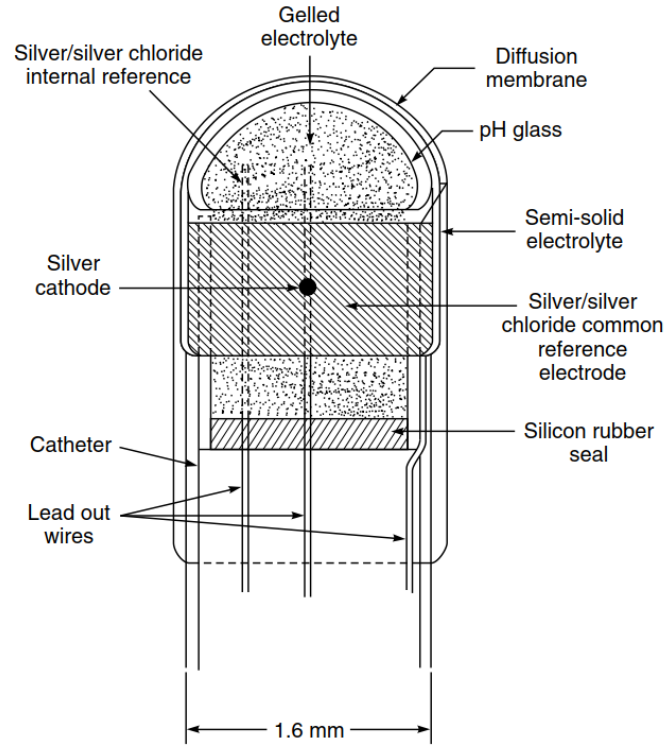
AULA 04 – PTC 3435

14/08/2018

SINAIS BIOQUÍMICOS



➤ **Fig. 15.7** *Catheter tip electrode for measurement of pO_2 and pCO_2 (after Parker et al. 1978; reproduced by permission of Med. & Biol. Eng. and Comput.)*

Biomedical Instrumentation, R. S. Khandpur

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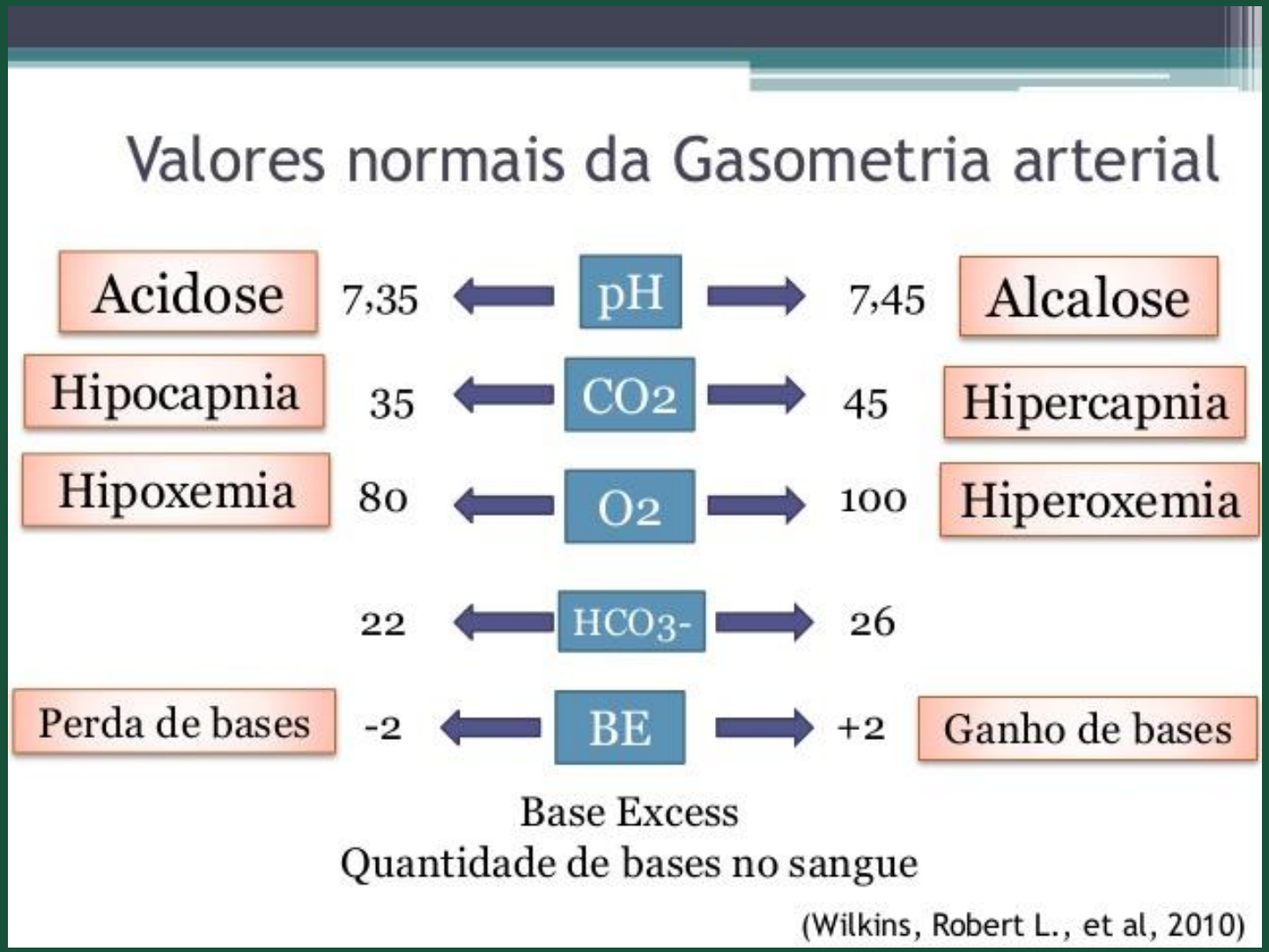

