Supporting Information

Rollins et al. 10.1073/pnas.1408071112

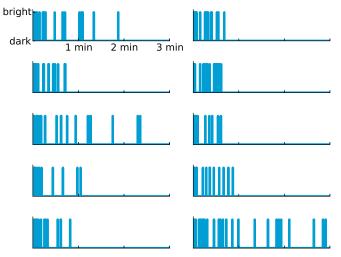


Fig. S1. Simulated time traces for a collection of PA-FPs. Sample traces from Gillespie simulations with parameters: N=5 and rates from data set 1.

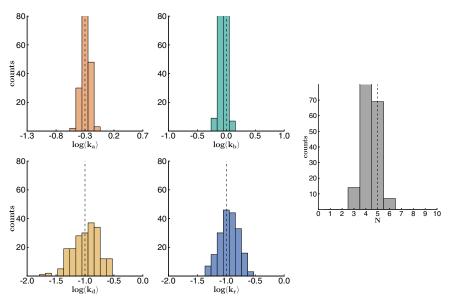


Fig. 52. Histogram of bootstrapping results from simulated data set 3. Histogram of bootstrapping results from simulated data set 3 with 200 traces (200 bootstrap iterations). The theoretically expected results are shown in the dotted line.

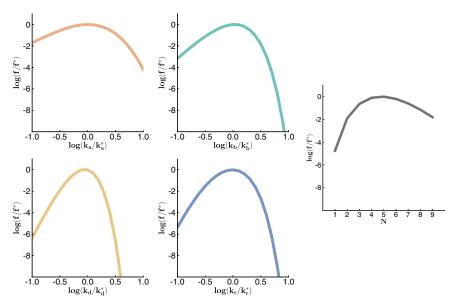


Fig. S3. One-dimensional slices through the likelihood function of simulated data set 1. In each panel, one parameter is varied while the other parameters are held at their true values. We find the likelihood is maximized at the true parameter values.

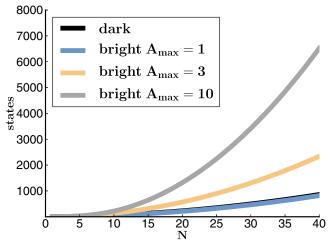


Fig. S4. Growth of state space with number of PA-FPs. As the number of PA-FPs increases, the number of macrostates grows exponentially. We tune the growth rate by setting A_{max}, the number of PA-FPs that we allow to be simultaneously active.

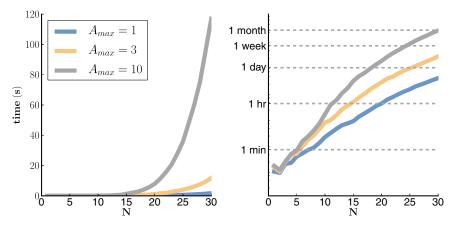


Fig. S5. Algorithm time scaling. (Left) Computation time for a single matrix exponential calculation. (Right) Estimated time for full likelihood maximization.

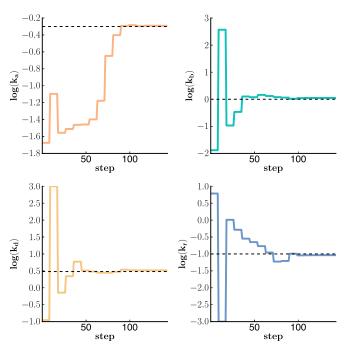


Fig. S6. Convergence of likelihood maximization of data set 1. Convergence of likelihood maximization of data set 1. The maximization converges close to true the parameter values. The parameters are estimated from the results of many independent maximization runs, like the one depicted here. In these runs, N=5. Similar plots can be generated for the other data sets.

Macrostate	{ <i>I</i> , <i>A</i> , <i>D</i> , <i>B</i> }	Aggregated class
s ₁	{2,0,0,0}	Dark
s ₂	{ 0,0,2,0 }	Dark
S 3	{0,0,0,2}	Dark
S4	{ 1,0,1,0 }	Dark
S 5	{ 1,0,0,1 }	Dark
s ₆	{ 0,0,1,1 }	Dark
\$ ₇	{ 0,2,0,0 }	Bright
S ₈	{ 1,1,0,0 }	Bright
Sg	{0,1,1,0}	Bright
s ₁₀	{0,1,0,1}	Bright

Table S1. Macrostates for a collection with N = 2 PA-FPs

Macrostates for a collection with N = 2 PA-FPs.

Table S2. Kinetic rates of a collection of PA-FPs

Transition type	Change in population	$\text{Rate } s_i \to s_j$
Activate	{ -1, +1,0,0 }	$N_{l,i}k_a(t)$
Blink	$\{0, -1, +1, 0\}$	N _{A,i} k _d
Recover	$\{0, +1, -1, 0\}$	N _{D,i} k _r
Photobleach	{0, -1,0, +1}	$N_{A,i}k_b$

Kinetic rates of a collection of PA-FPs.