

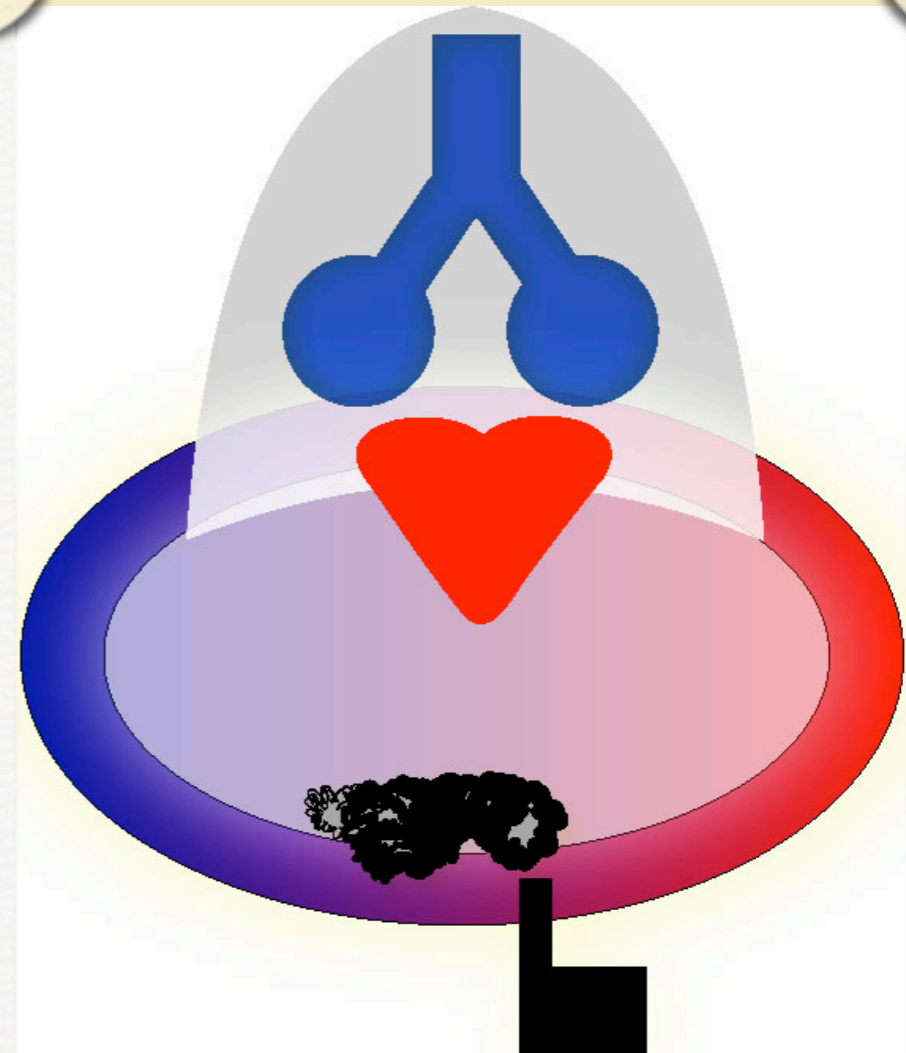
Grundlagen

Lungenatmung

Frank Repschläger & Lorenz Droll

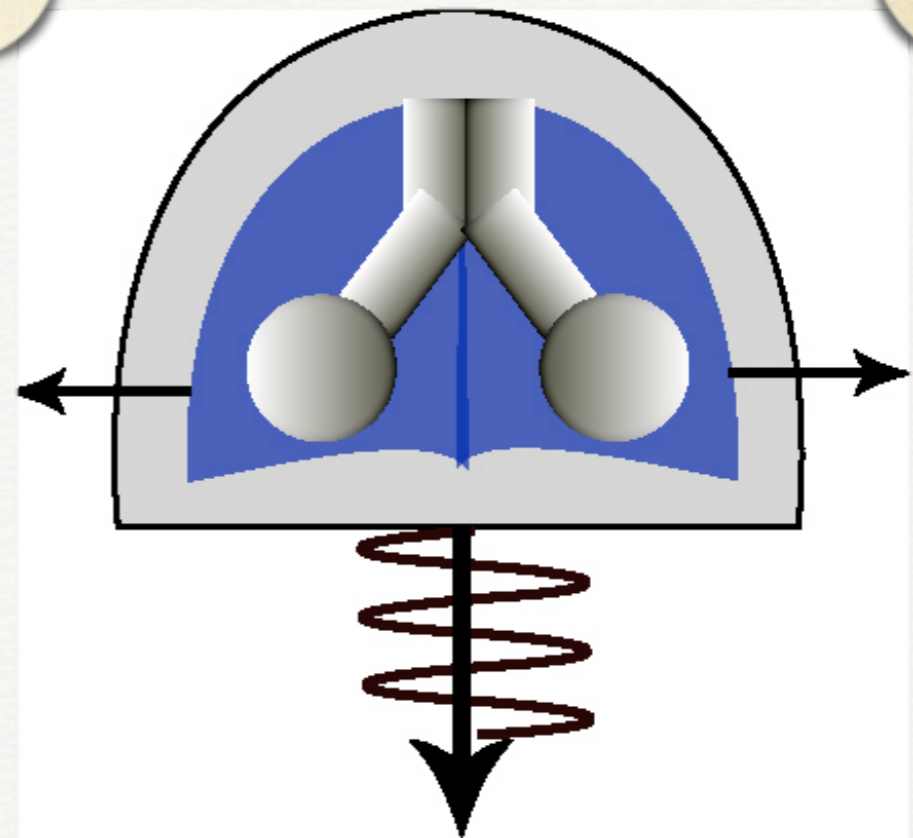
Elemente der Atmung

- Gaswechsel
- Diffusion
- Zirkulation
