

Biophoton Emission of Alive Objects

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Biophoton Emission of Alive Objects

- Photon emission of unknown origin mainly in the visible range and of ultra weak strength.
- All objects in vivo only
- Strength varies by 3 orders
(**Alga** → Human skin)
- Provides sensitive indicators of vitality through non invasive measurements in 1m to 30m at negligible running cost:

Why Biophotons?

Photons with unusual properties:

1. Mainly in the visible range.
2. Absence of exponential decay.
3. Sensitive to many factors.
4. Patterns in detected photons.

Biophotons are photons of quantum nature
isomorphic to “life”.

Photons of quantum nature

- Quantum framework for description expects patterns or correlation in photons detected at different locations and times.

Wave function $\Psi(r,t)$

- Classical framework finds these correlations unusual and is unable to discover a cause.
- Mode of detection: Correlation among photons detected at (\mathbf{r}_1, t_1) and (\mathbf{r}_2, t_2) or rather at regions $(\Delta \mathbf{r}_1, \Delta t_1)$ and $(\Delta \mathbf{r}_2, \Delta t_2)$.

Isomorphic to “life”

Type of
property

Identity of
bio-molecules

Correlation
among photons

Local

Intact

Incoherent

Holistic
and causal

Compromised
Coordination

Causal
Coherence

Holistic
and non-causal

Obliterated
Counter intuitive

Non-causal
Coherence

Consequences of Isomorphism

Shifting of the problem:

Living systems → Non-living photons

Change in the perspective:

Holistic properties + Remote interaction

New characteristics of living state:

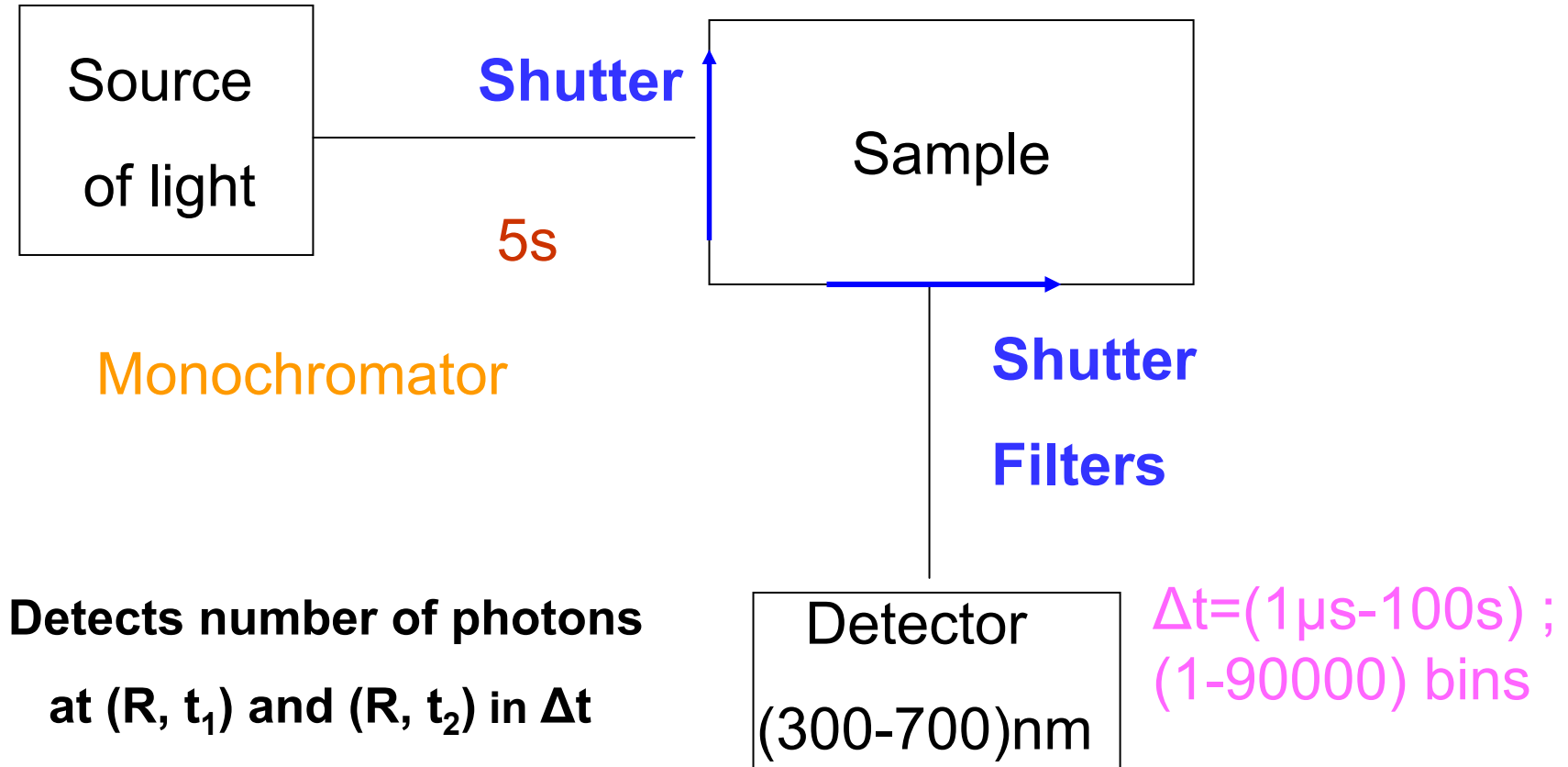
Identification and utilities

Bacteria are quantum systems floating around!

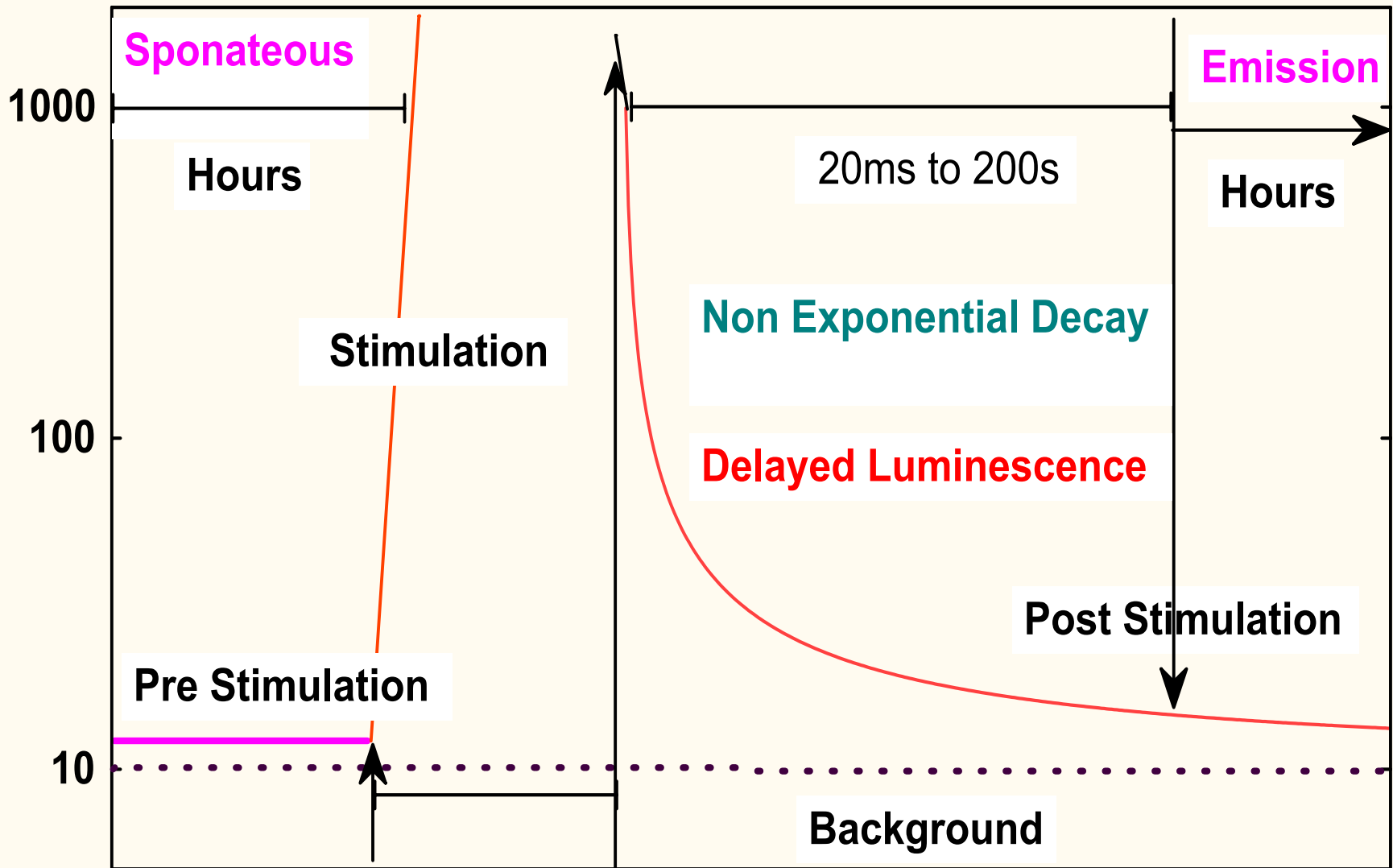
A sample of lichen is an ideal system for pedagogic studies

- Symbiotic association of an **alga** and a fungus.
(Decay \approx 200s; strength \approx 100 times)
- Very slow growth and decay
(quasi-stable system; repeatable over a month)
- Two distinct metabolic states \rightarrow dry and wet.
(Signal changes 500 \rightarrow 200000)
- Transition between two states is reversible, fast and externally controllable.
- Very cheap.