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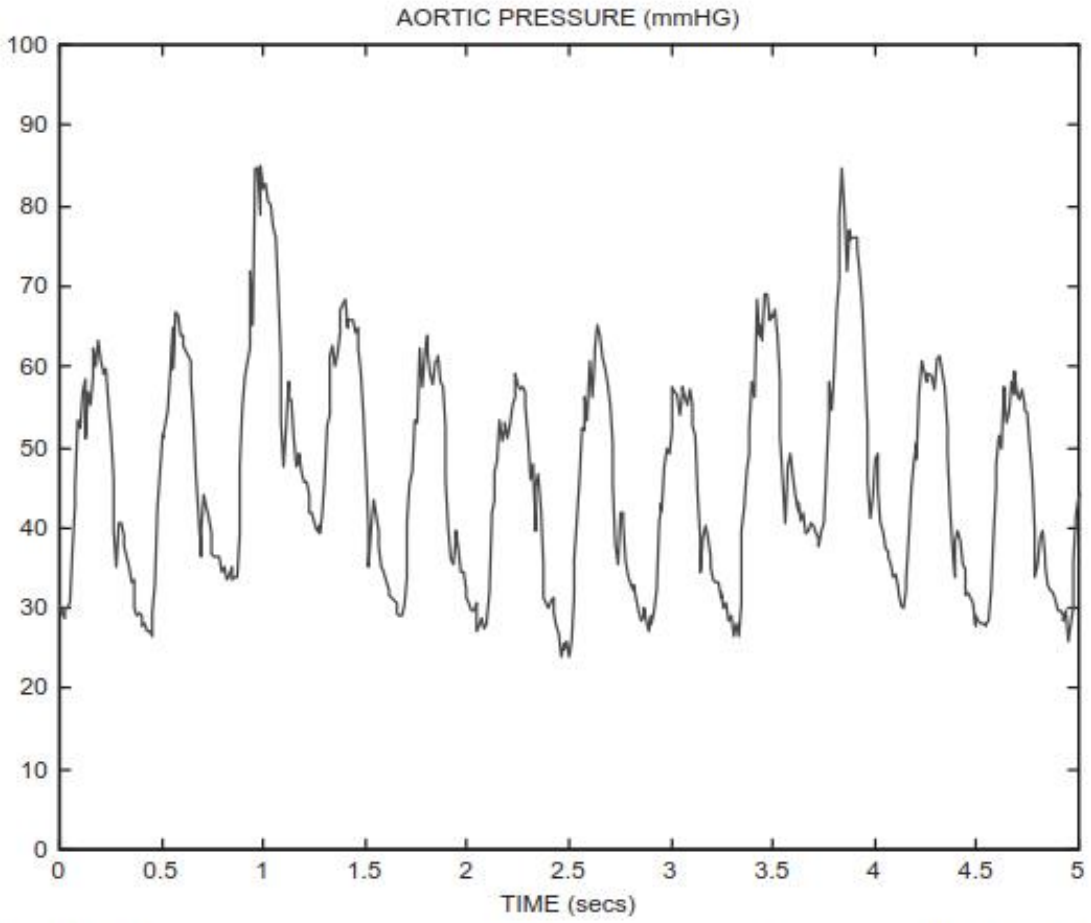

FIGURE 11.2 Blood pressure waveform recorded from the aortic arch of a 4-year-old child. (Sampled at 200 samples/s.)

(Introduction to Biomedical Engineering 3ª ed, Enderle, Bronzino (eds), Biosignal Processing, M. Escabí)

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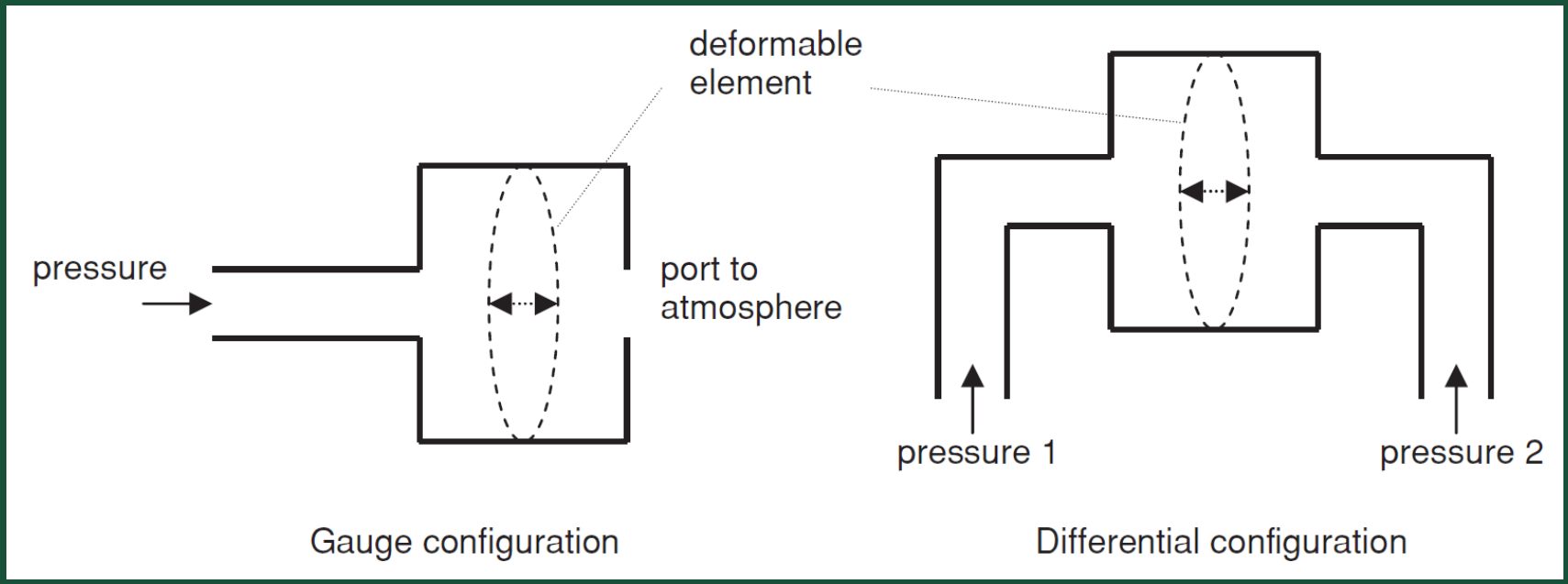
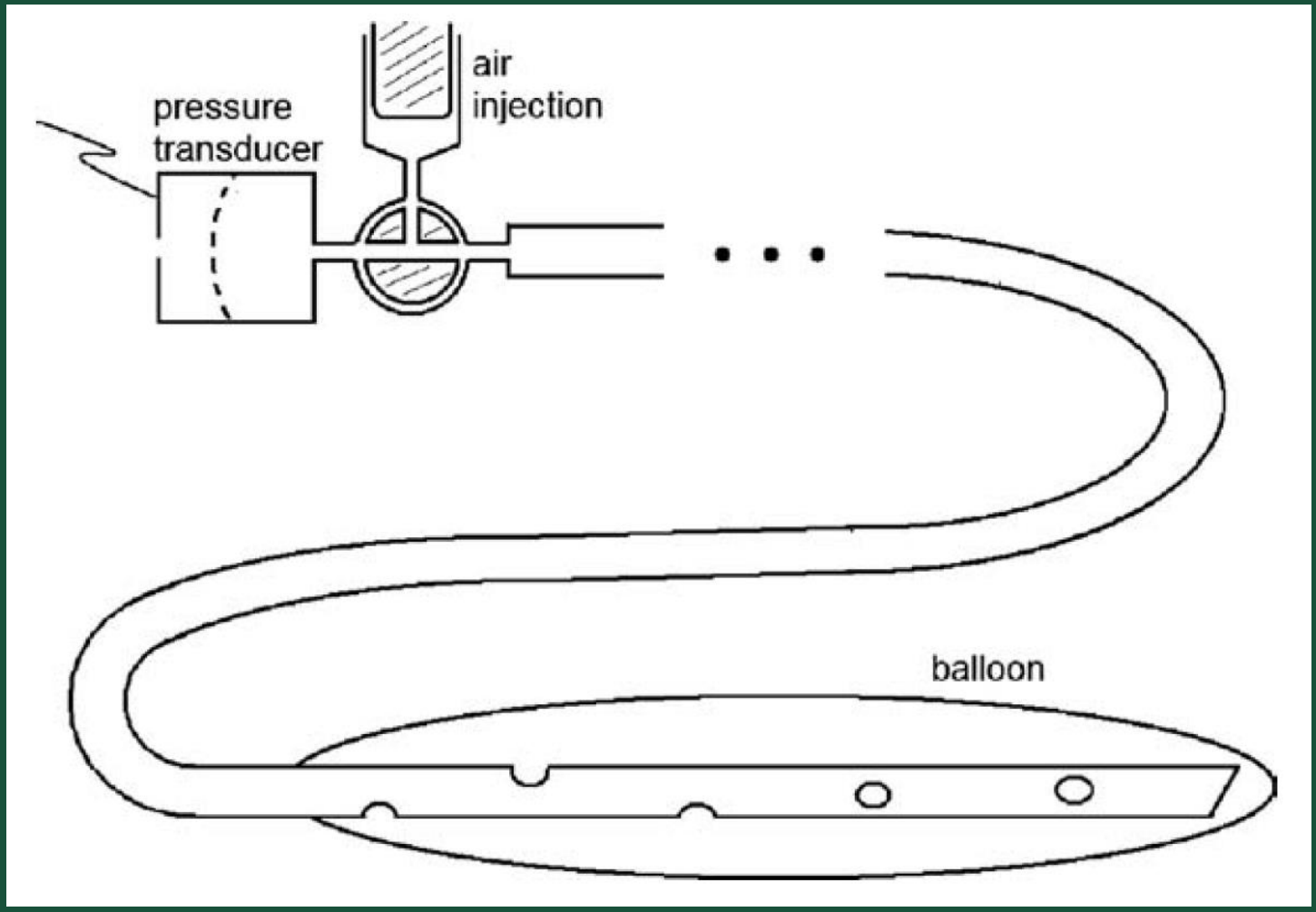


