Optimizing Data Acquisition

Robert I. Price

Osher Lifelong Learning Institute

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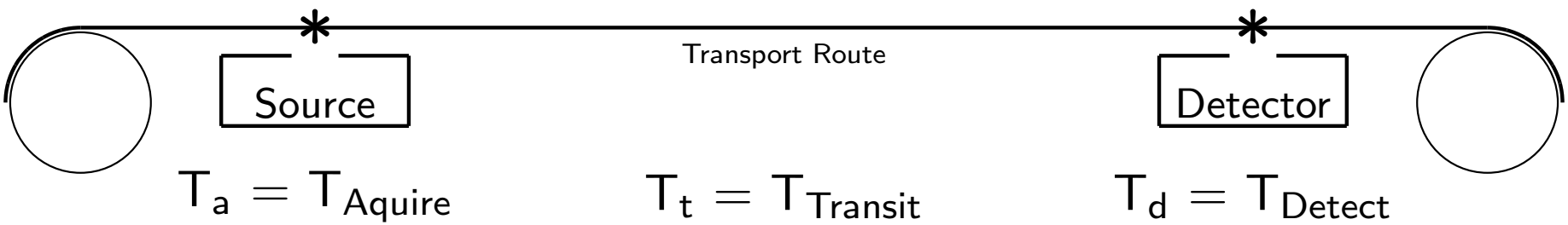
The Setup : To monitor $_{98}Cf^{252}$ fission fragments

and, as I learned 40 years later, radioactivity of the Dust in the Air.



The Standard $\cdots$ as described prior to 1975(6)

$$A_{\max} = A_{\infty}\left(1 - e^{-\lambda t}\right) \ , \ 0 \leq t \leq T_a \tag{1}$$

$$A_{\text{delivered}} = A_{\max}\left(e^{-\lambda t}\right) \ , \ 0 \leq t \leq T_t \tag{2}$$

$$N_{\text{Detected}} = \mathcal{G} \times \mathcal{E} \times A_{\text{delivered}} \frac{1}{\lambda}\left(1 - e^{-\lambda t}\right) \ , \ 0 \leq t \leq T_d \tag{3}$$

Set $T_d = T_a$ and notice that T_t is "constant" :

$$N_{\text{Detected}} = [C]\left(1 - e^{-\lambda t}\right)^2 \ , \ 0 \leq t \leq T_{\text{dwell}}$$

The Standard $\cdots$ continued

Figure 1 : Activity and Detection vs. Dwell Time (Mean-Lives)

The Conflict

$$N_{\text{Detected}} = [\ \mathscr{C}\ ]\left(1 - e^{-\lambda t}\right)^2 \times \left(\frac{1}{t}\right) \tag{4}$$

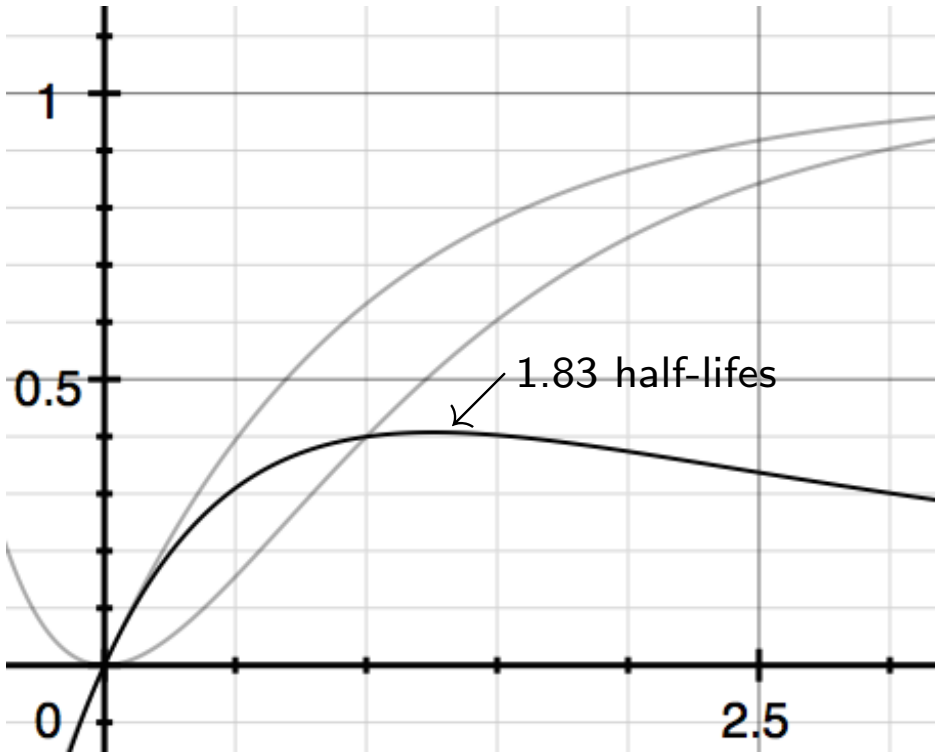


Figure 2 : Multiple Detection Cycles ($1.25^{+} \ll 5$)

The Conflict $\cdots$ continued

I brought this to Dr. Roy and John.

Much discussion ensued $\cdots$

"Go to the lab and get some data."

The Adjustment

Original Context

Determining the optimal dwell time defines the isotope's lifetime.

"Corrected" Context

Referenced an article that detailed how knowing the isotope's lifetime defined the optimal dwell time.

Potential Payoff

Referenced an article that may have contributed to the article being published.