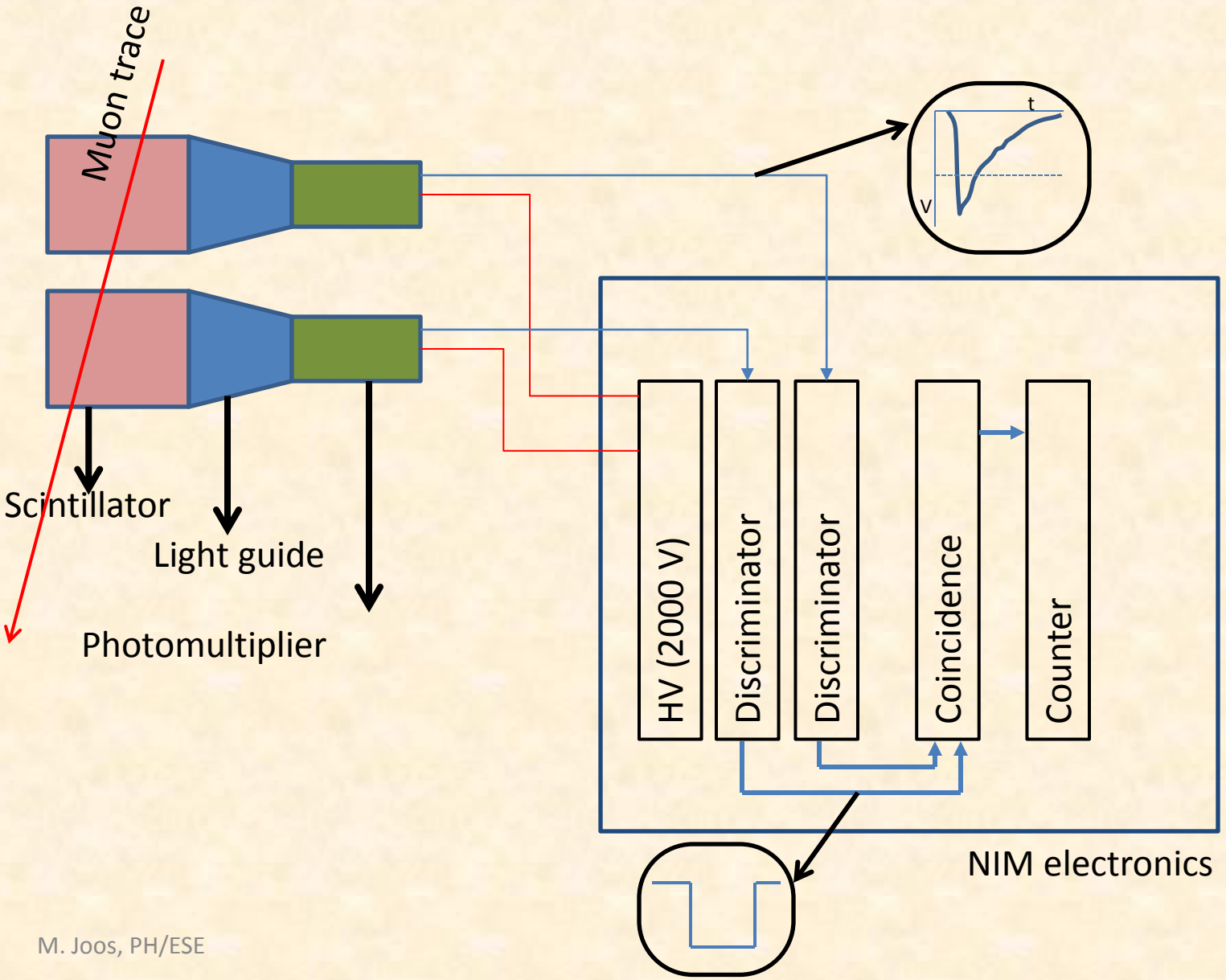