Essentials of Measuring System

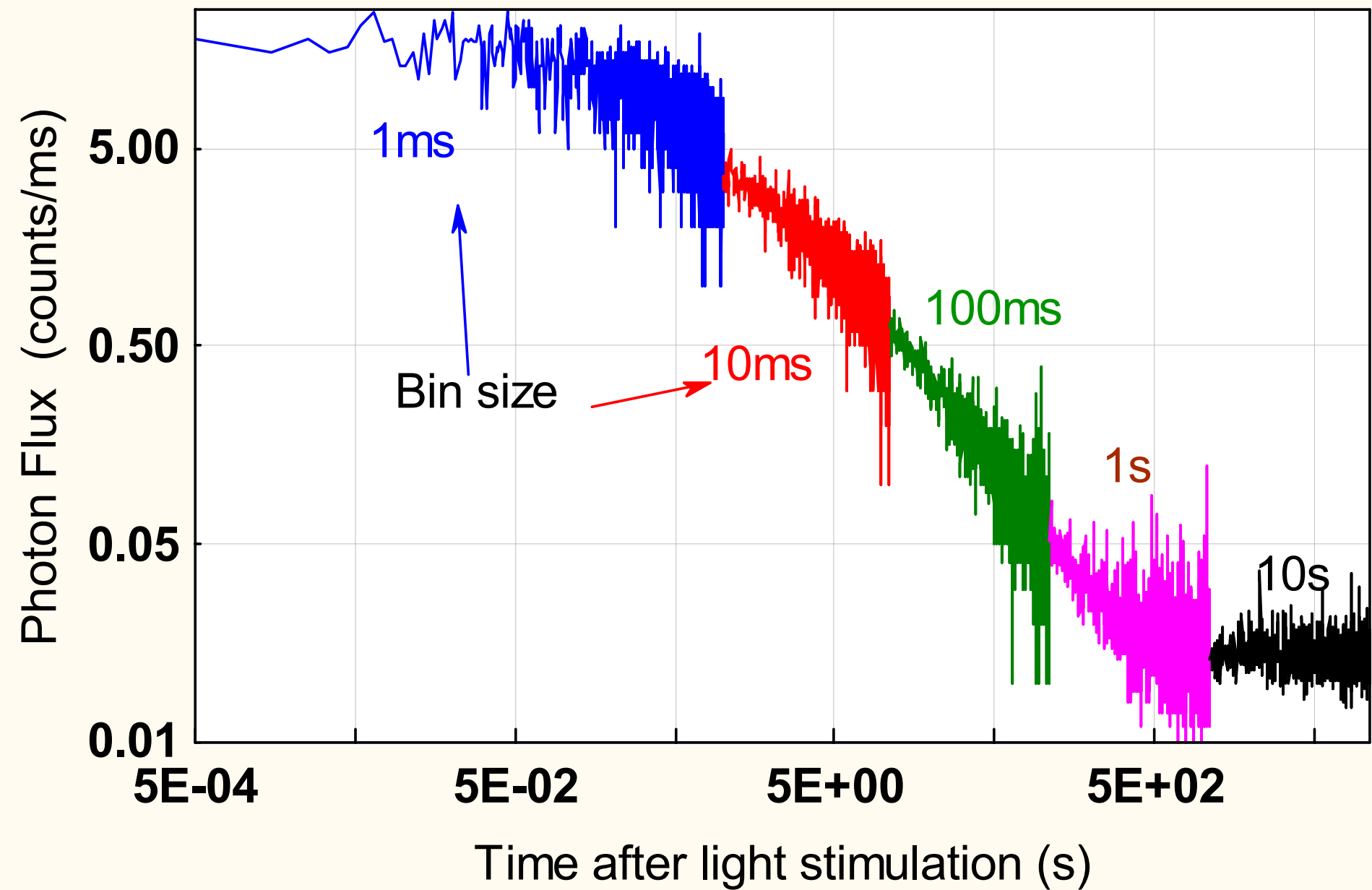


Universal shape of a biophoton signal



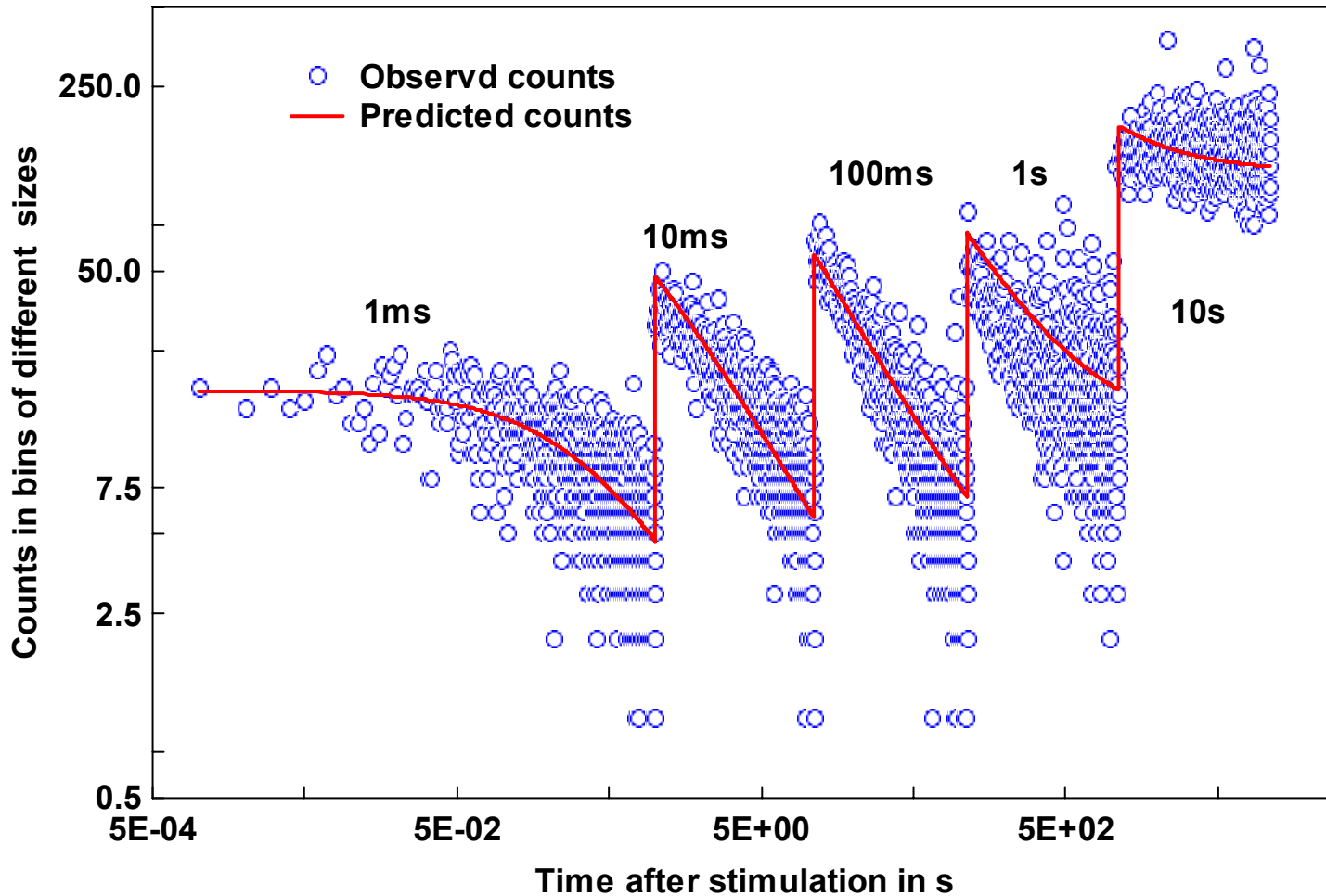
Time (Different Scales for different regions)

Light induced biophoton signal of *Parmelina.Wallichiana*
(collected 3 months earlier)



$$n(t) = B_0 + \frac{B_1}{(t + t_0)} + \frac{B_2}{(t + t_0)^2} \quad B1=6475; B2=0.02; B0=11.8; t0=0.369$$

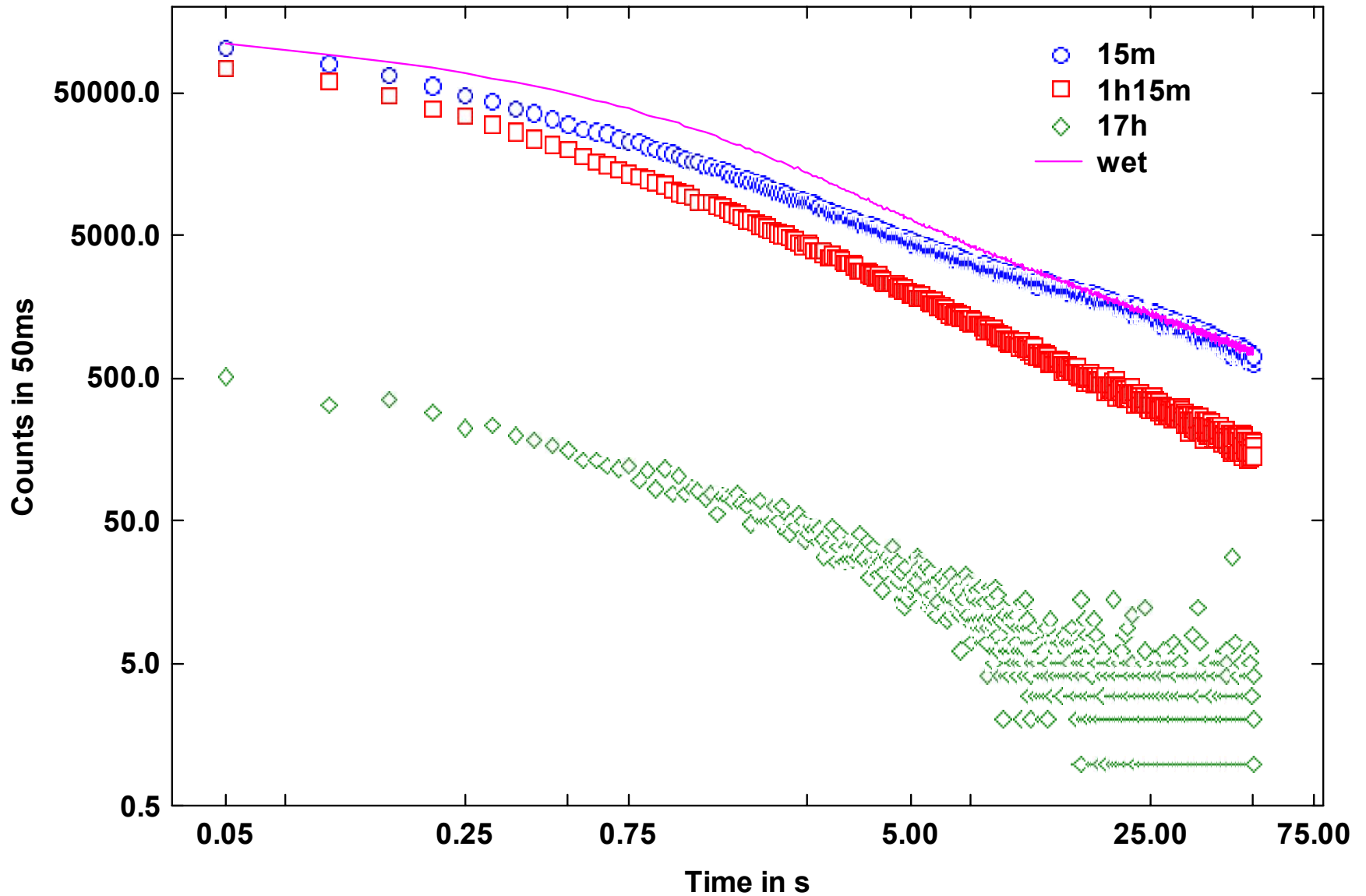
Light induced biophoton signal of *Parmelina. Wallichiana*