Jason H. T. Bates – Cap. 2
Lung Mechanics: an Inverse Modeling Approach

SINAIS BIOMECÂNICOS



Jason H. T. Bates – Cap. 2
Lung Mechanics: an Inverse Modeling Approach

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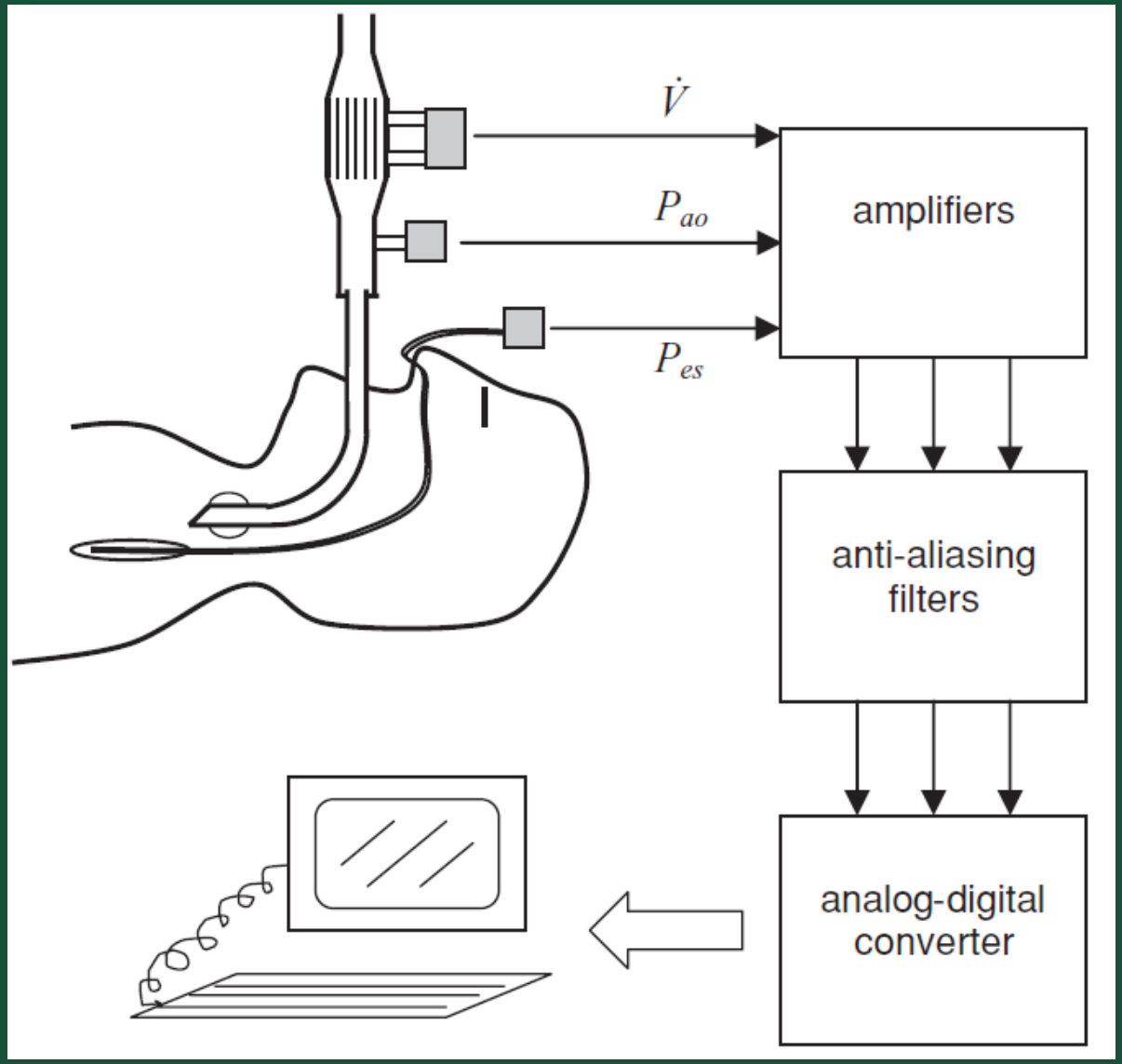