- Biologische Atmung

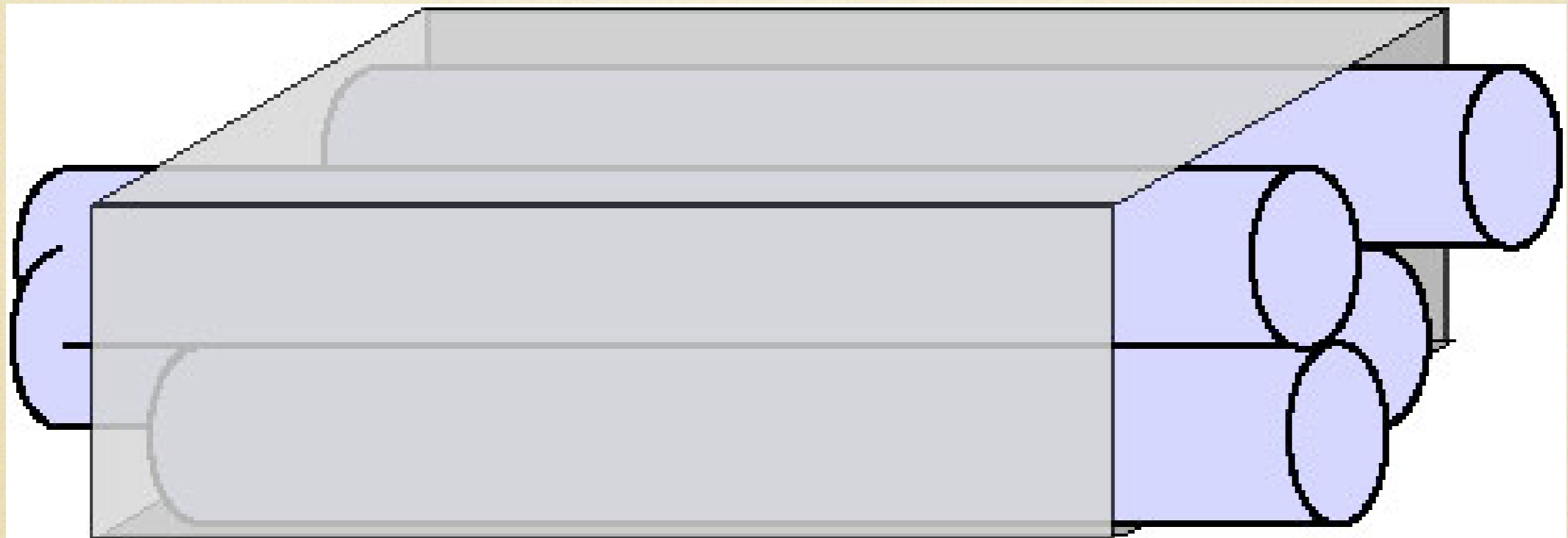


Atemapparat

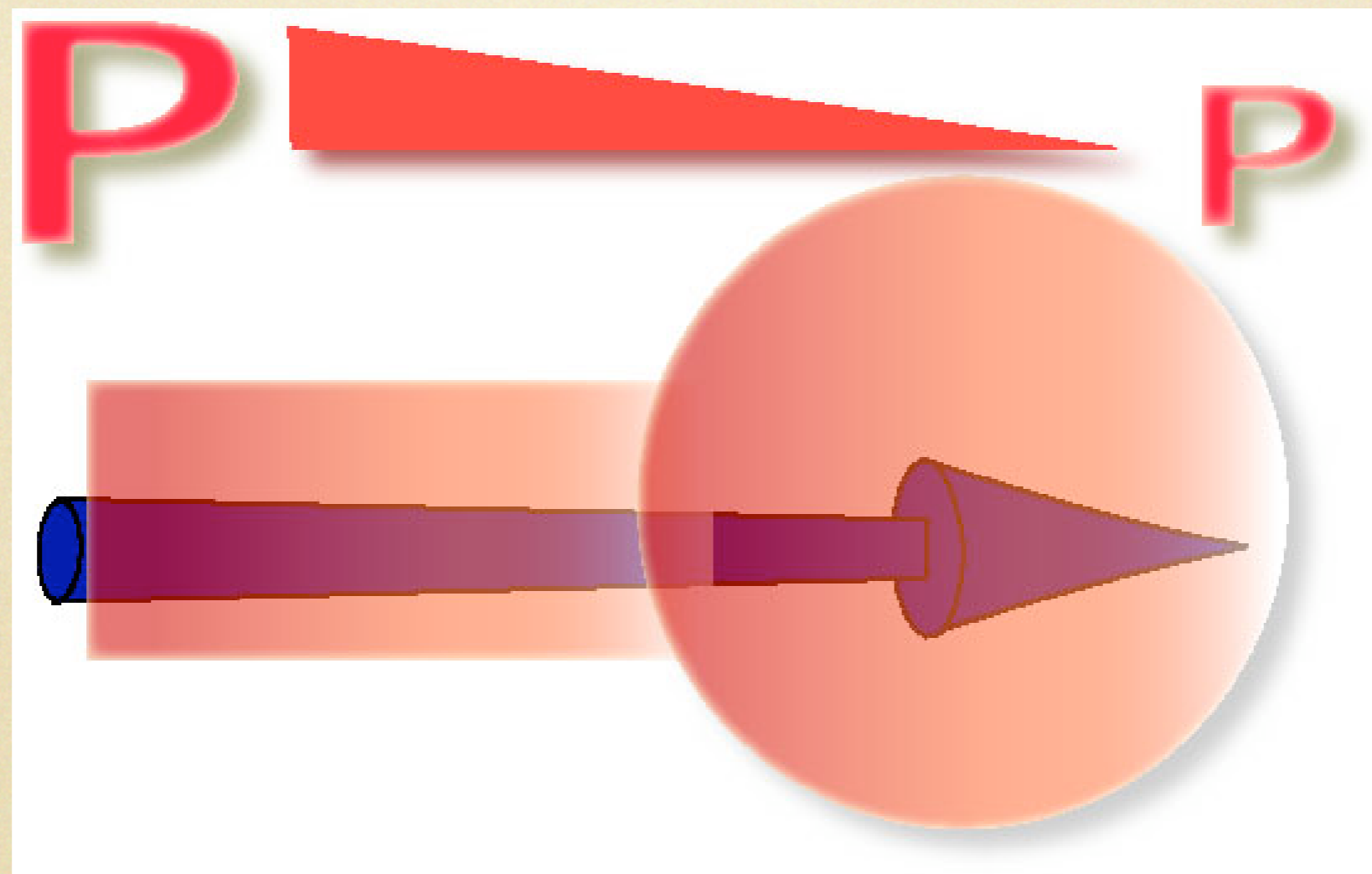
- Muskuläre Komponente
- Konduktive Komponente
- Kapazitive Komponente