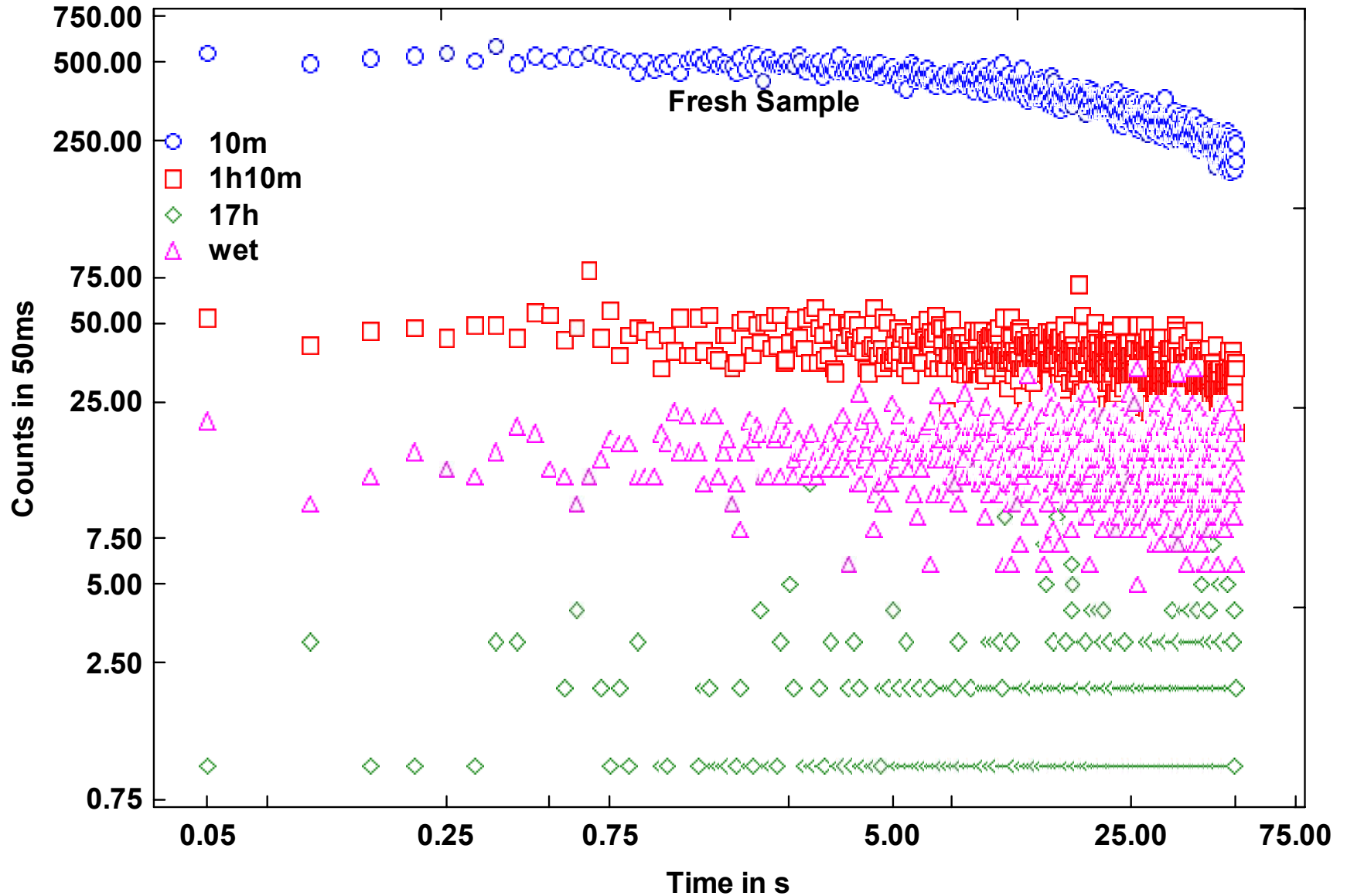
Pattern in the shape of a biophoton signal

- 4 parameters describe (10^{-3} - 10^4)s.
- Universal but restricted to living matter.
- Similar shape with different filters.
- Similar shape with different excitations.
- Sensitive to many physiological and environmental factors.
- Some additional structure.

Drying of a fresh lichen sample (delayed luminescences)



Drying of a fresh lichen sample (spontaneous emission)



Special Features of Fresh Samples

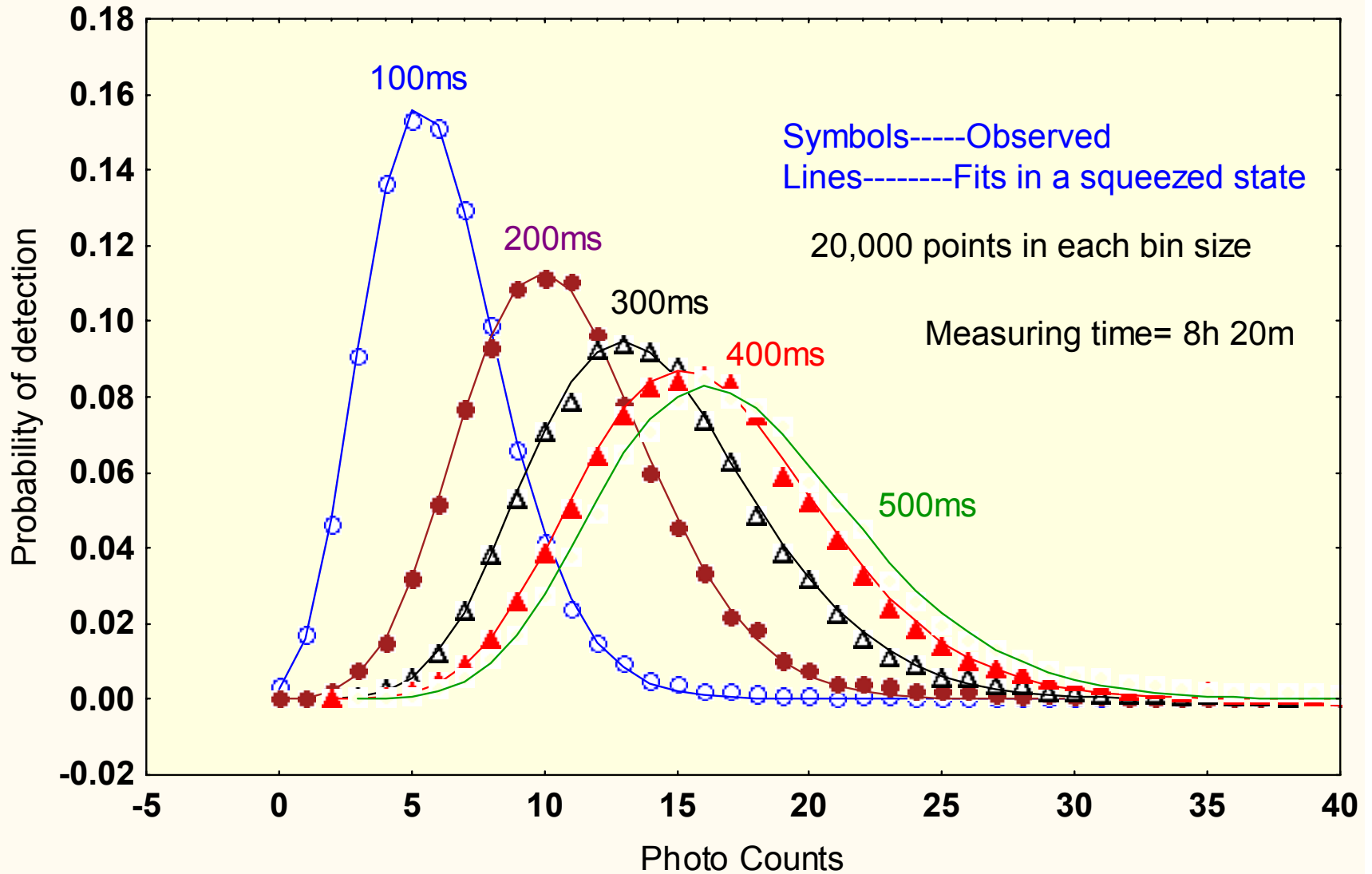
- Fresh → just detached along with substrate from the host
- Does not decay monotonically but has a point of inflection
- Non decaying value is much higher
- This behaviour lasts for nearly 2h
- Settles to monotonic decay and less non decaying value of dry and wet cycle.