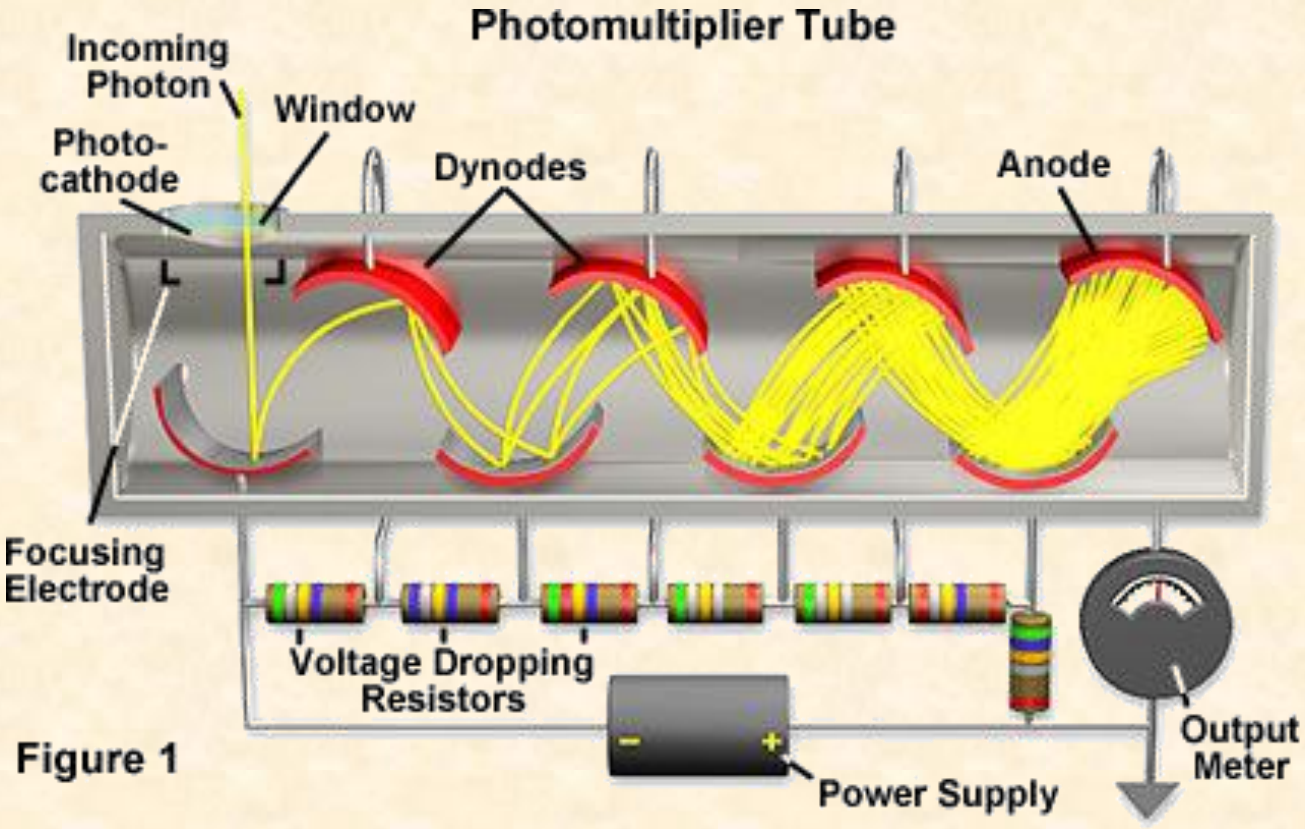
A simple Muon-Detector