Konduktive Komponente



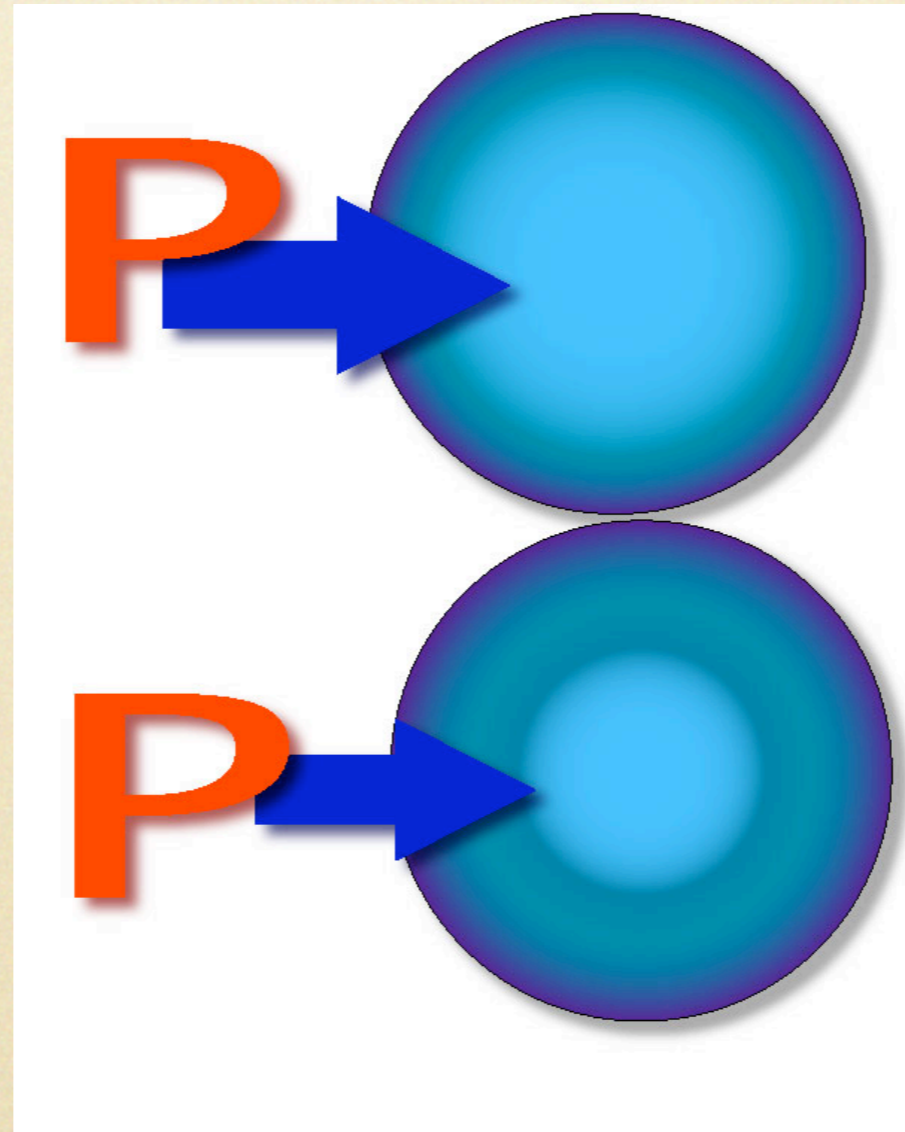
Strömung und Druck



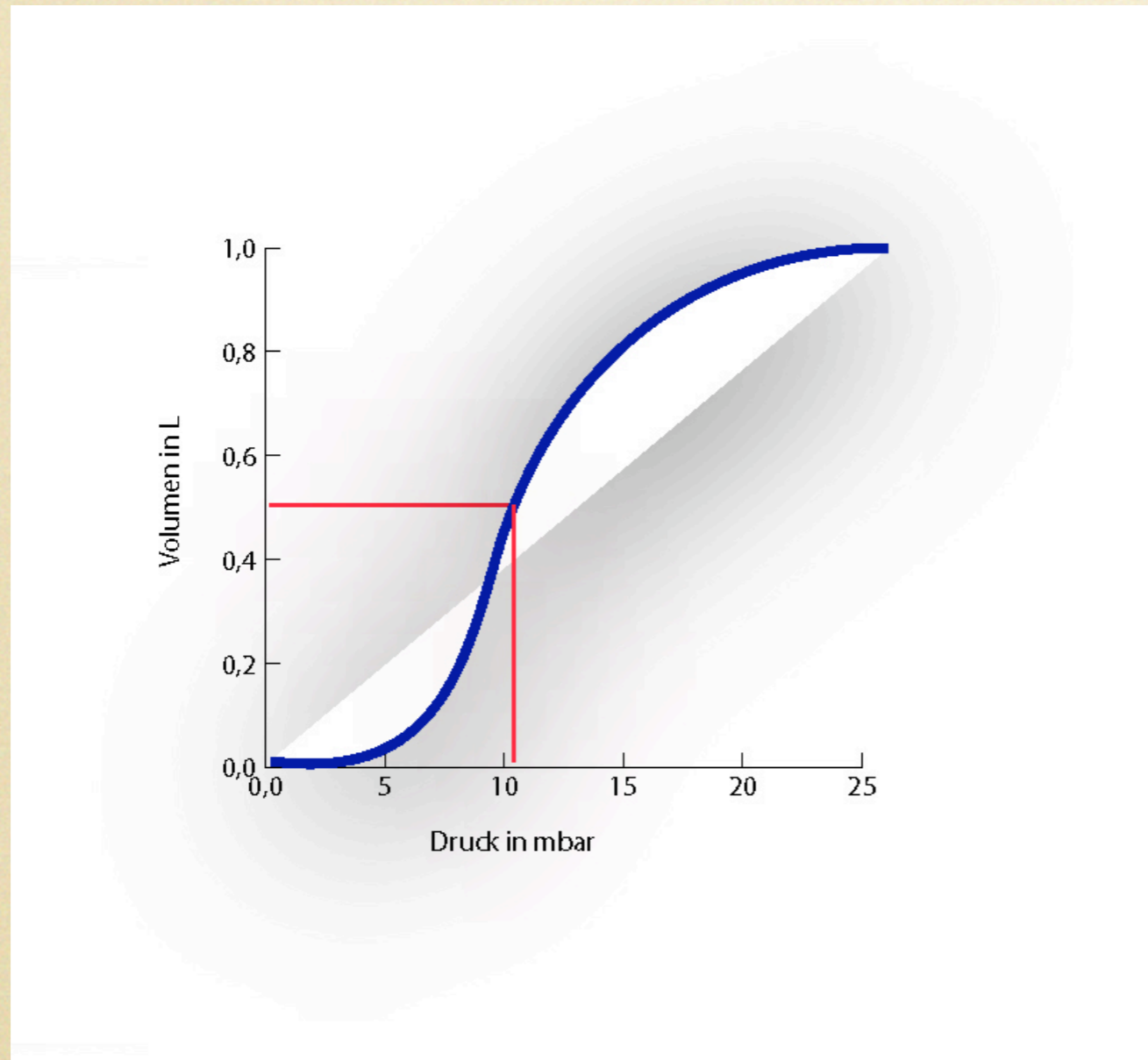
$$\frac{V}{t} = \dot{V}$$

$$Q = \frac{AP}{\dot{V}} = \frac{AP \cdot t}{V}$$

Kapazitive Komponente



Volumen und Druck



Compliance

Elastance

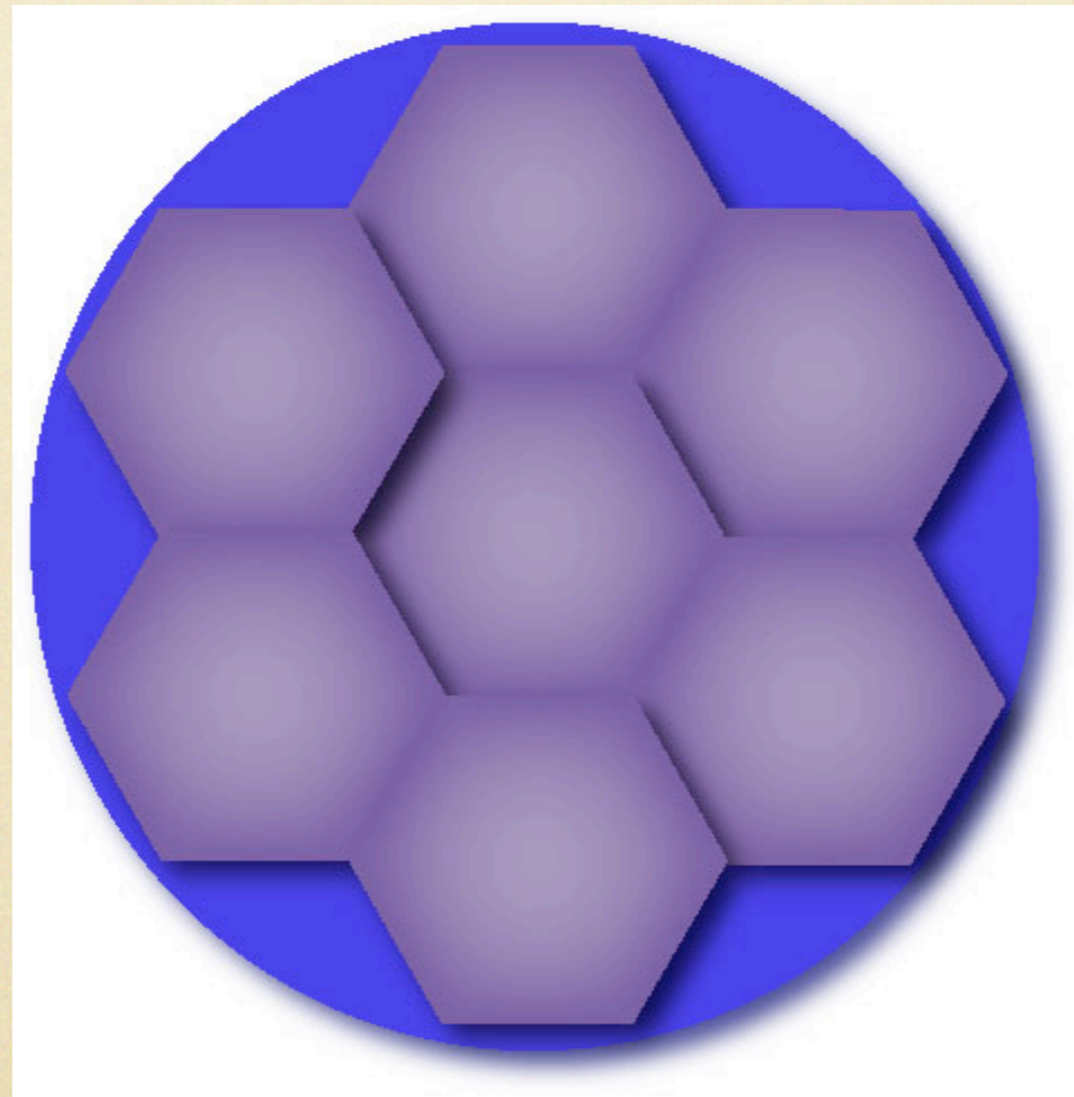