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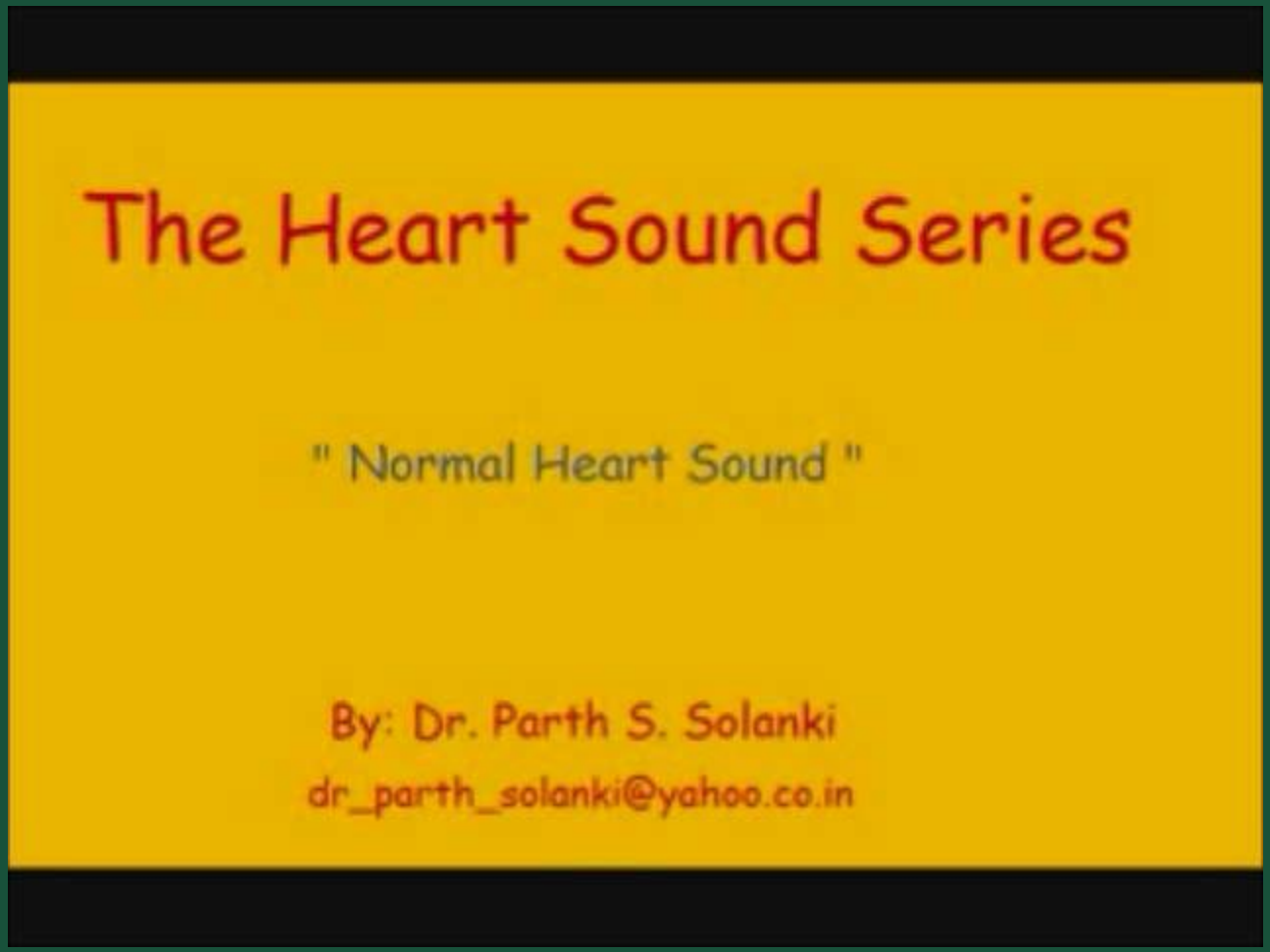
Lung Mechanics: an Inverse Modeling Approach

SINAIS BIOACÚSTICOS

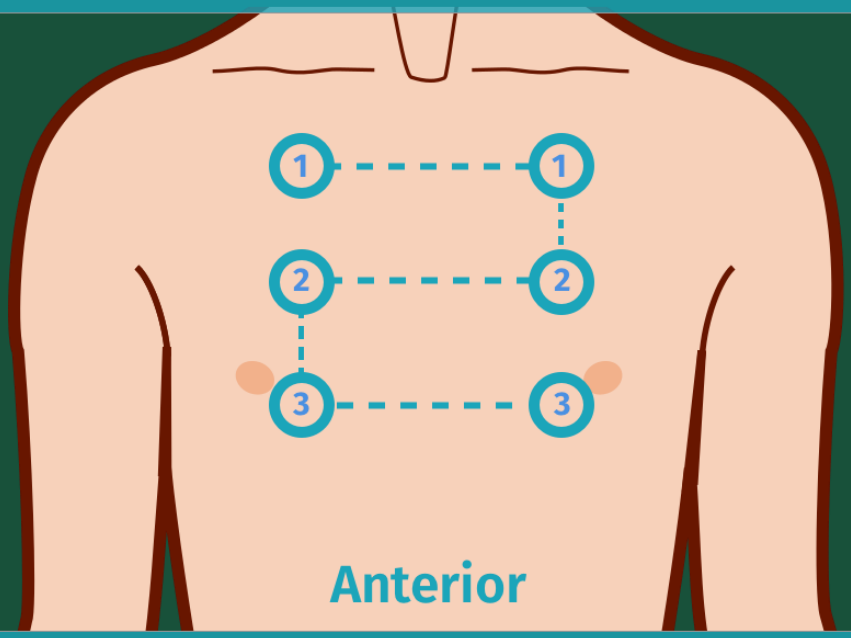


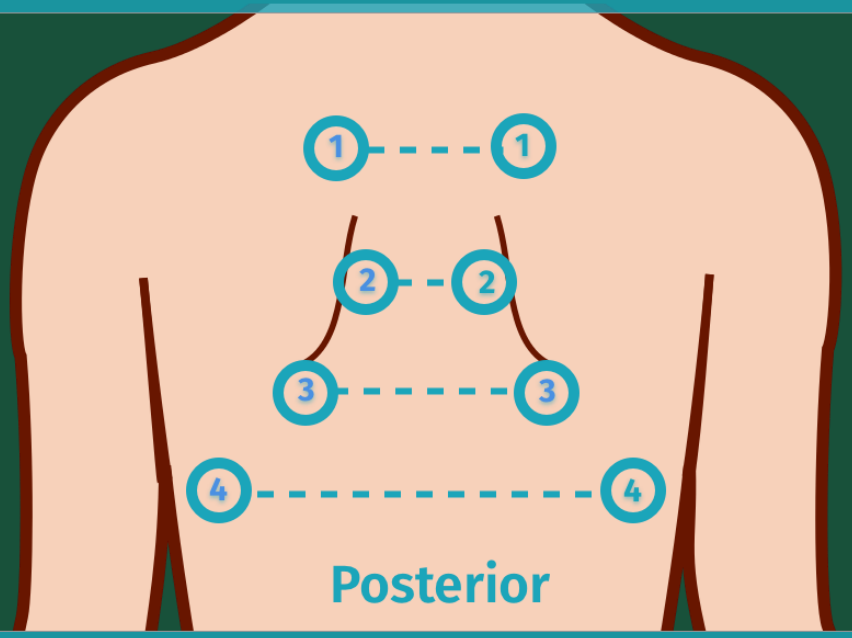
http://www.youtube.com/watch?v=xS3jX1FYG-M