Pattern in the non-decaying part

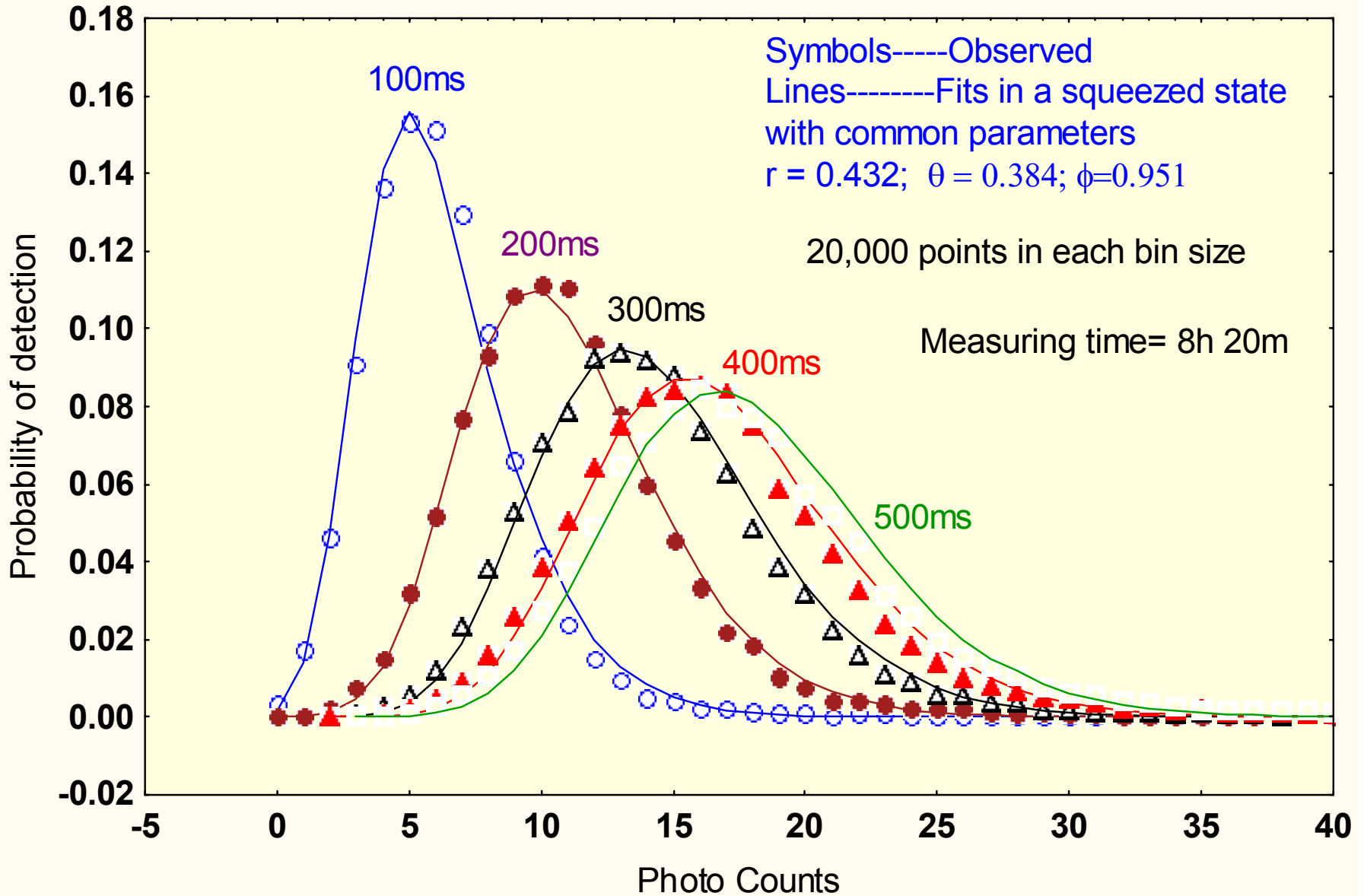
- Fluctuations in the number n of photons detected in a bin of size Δt
- Observed at all sizes of a bin
- High value of Q (=variance/mean -1).
- Random and probabilistic
- Time and frequency of detecting n photons give nearly same probabilities for every n

$$P_{\Delta t}(n) \approx P_n(\Delta t)$$

Spontaneous biophoton emission from a **Lichen** sample at 5 bin sizes
(after 4h in the dark chamber)



Spontaneous biophoton emission from a **Lichen** sample at 5 bin sizes
(after 4h in the dark chamber)



Spontaneous photon emission of human skin

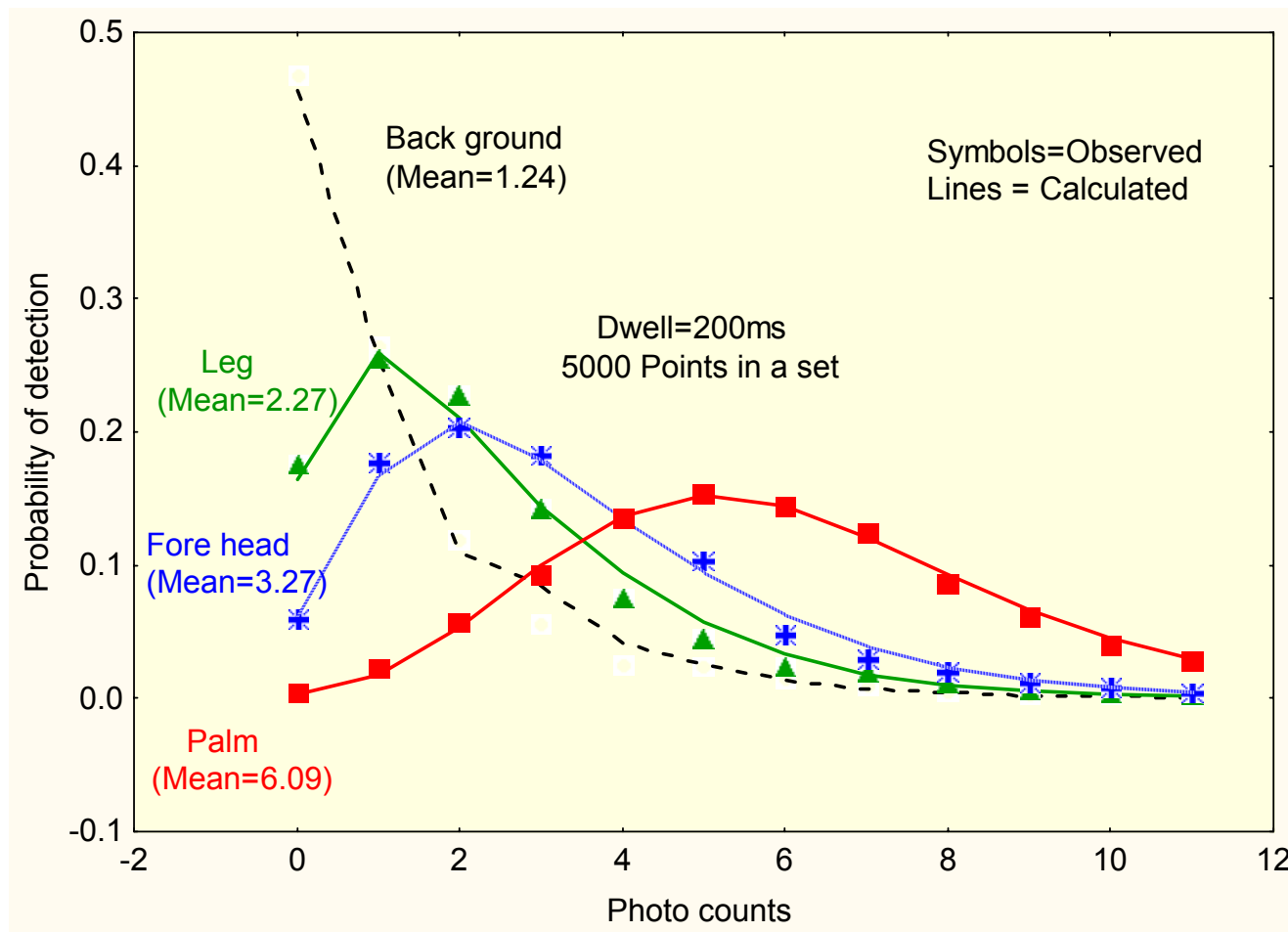
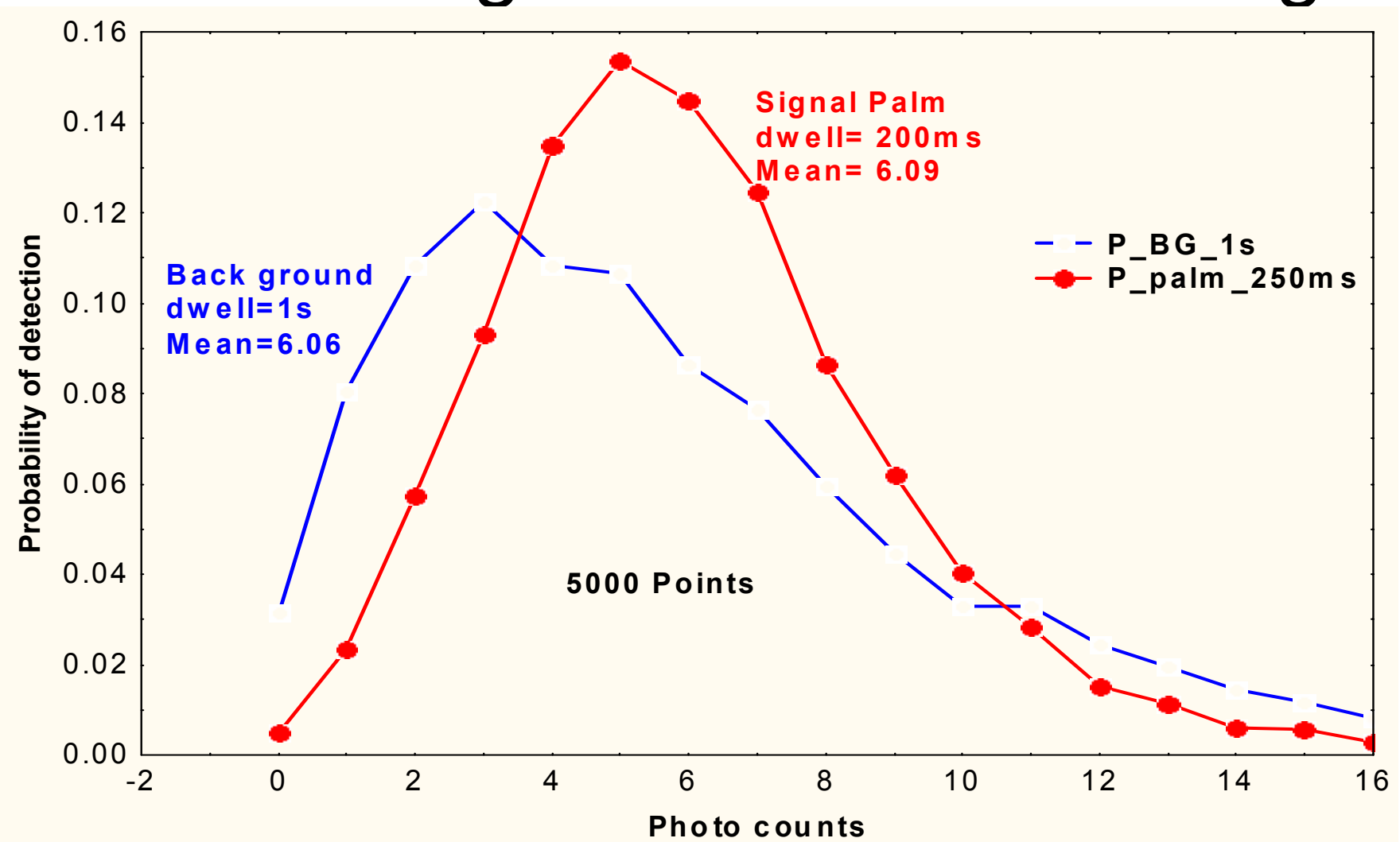