- Compliance ist das Verhältnis von Volumen zu Druck.
- $C = V / P$
- Elastance ist das Verhältnis von Druck zu Volumen.
- $E = P / V$

Werte für R & C

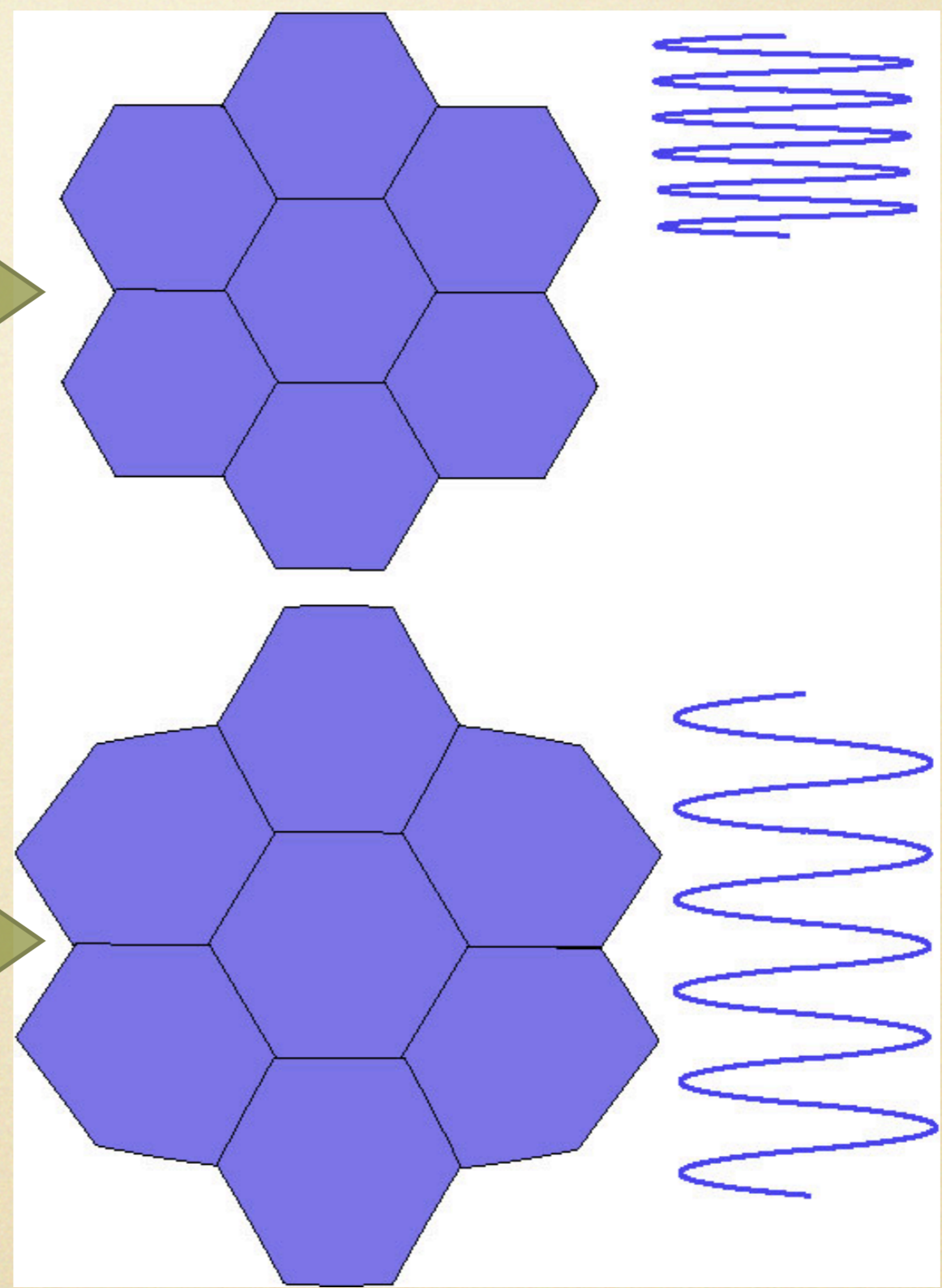
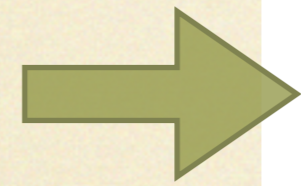
Status	R	C
normal	12 -15 mbar*Sek/L	50 - 100 ml/mbar
erhöht	> 16 mbar*Sek/L	> 110 ml/mbar
erniedrigt	-	< 40 ml/mbar