SINAIS BIOACÚSTICOS

Medicslist

RESPIRATORY AUSCULTATION & PERCUSSION

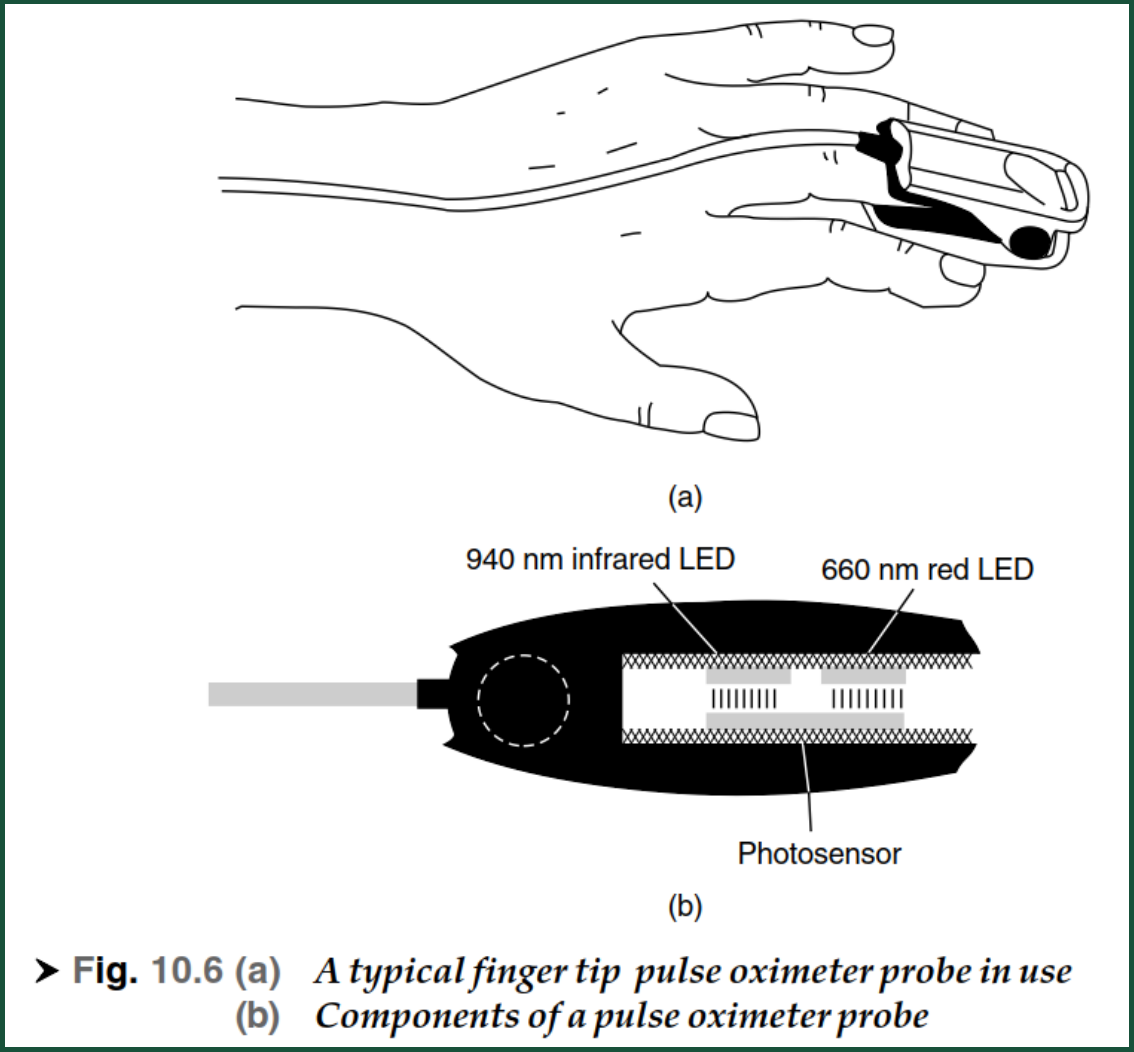




RESPIRATORY PATTERNS	
Vesicular - Normal	**Bronchial** - Consolidation, Fibrosis
Quiet - Consolidation, Collapse, or effusion	**Fine Crackles** - Pulmonary Fibrosis
Polyphonic Wheeze - Asthma, COPD	**Coarse crackles** - LRTI, Bronhiectasis, Effusion

https://beststethoscopeguide.com/where-to-listen-to-lung-sounds-respiratory-assessment/

SINAIS BIO-ÓPTICOS



➤ **Fig. 10.6** (a) *A typical finger tip pulse oximeter probe in use*
(b) *Components of a pulse oximeter probe*

Biomedical Instrumentation, R. S. Khandpur

SINAIS DE BIOIMPEDÂNCIA

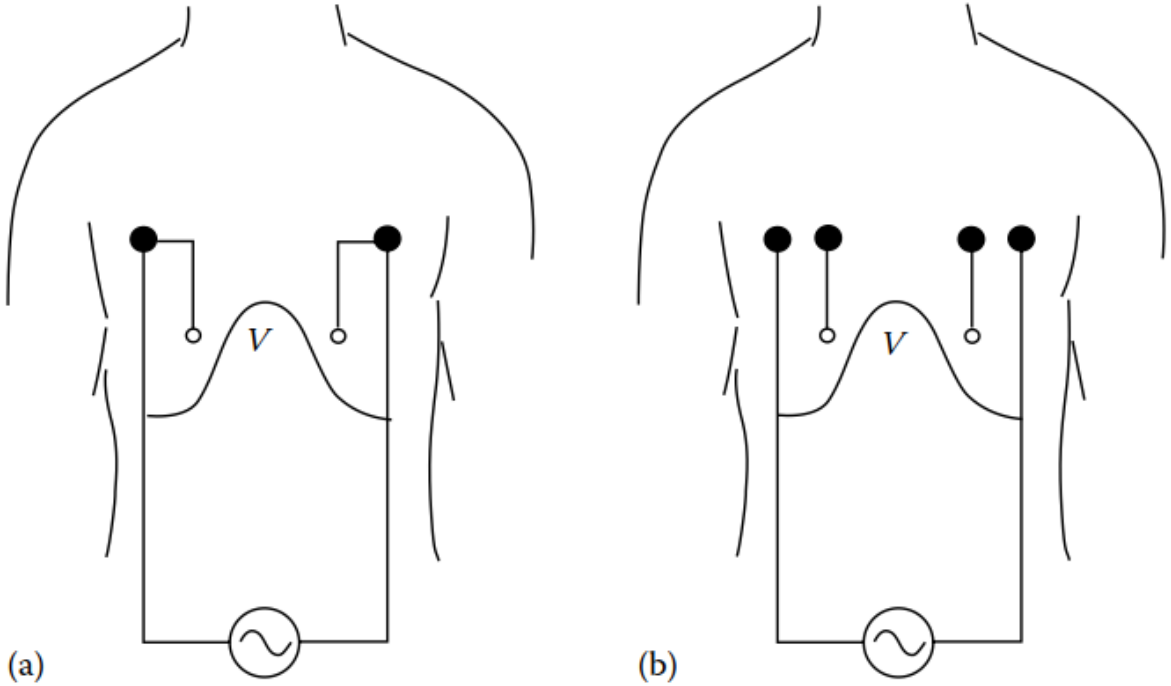


FIGURE 3.88 Typical electrode positions in impedance pnumography: (a) two-electrode system and (b) four-electrode system.