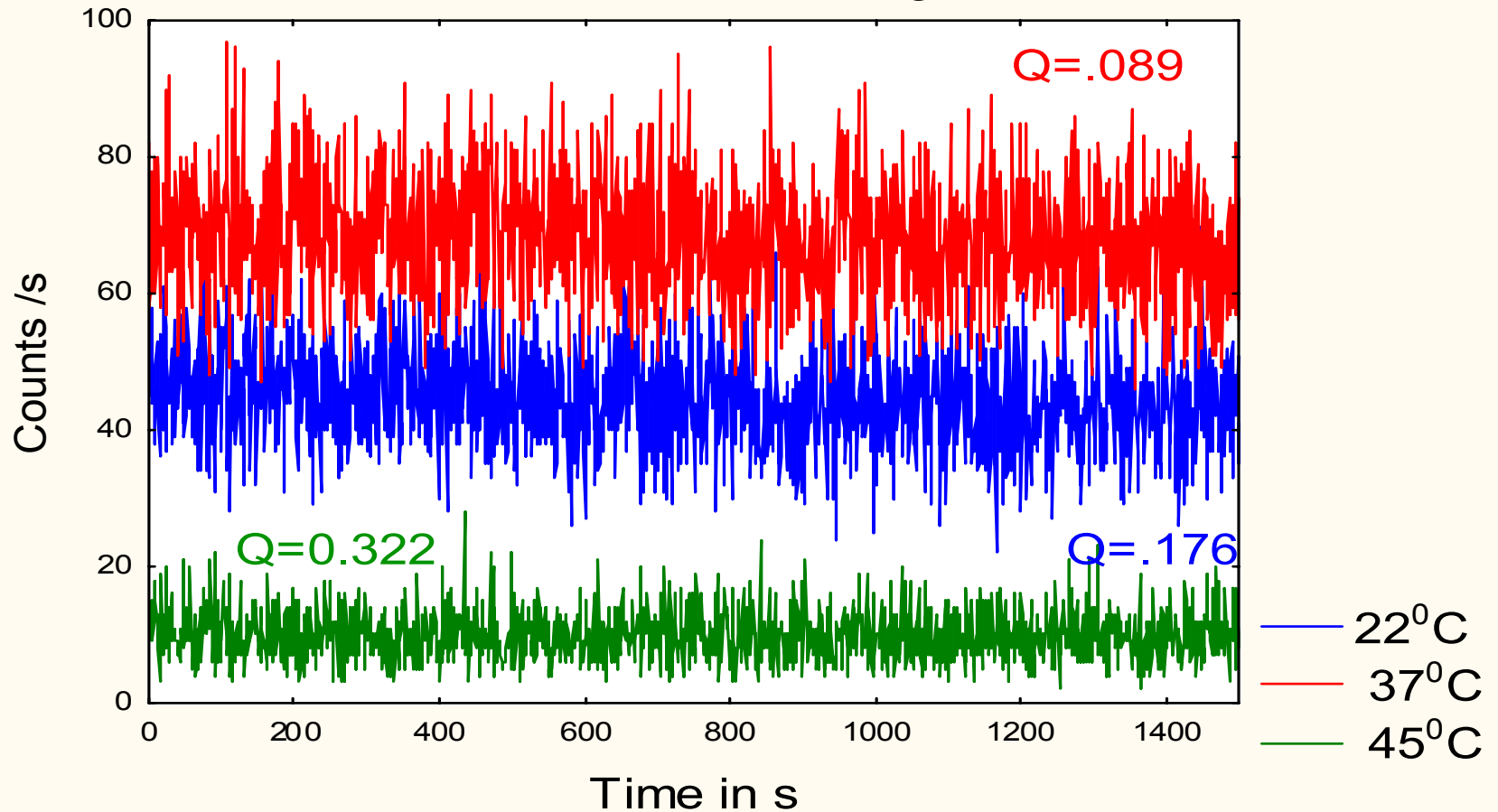
Photo count distribution in signal and background of same strength



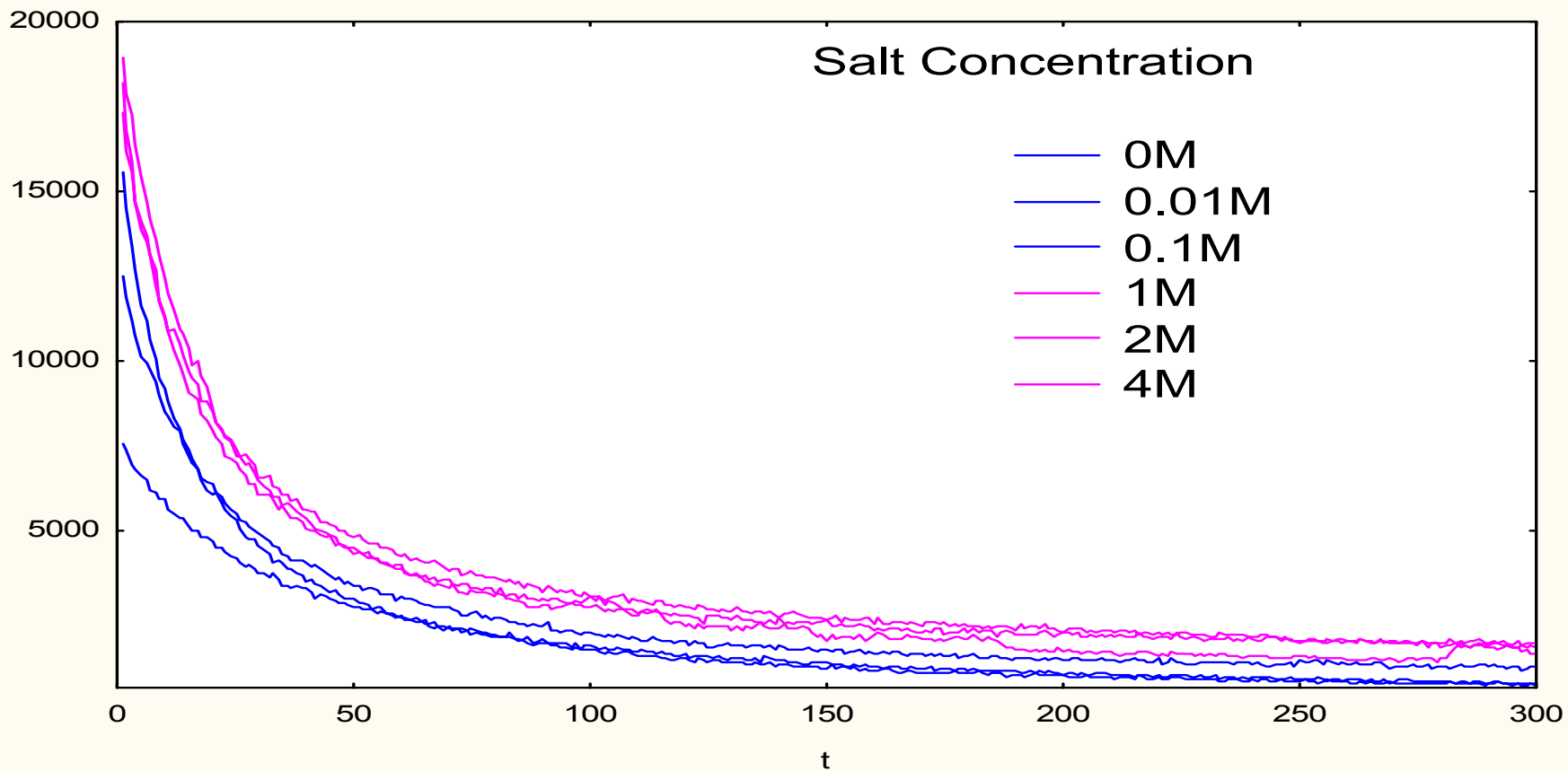
Possible Applications

- Identifies a living object and its state.
- Detects the response of a living system to any environmental stress and can grade stress and vitality.
- Storage (food, flowers , etc.), quality of food, health, germination capacity, effects of chemicals (cosmetics, pollution).
- Research(Physiology↔Genetics)