Azinus

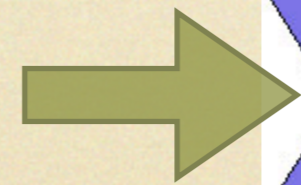
Polyeder und Blase



Expiration



Inspiration



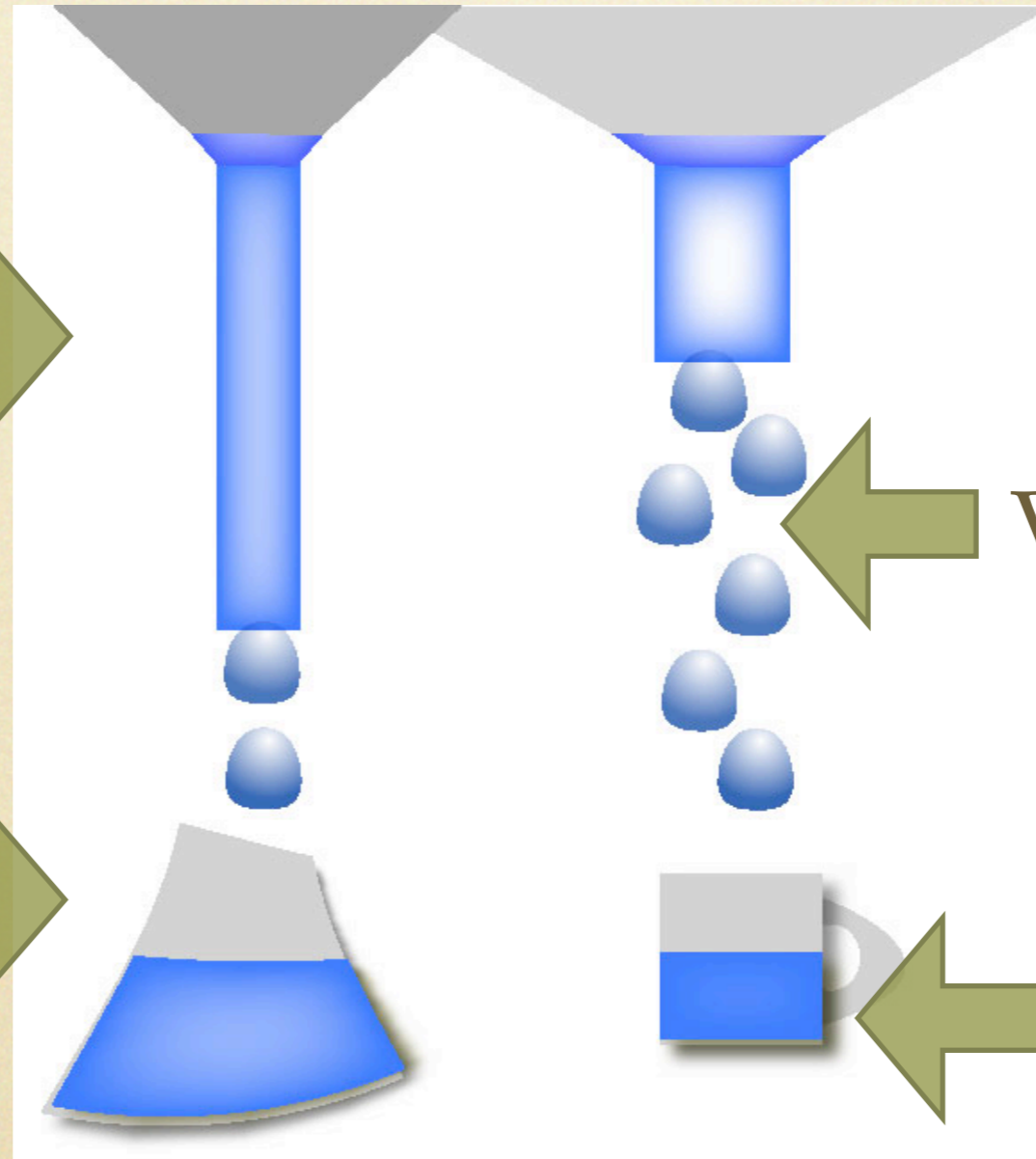
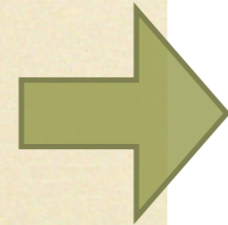
Konsensus

Beatmungsvolumina

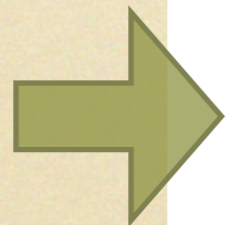
- Lung at no risk: 8 ml/kg Körpergewicht (0,56 Liter bei 70 kg)
- Lung at risk: 7 ml/kg Körpergewicht (0,59 Liter bei 70 kg)
- Severe lung injury: 5 ml/kg Körpergewicht (0,35 Liter bei 70 kg)