Biomedical Sensors and Instruments, T. Togawa et al.

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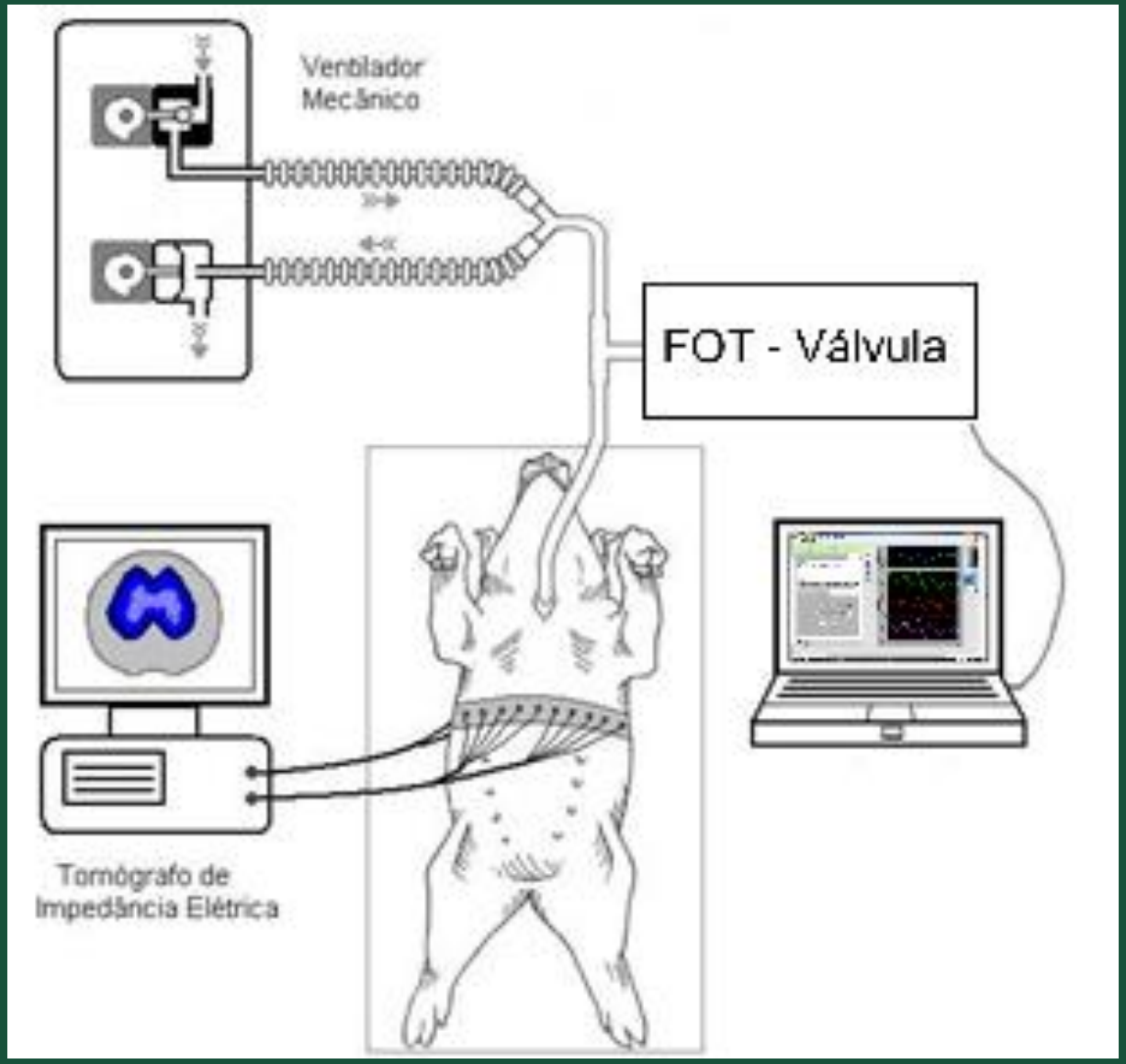

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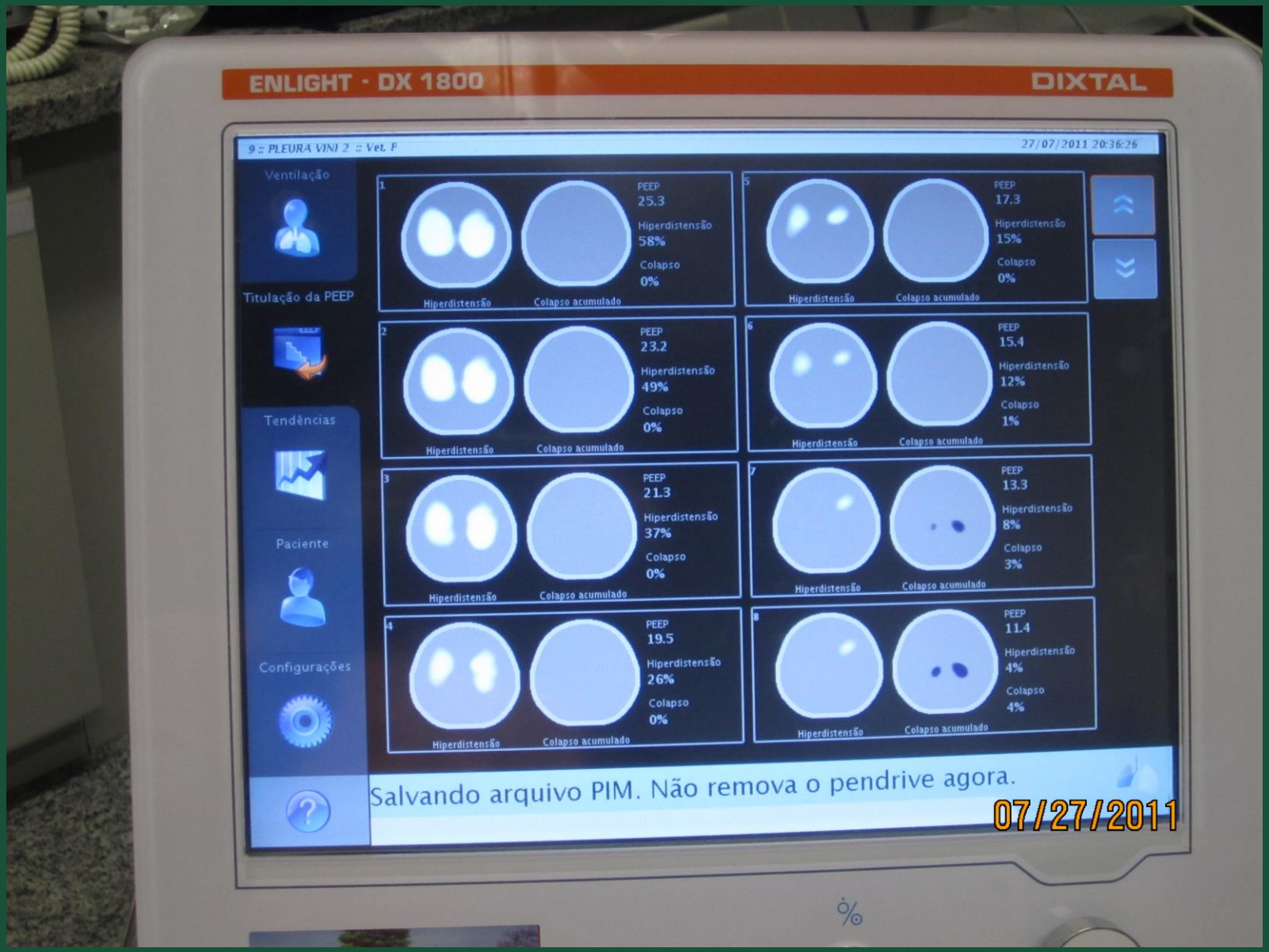