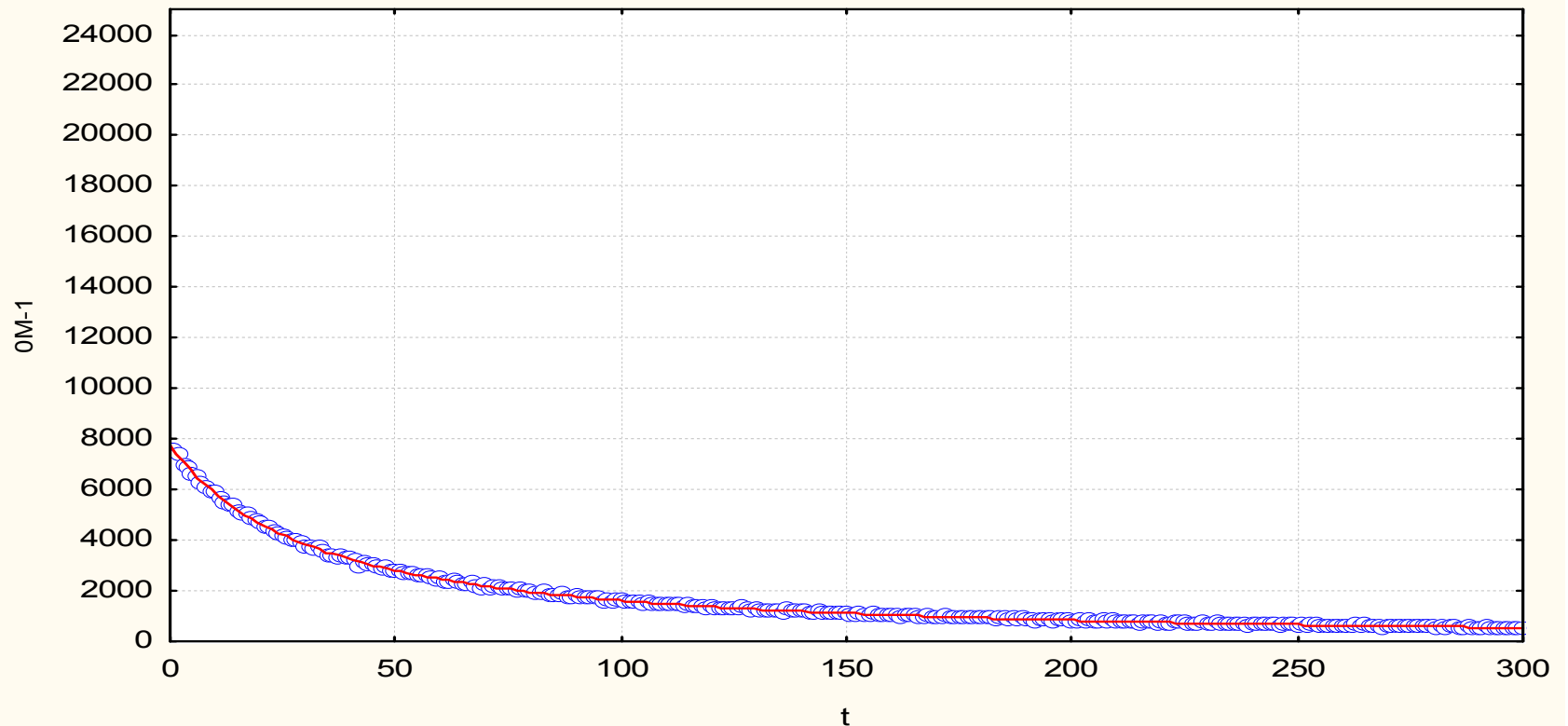
Effect of Temperature on Spontaneous Biophoton Emission in Lenthil Seedlings



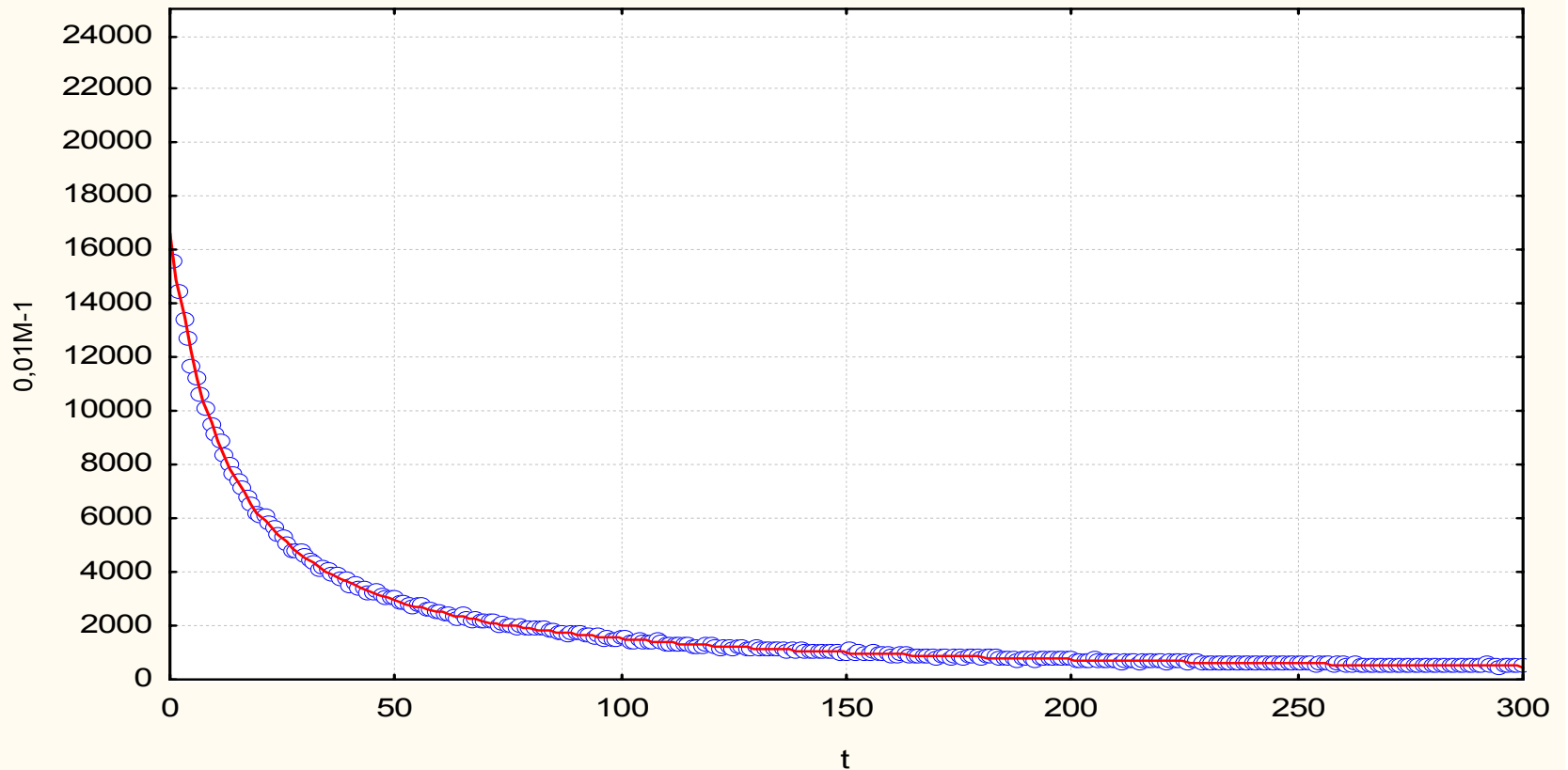
Effect of Salt Stress of 48h in Lenthil seeds



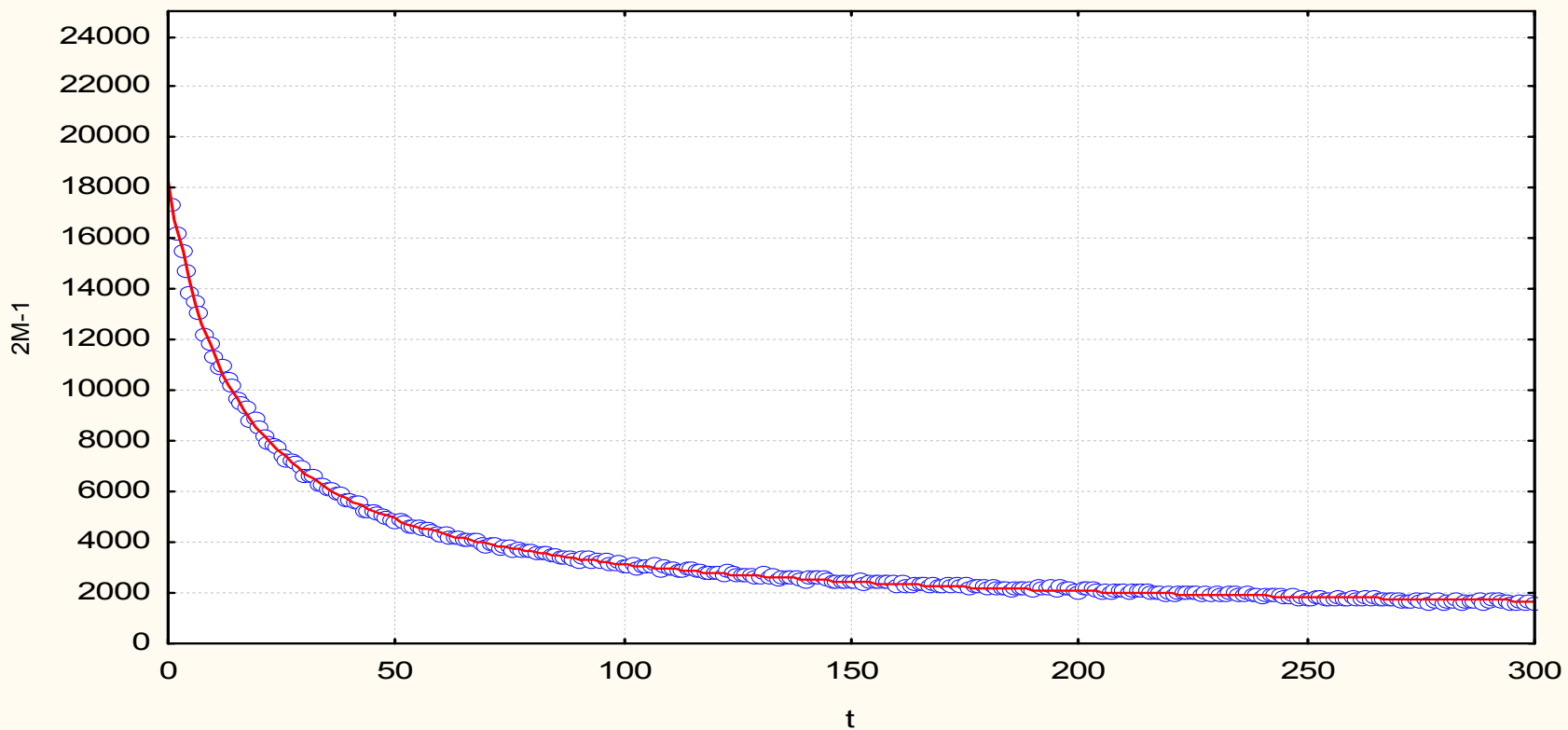
Model: $v_2 = \text{abs}(b_1) \cdot \log\left(\frac{t + \text{abs}(t_0) + 1}{t - \text{abs}(t_0)}\right) + \text{abs}(b_2) / \left(\frac{t + \text{abs}(193196)}{x + \text{abs}(-47.464) + 1} / (x + \text{abs}(-47.464))\right) + \text{abs}(87351e2) / \left(\frac{x + \text{abs}(-47.464)}{x + \text{abs}(-47.464) + 1}\right) + (-85.293)$