Dynamik

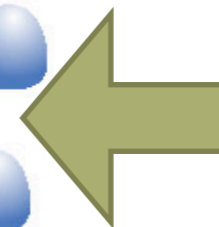
Widerstand



Elastizität



Volumen / Zeit



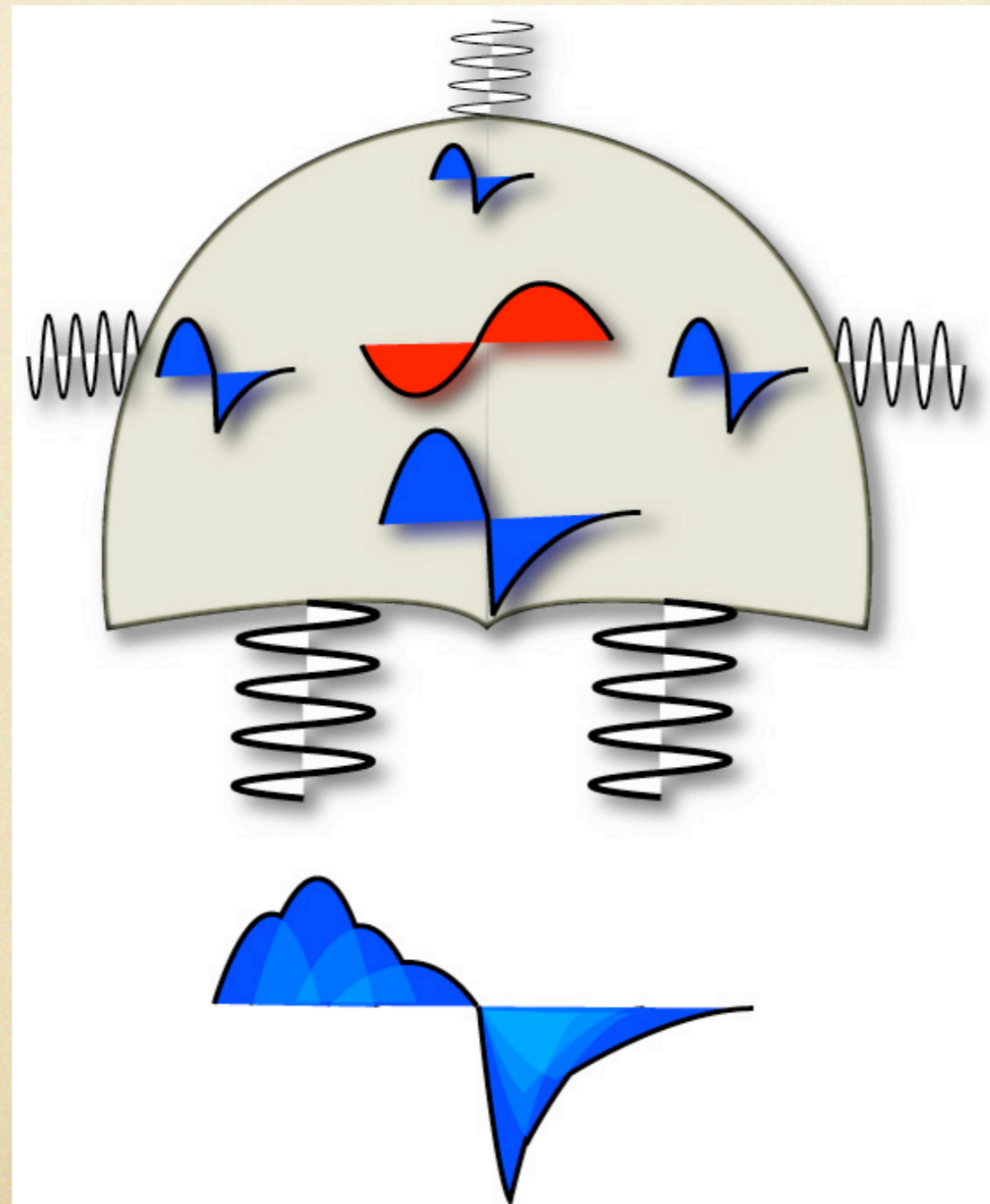
gef. Volumen



$$R * C$$

- Das Produkt aus Resistance und Compliance beschreibt die spezifische Zeit zur Volumenfüllung und -entleerung einer kondukto-kapazitiven Einheit.
- Alle Einheiten mit gleicher Zeitkonstante rechnet man einem Kompartiment zu.

Ventilationstrajektor

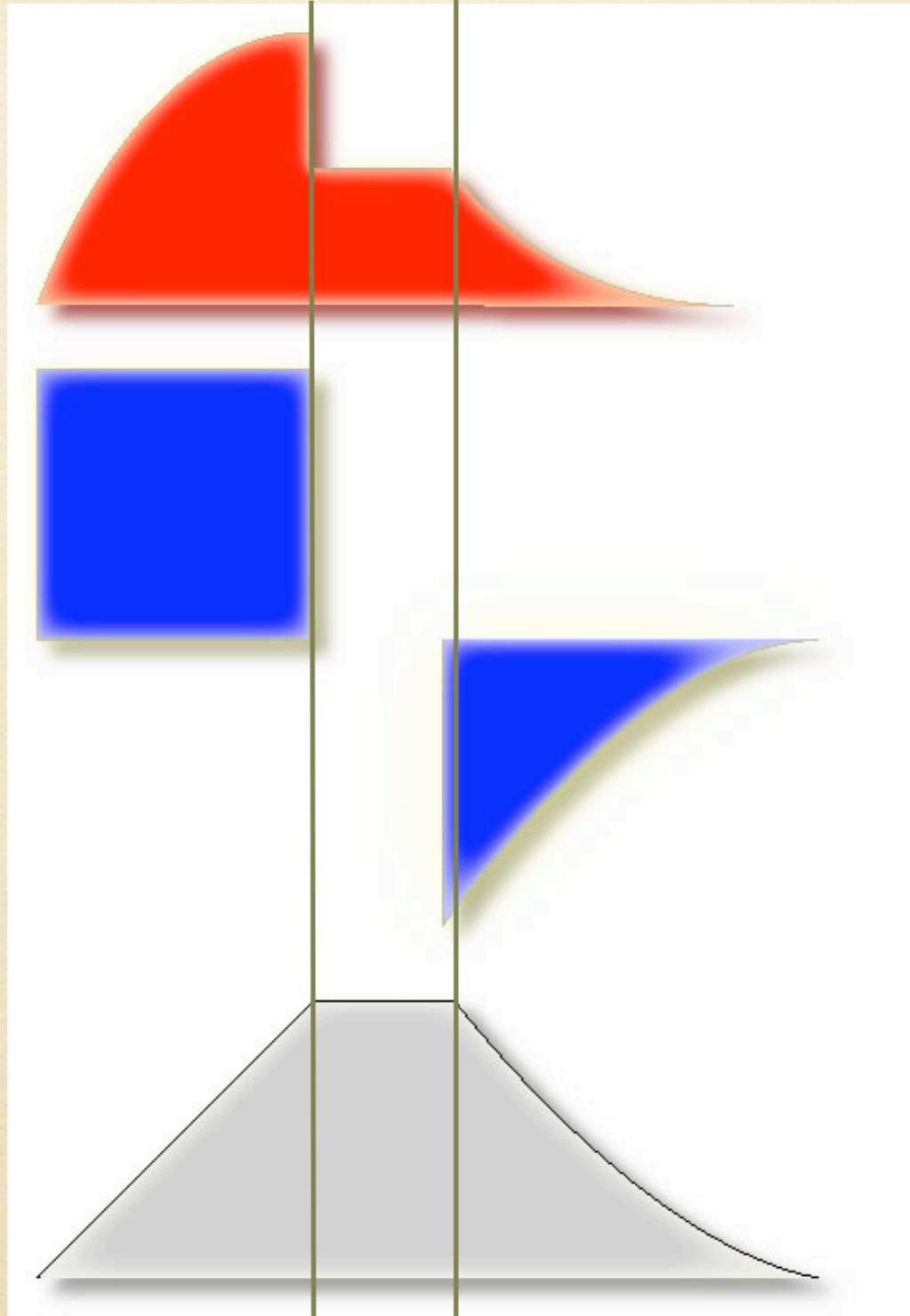
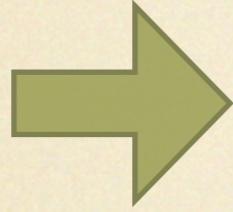