PARÂMETROS MÉDICOS E FISIOLÓGICOS

Table 1.1 Medical and Physiological Parameters

Parameter or Measuring Technique	Principal Measurement Range of Parameter	Signal Frequency Range, Hz	Standard Sensor or Method
Ballistocardiography (BCG)	0–7 mg	dc–40	Accelerometer, strain gage
	0–100 μm	dc–40	Displacement linear variable differential transformer (LVDT)
Bladder pressure	1–100 cm H_2O	dc–10	Strain-gage manometer
Blood flow	1–300 ml/s	dc–20	Flowmeter (electromagnetic or ultrasonic)
Blood pressure, arterial			
Direct	10–400 mm Hg	dc–50	Strain-gage manometer
Indirect	25–400 mm Hg	dc–60	Cuff, auscultation
Blood pressure, venous	0–50 mm Hg	dc–50	Strain gage

PARÂMETROS MÉDICOS E FISIOLÓGICOS

Table 1.1 Medical and Physiological Parameters

Parameter or Measuring Technique	Principal Measurement Range of Parameter	Signal Frequency Range, Hz	Standard Sensor or Method
Blood gases			
P_{O_2}	30–100 mm Hg	dc–2	Specific electrode, volumetric or manometric
P_{CO_2}	40–100 mm Hg	dc–2	Specific electrode, volumetric or manometric
P_{N_2}	1–3 mm Hg	dc–2	Specific electrode, volumetric or manometric
P_{CO}	0.1–0.4 mm Hg	dc–2	Specific electrode, volumetric or manometric
Blood pH	6.8–7.8 pH units	dc–2	Specific electrode
Cardiac output	4–25 liter/min	dc–20	Dye dilution, Fick

PARÂMETROS MÉDICOS E FISIOLÓGICOS

Table 1.1 Medical and Physiological Parameters

Parameter or Measuring Technique	Principal Measurement Range of Parameter	Signal Frequency Range, Hz	Standard Sensor or Method
Electrocardiography (ECG)	0.5–4 mV	0.01–250	Skin electrodes
Electroencephalography (EEG)	5–300 μV	dc–150	Scalp electrodes
(Electrocorticography and brain depth)	10–5000 μV	dc–150	Brain-surface or depth electrodes
Electrogastrography (EGG)	10–1000 μV	dc–1	Skin-surface electrodes
	0.5–80 mV	dc–1	Stomach-surface electrodes
Electromyography (EMG)	0.1–5 mV	dc–10,000	Needle electrodes
Eye potentials			
Electro-oculogram (EOG)	50–3500 μV	dc–50	Contact electrodes
Electroretinogram (ERG)	0–900 μV	dc–50	Contact electrodes
Galvanic skin response (GSR)	1–500 kΩ	0.01–1	Skin electrodes
Gastric pH	3–13 pH units	dc–1	pH electrode; antimony electrode

PARÂMETROS MÉDICOS E FISIOLÓGICOS

Table 1.1 Medical and Physiological Parameters

Parameter or Measuring Technique	Principal Measurement Range of Parameter	Signal Frequency Range, Hz	Standard Sensor or Method
Gastrointestinal pressure	0–100 cm H_2O	dc–10	Strain-gage manometer
Gastrointestinal forces	1–50 g	dc–1	Displacement system, LVDT
Nerve potentials	0.01–3 mV	dc–10,000	Surface or needle electrodes
Phonocardiography	Dynamic range 80 dB, threshold about 100 μPa	5–2000	Microphone
Plethysmography (volume change)	Varies with organ measured	dc–30	Displacement chamber or impedance change
Circulatory	0–30 ml	dc–30	Displacement chamber or impedance change

PARÂMETROS MÉDICOS E FISIOLÓGICOS

Table 1.1 Medical and Physiological Parameters

Parameter or Measuring Technique	Principal Measurement Range of Parameter	Signal Frequency Range, Hz	Standard Sensor or Method
Respiratory functions	0–600 liter/min	dc–40	Pneumotachograph head and differential pressure
Pneumotachography (flow rate)			
Respiratory rate	2–50 breaths/min	0.1–10	Strain gage on chest, impedance, nasal thermistor
Tidal volume	50–1000 ml/breath	0.1–10	Above methods
Temperature of body	32–40°C 90–104 °F	dc–0.1	Themistor, thermocouple

SOURCE: Revised from *Medical Engineering*. C. D. Ray (ed.). Copyright © 1974 by Year Book Medical Publishers, Inc., Chicago. Used by permission.

