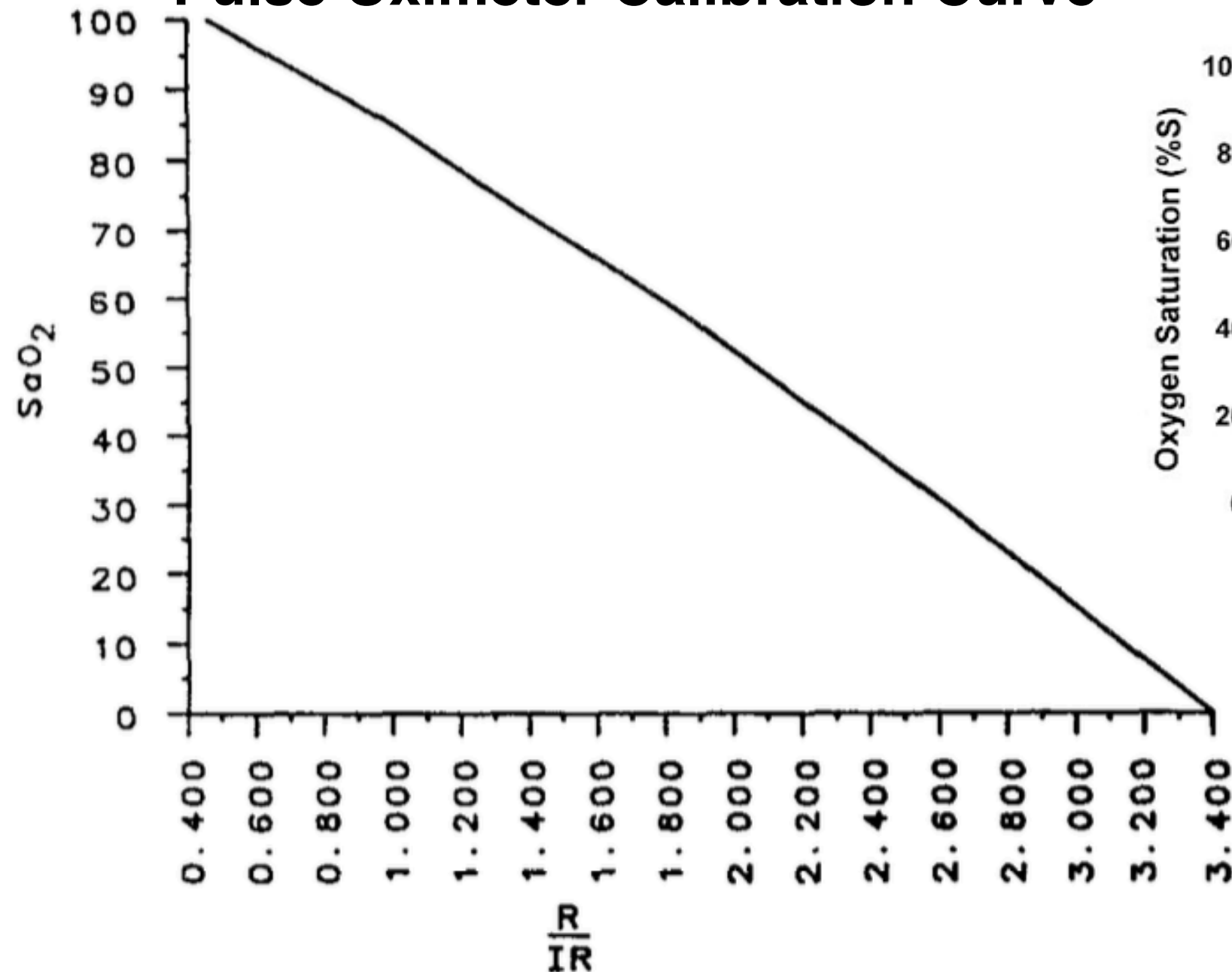
# How to measure SpO<sub>2</sub>



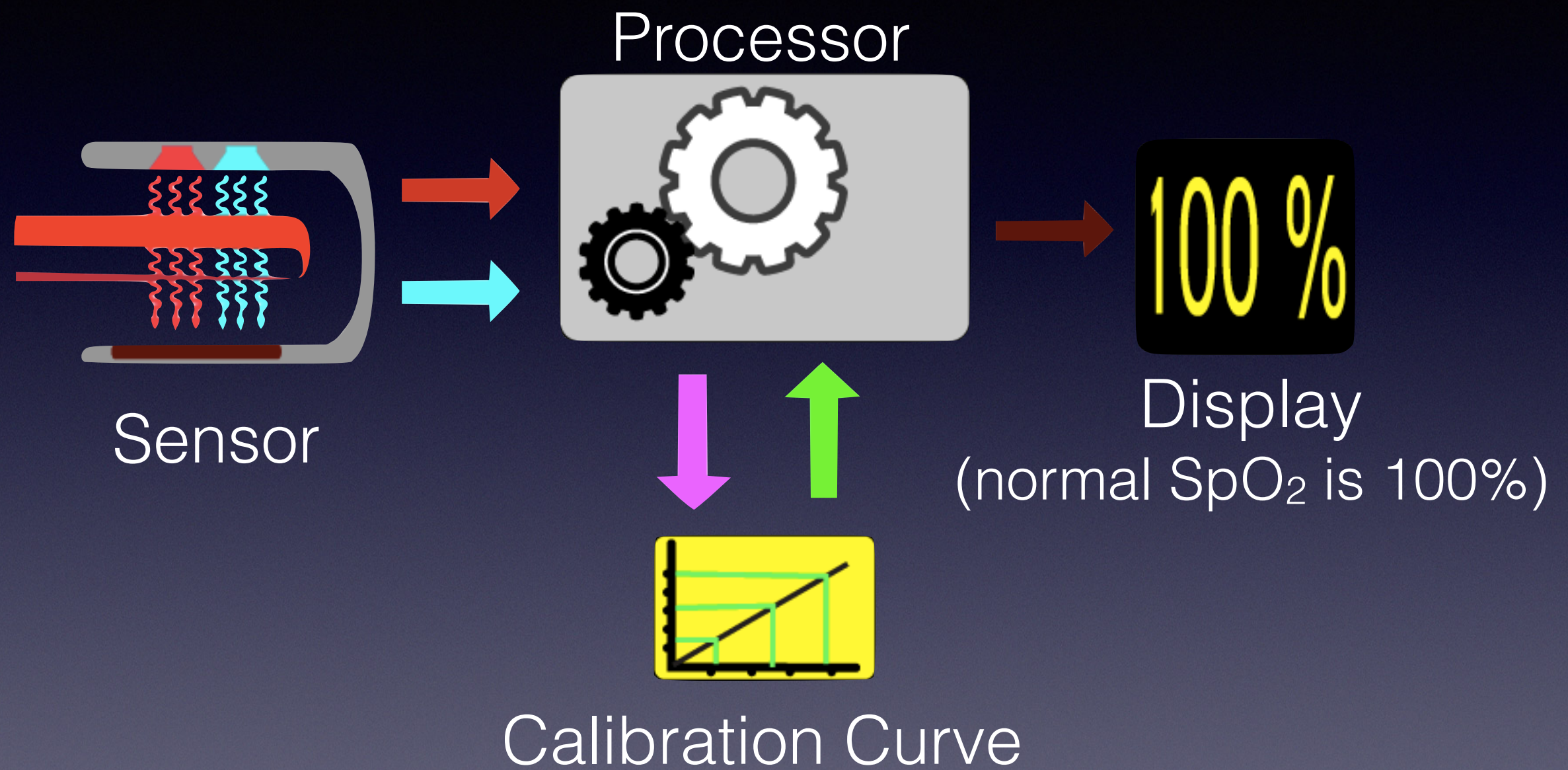


# How to measure SpO<sub>2</sub>

**Pulse Oximeter Calibration Curve**









# Conclusion

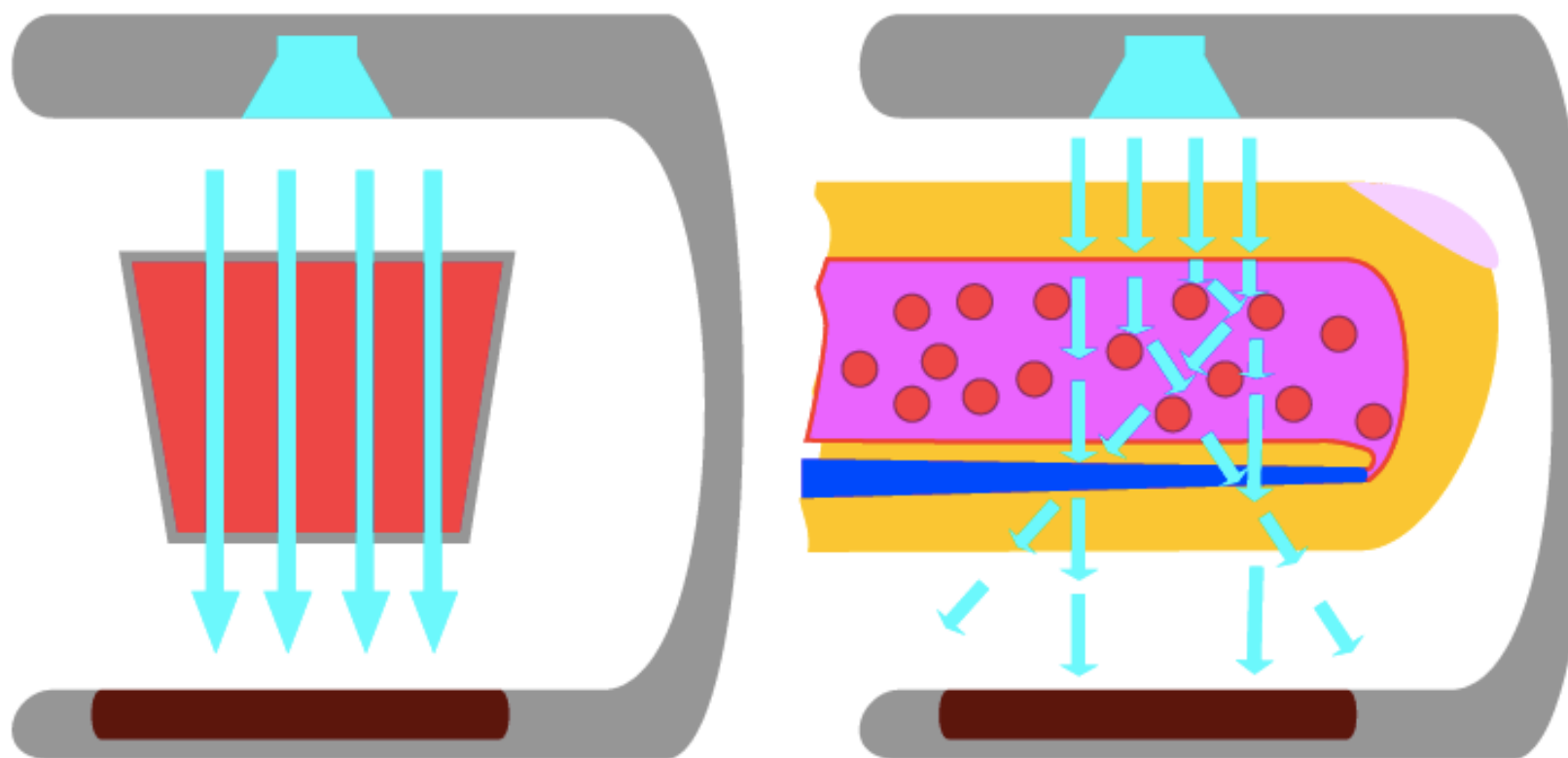
- Pulse Oximeter is used as crucial monitoring equipment in hospital.
- It can monitor **pulse rate** and **SpO<sub>2</sub>**.
- **Non-invasive** measurement. (not harmful)
- The same principle can be applied with other wavelengths to measure SpO<sub>2</sub> and other **blood-related parameters**.
- because we have better **photodetectors** and signal processing techniques.



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