Inspiration

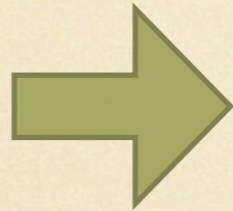
Plateau

Expiration

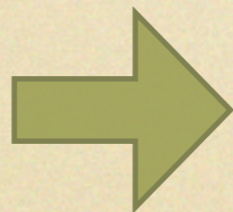
Druck



Flow

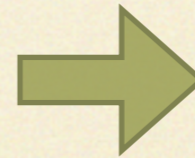


Volumen

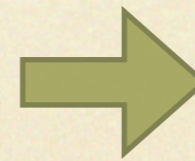


MV - Vektor

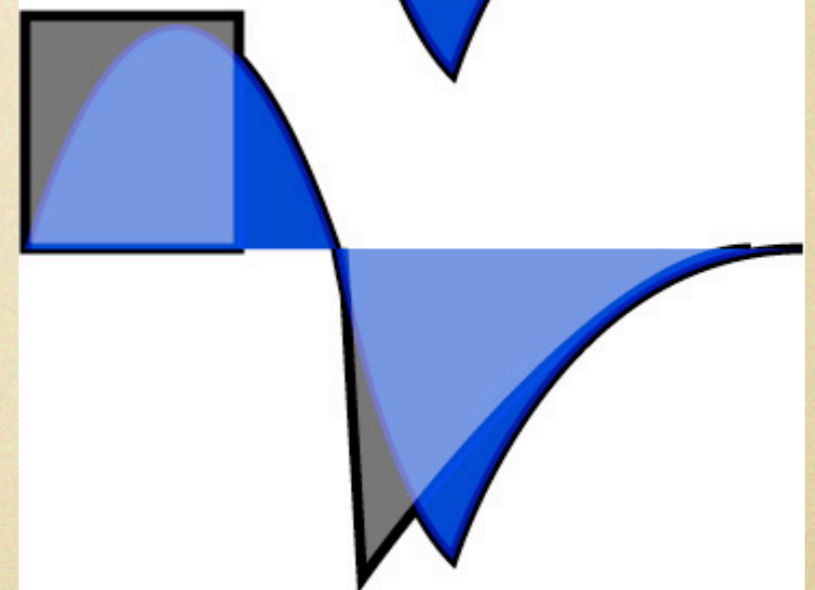
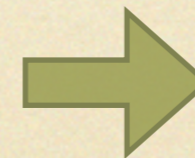
spontane Einzelvektoren