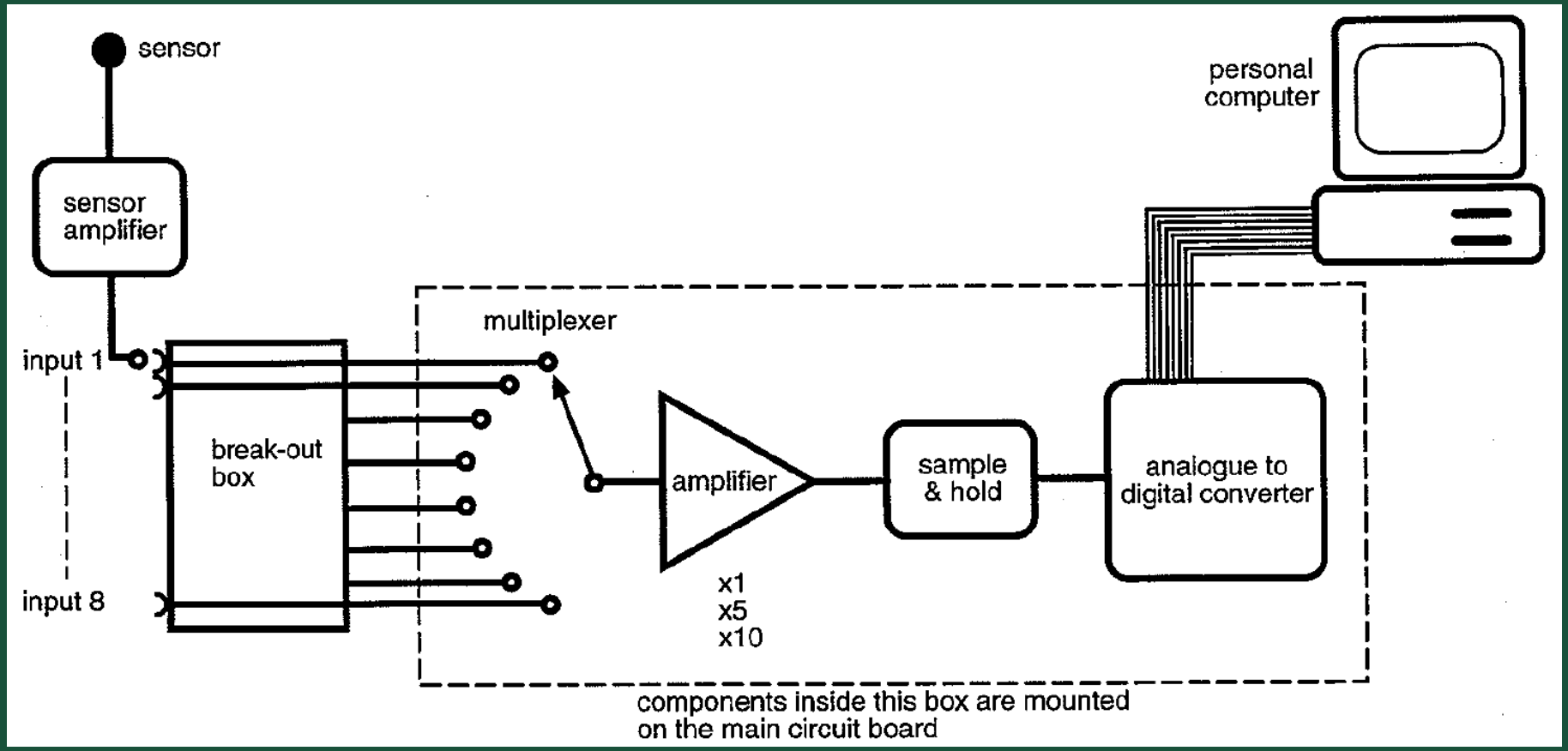
MEDIDAS NÃO INVASIVAS

MEDIDAS MINIMAMENTE INVASIVAS

MEDIDAS INVASIVAS

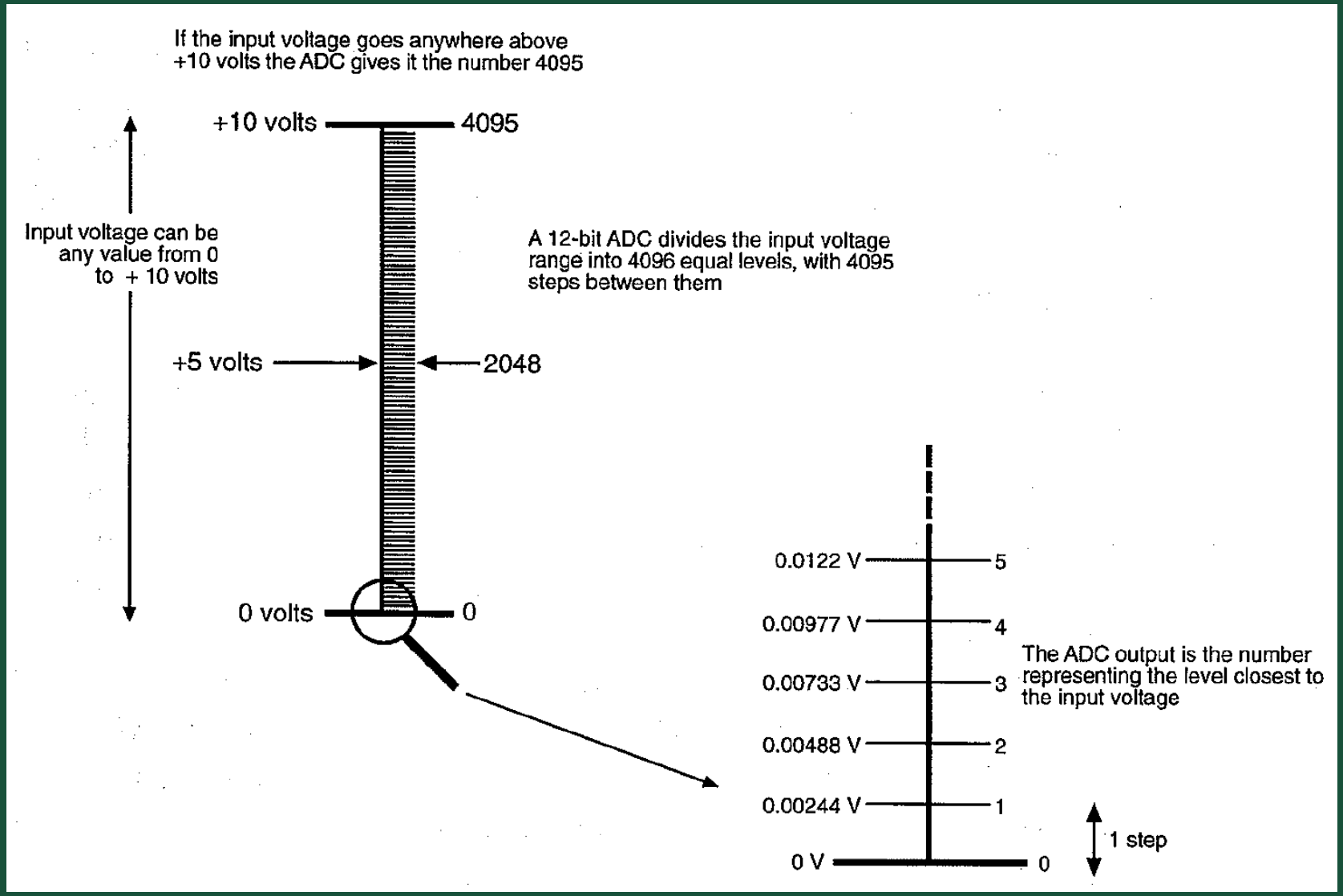
VIDEO CIRURGIA ROBÓTICA

CONVERSOR A/D



(Computerized Data Acquisition and Analysis for the Life Sciences: a hands-on guide, S. S. Young)

INTERVALO DE ENTRADA/NÚMERO DE BITS



(Computerized Data Acquisition and Analysis for the Life Sciences: a hands-on guide, S. S. Young)