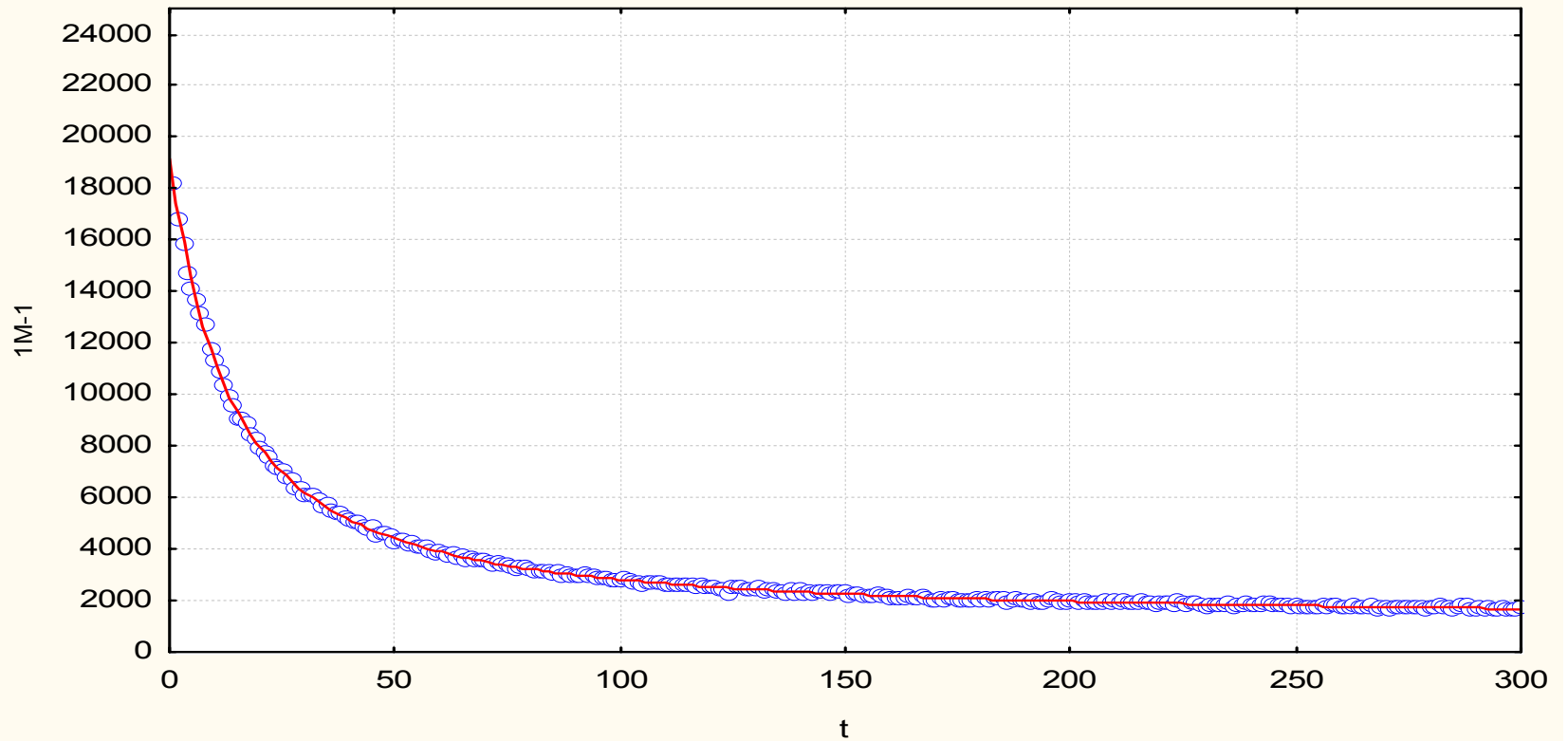
Model: $v5 = \text{abs}(b1) \cdot \log\left(\frac{t + \text{abs}(t0) + 1}{t + \text{abs}(t0)}\right) + \text{abs}(b2) / \left(\frac{t + \text{abs}(t0) + 1}{t + \text{abs}(t0)}\right)$
 $y = \text{abs}((161201.)) \cdot \log\left(\frac{x + \text{abs}((19.5768)) + 1}{x + \text{abs}((19.5768))}\right) + \text{abs}((34905e2)) / \left(\frac{x + \text{abs}((19.5768)) + 1}{x + \text{abs}((19.5768))}\right) + (-58.327)$



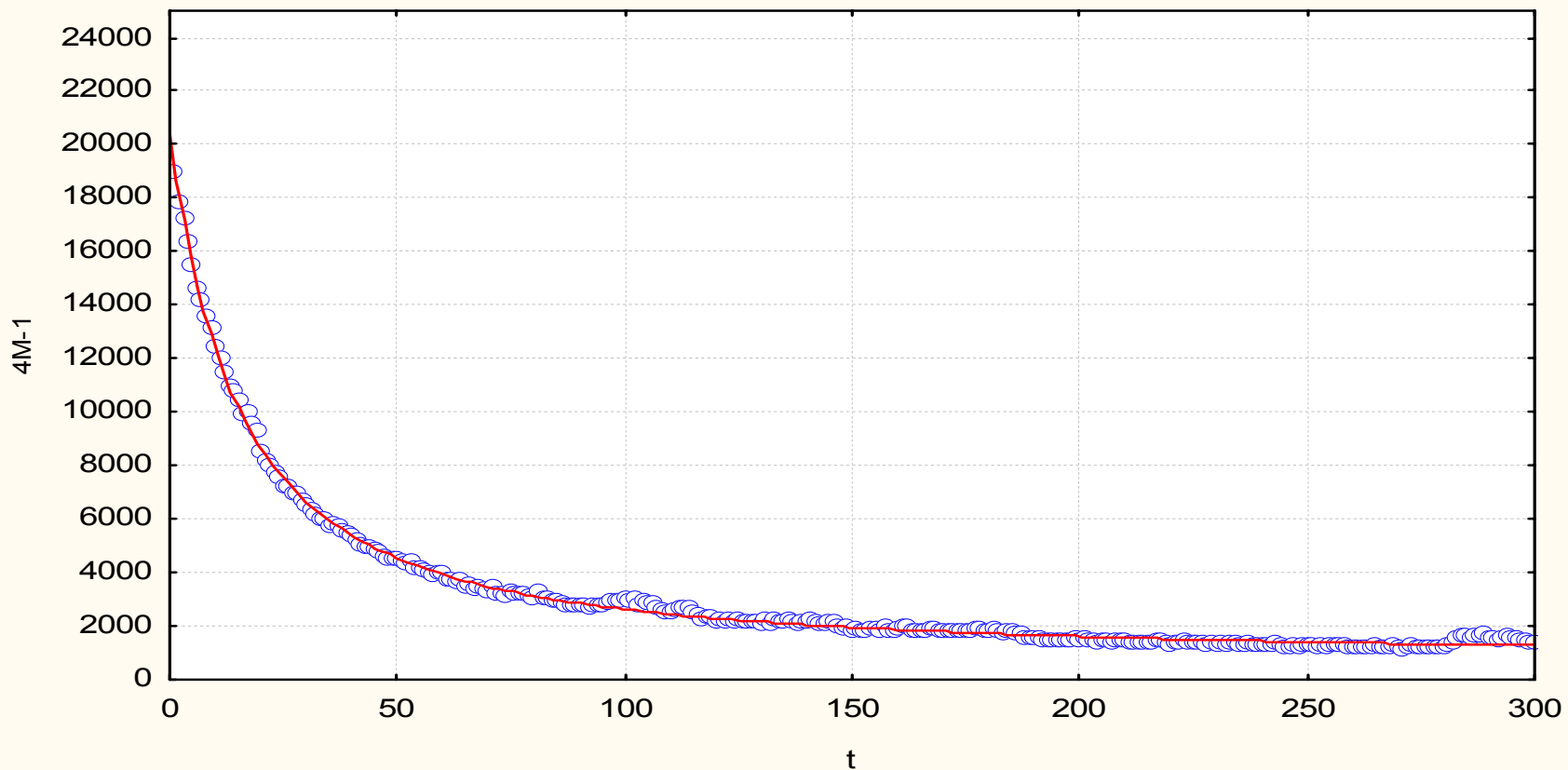
Model: $v_{14} = \text{abs}(b1) \cdot \log((t + \text{abs}(t_0)) + 1) / (t + \text{abs}(t_0)) + \text{abs}(b2) / ((t$
 $y = \text{abs}((255375.)) \cdot \log((x + \text{abs}((-20.038)) + 1) / (x + \text{abs}((-20.038)))) + \text{abs}((-2086e3)) / (($
 $x + \text{abs}((-20.038))) \cdot (x + \text{abs}((-20.038)) + 1) + (874.191)$