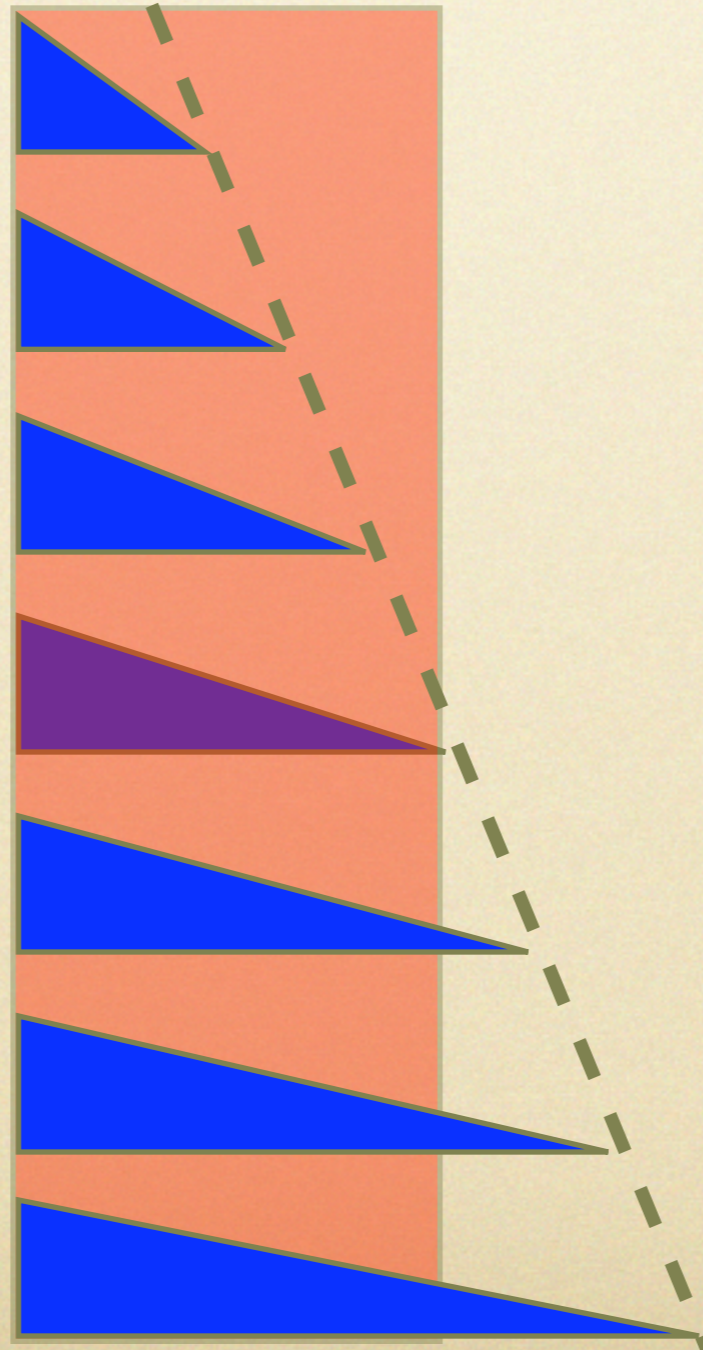
spontane Vektorsumme



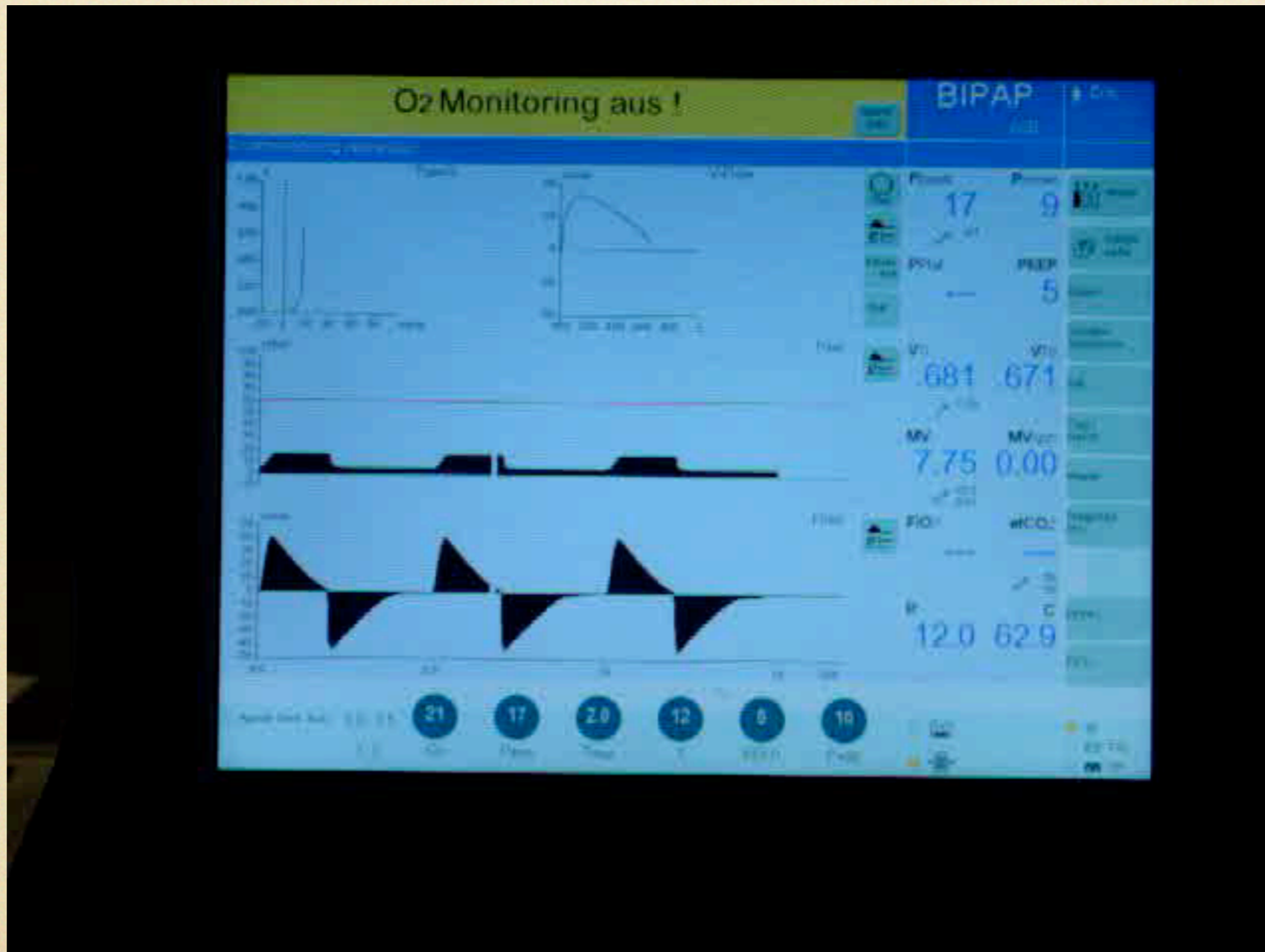
mandatorischer Vektor



Zeitkonstanten



Ventilation mit adaptiertem Flow



Lungenvolumina

inspiratorisches
Reservevolumen

2,5 - 3,5 Liter

Tidalvolumen in
Atemmittellage

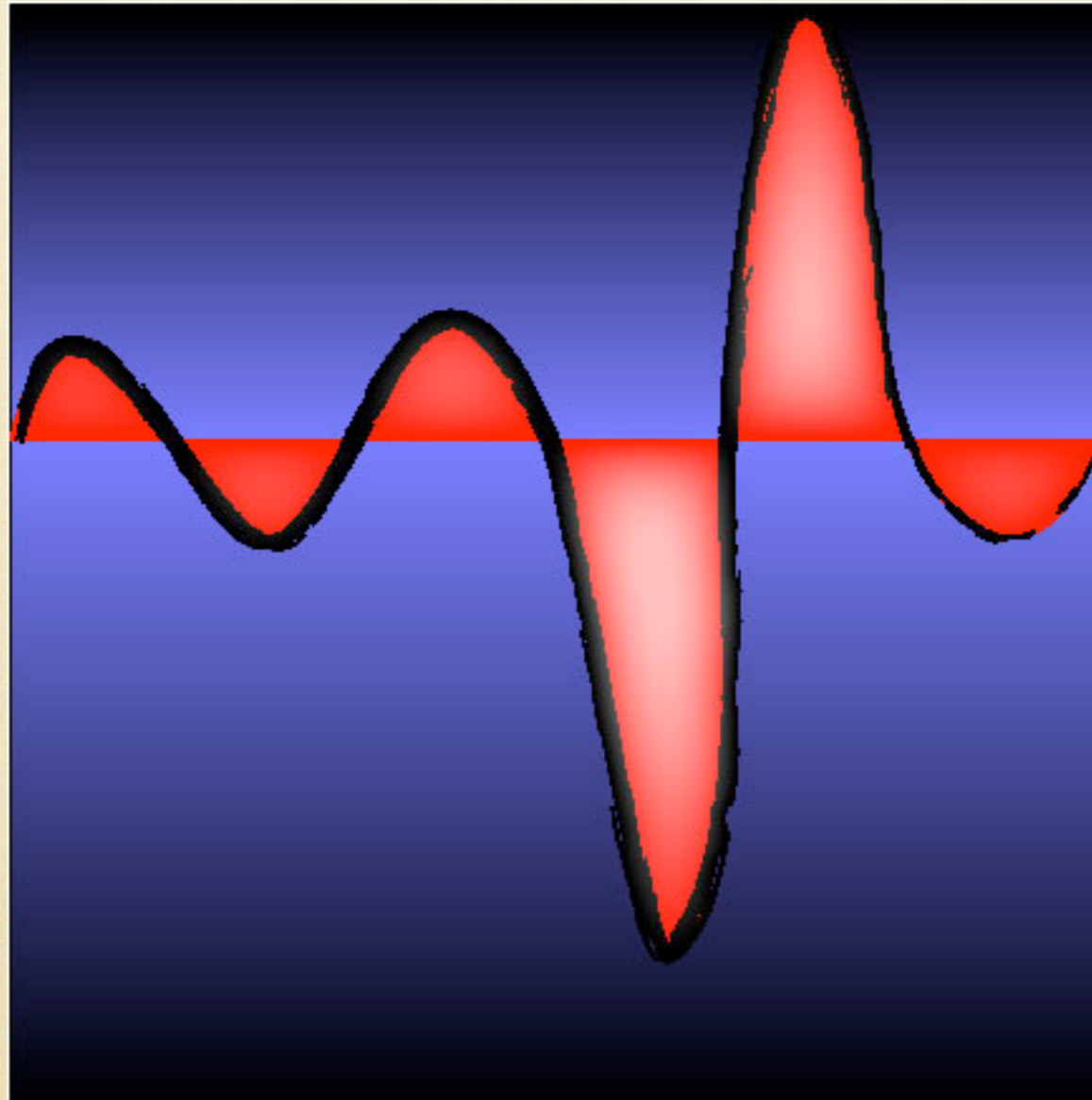
0,4 - 0,6 Liter

expiratorisches
Reservevolumen

2,0 - 2,5 Liter

Residualvolumen

1,5 - 2,5 Liter



Funktionelle Residualkapazität