Light guides

Photomultipliers



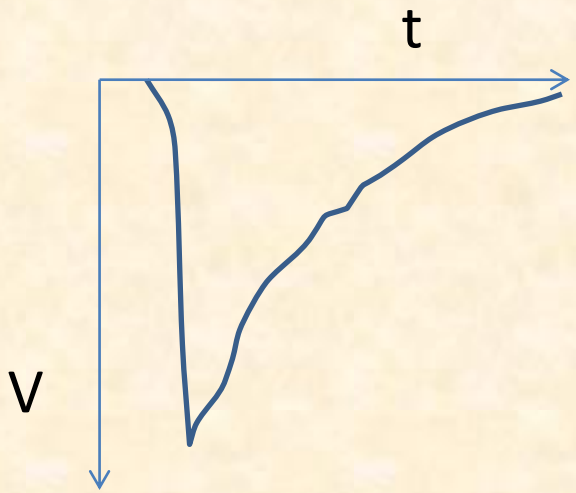
Reasons for noise:

- Thermal electrons (dark current)
- Light leaks

Computing the number of photons

$U = R * I$
$Q = I * t$

Therefore: $Q = U * t / R$
For a triangle: $Q = U * t / 2 * R$



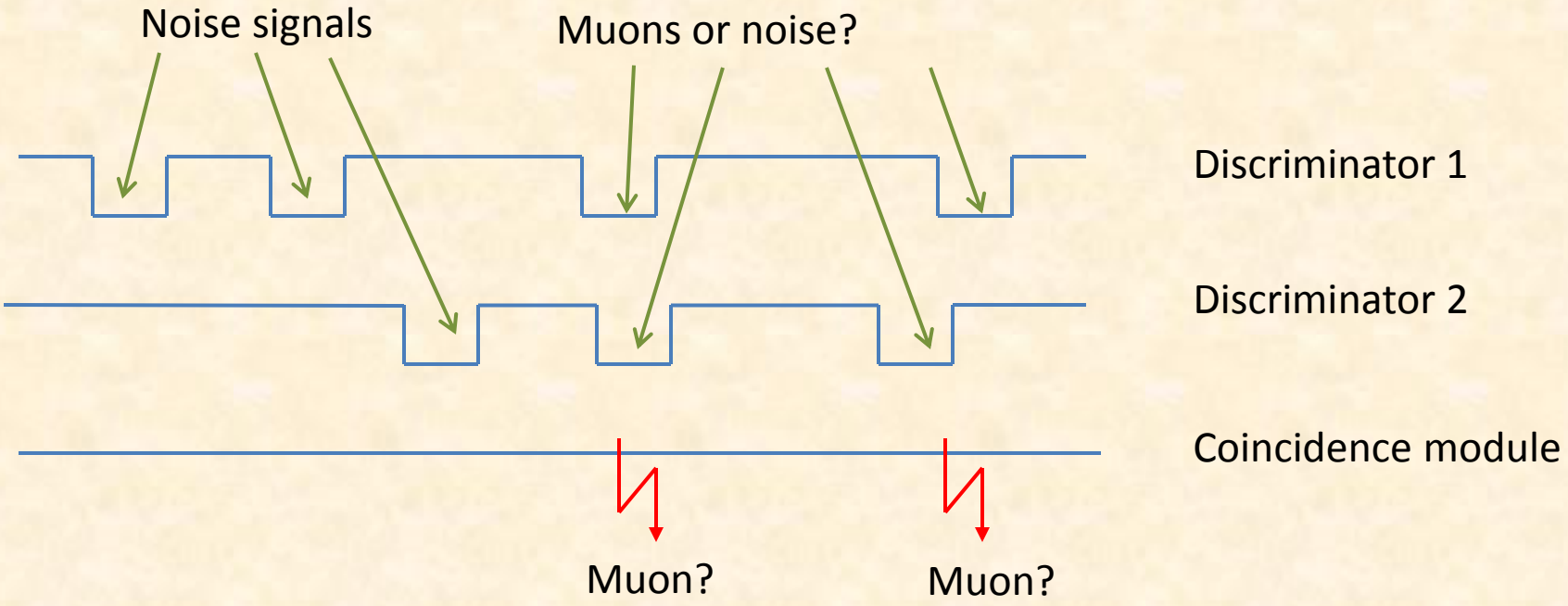
Additional parameters:
Resistance: 50 Ω
1 Coulomb = 1 As = $6.24150965 \times 10^{18}$ electrons
Electron amplification of the PMT: $V_E = 10^5$
Efficiency of the Photo-Cathode: $E_P = 0.1$

Number of photons generated by a muon crossing the scintillator:

$N_{photon} = (U * t * 6.24 * 10^{18}) / (2 * R * V_E * E_P)$
$N_{photon} = (U * t * 3.12 * 10^{14}) / R$

Sensitivity of the human eye: http://en.wikipedia.org/wiki/Rod_cell

Random Coincidence



- How likely is the overlapping of noise pulses on the two channels?
  - What parameters does the formula depend on?
  - How does the formula look like?
- How can we measure the rate of random coincidences with our set-up?

Application: Volcano-Tomography