Model: $v_{11} = \text{abs}(b1) \cdot \log\left(\frac{t + \text{abs}(t_0) + 1}{t + \text{abs}(t_0)}\right) + \text{abs}(b2) / \left(\frac{t}{x + \text{abs}((-22.217)) + 1} / (x + \text{abs}((-22.217)))\right) + \text{abs}((-5684e3)) / \left(\frac{x + \text{abs}((-22.217))}{(x + \text{abs}((-22.217)) + 1)} + 1\right) + (1142.94)$



Model: $v_{17} = \text{abs}(b1) \cdot \log((t + \text{abs}(t_0) + 1) / (t + \text{abs}(t_0))) + \text{abs}(b2) / ((t$
 $y = \text{abs}((183472.)) \cdot \log((x + \text{abs}((-25.59)) + 1) / (x + \text{abs}((-25.59)))) + \text{abs}((86468e2)) / ((x +$
 $\text{abs}((-25.59))) \cdot (x + \text{abs}((-25.59)) + 1)) + (630.964)$



Some practical tips

- A quantum state changes abruptly.
- The characteristics respond differently.
- The effect of a factor is measurable in many ways.
- Delayed luminescence is suitable for fast response.
- Spontaneous emission for identification of stable systems.

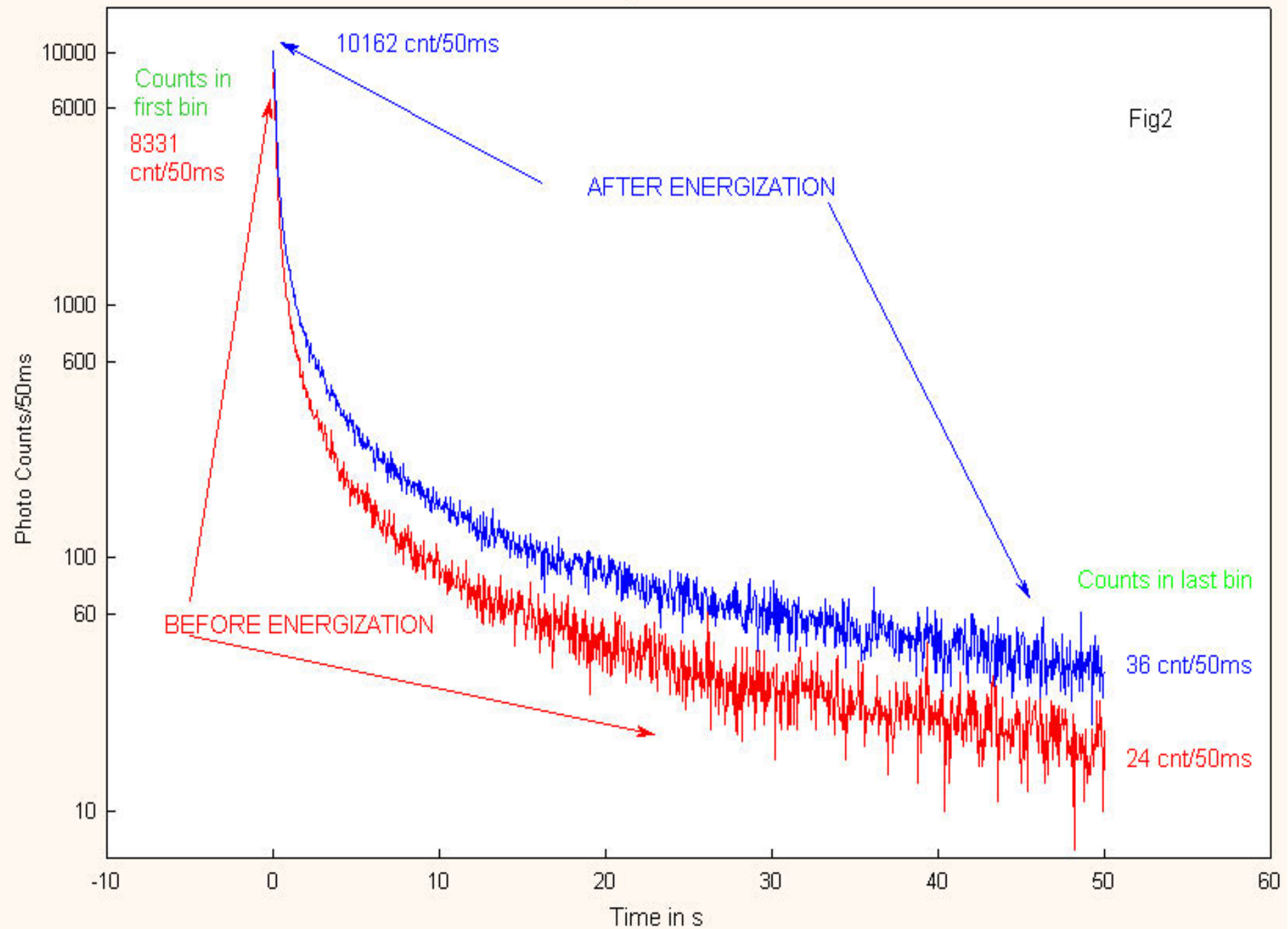
Lichen- a sensor of minute effects

- Remote influence by healers (4 cases)
 1. Shape of the decay is changed
 2. Higher strength of non decaying portion
 3. Q value is increased.
 4. B_1/B_2 is increased.
 5. Magnitude of squeezing is increased.

Both dry and wet states → Fresh state

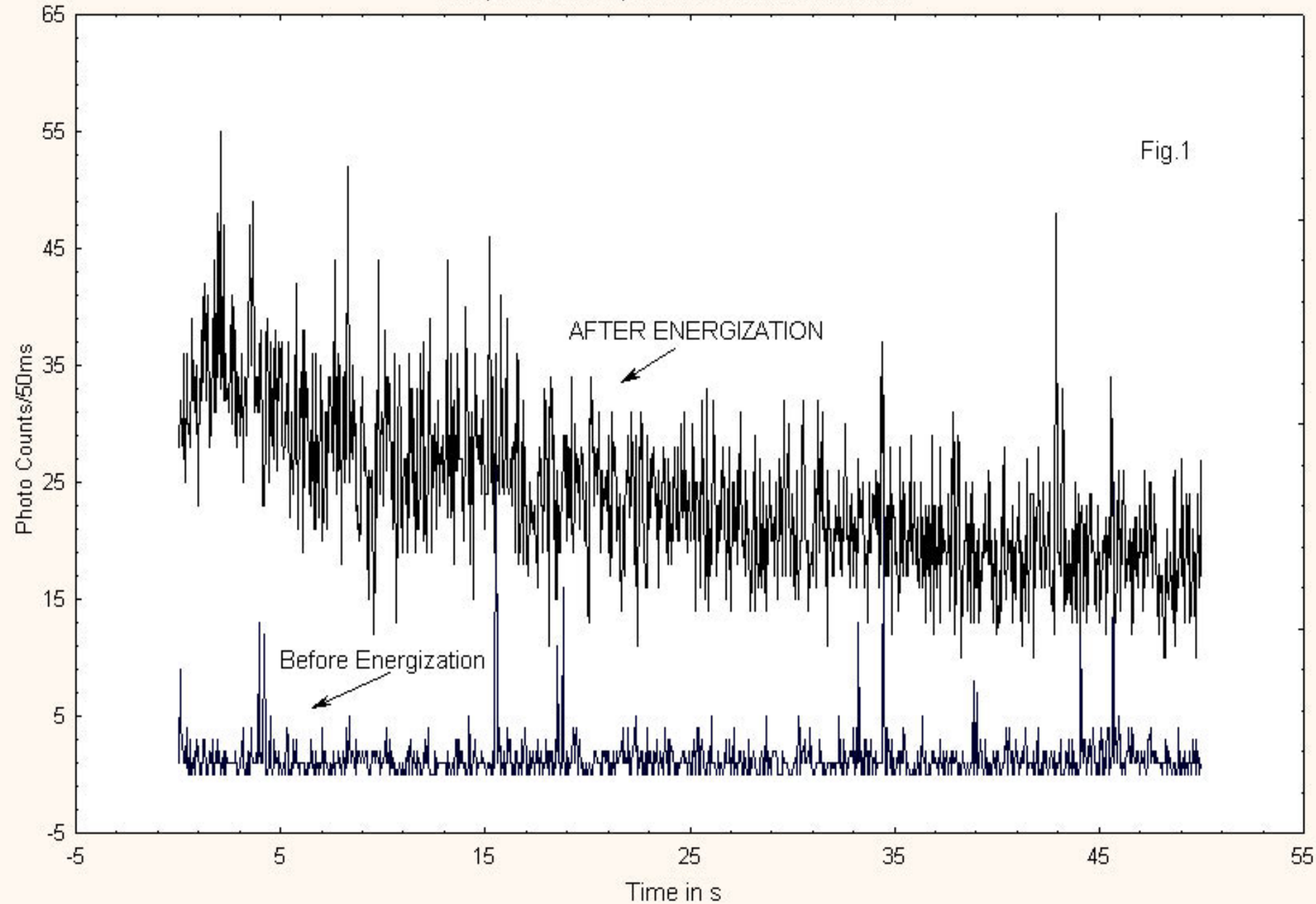
Stimulated Emission I in a sample of lichen Parmelinella.Wallichiana

Fig2



Background or Spontaneous Emission 2m after the placement
Sample of Lichen species *Parmelinella wallichiana*

Fig.1



Outlook and perspectives

- There is need to demonstrate the quantum nature of biophoton signals in different systems by measuring their unusual features.
- A quantum signal emanates from quantum objects. The objects and mechanism are to be discovered.
- The parameters of biophoton signals can identify vital systems and grade their vitality even without the knowledge of source and mechanism of emission.

Thank You