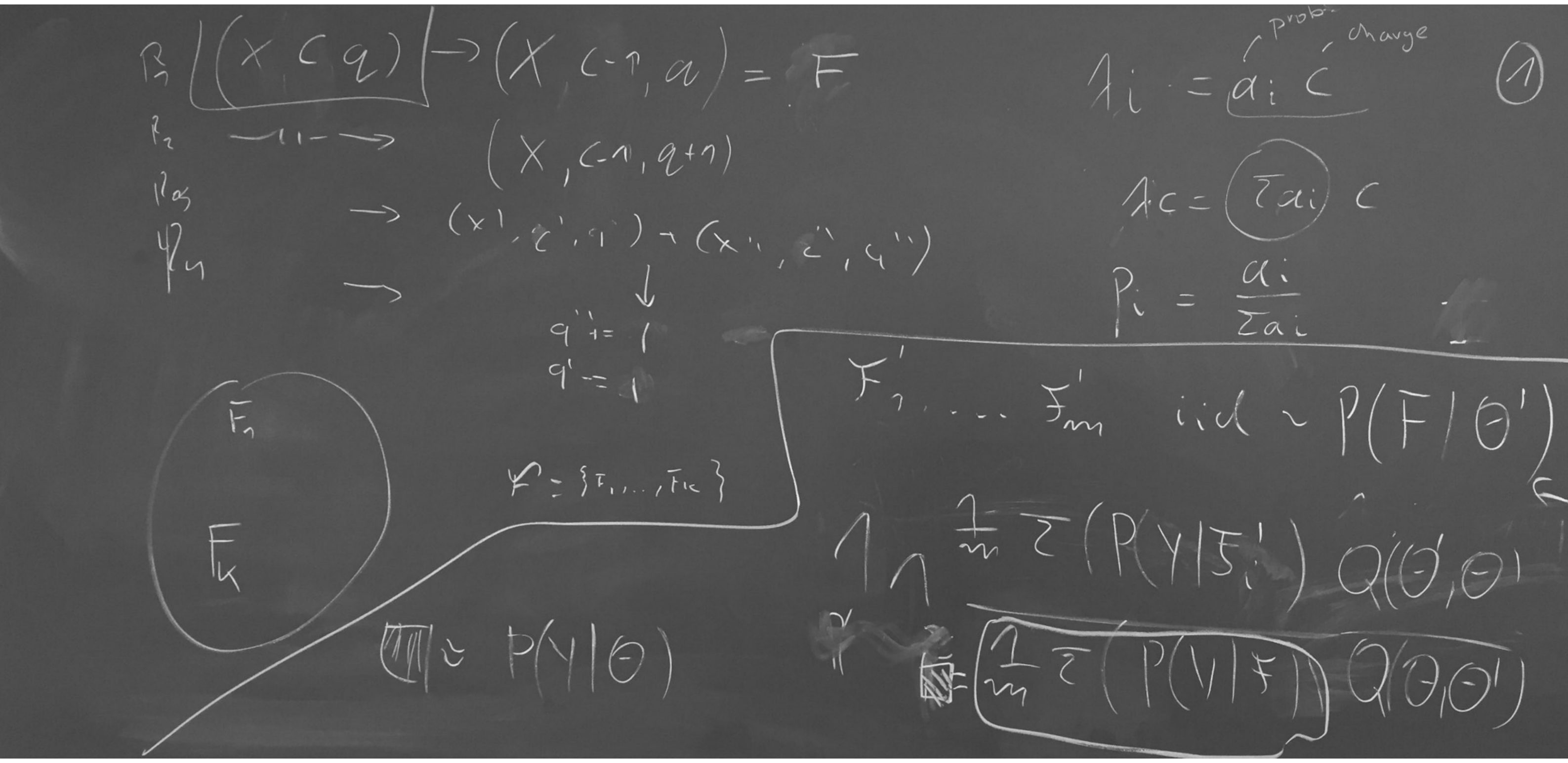


R_1 $\boxed{(X, c, q)} \to (X, c-1, a) = F$

R_2 —"— $\to$ $(X, c-1, q+1)$

R_{25} $\to$ $(x', c', q') \to (x'', c'', q'')$

R_{41} $\to$

$\downarrow$

$q'' += 1$

$q' -= 1$

F_1

F_k

$\mathcal{F} = \{F_1, \dots, F_k\}$

▨ $\approx P(Y|\Theta)$

prob. charge

$\lambda_i = \underline{a_i\, c}$

①

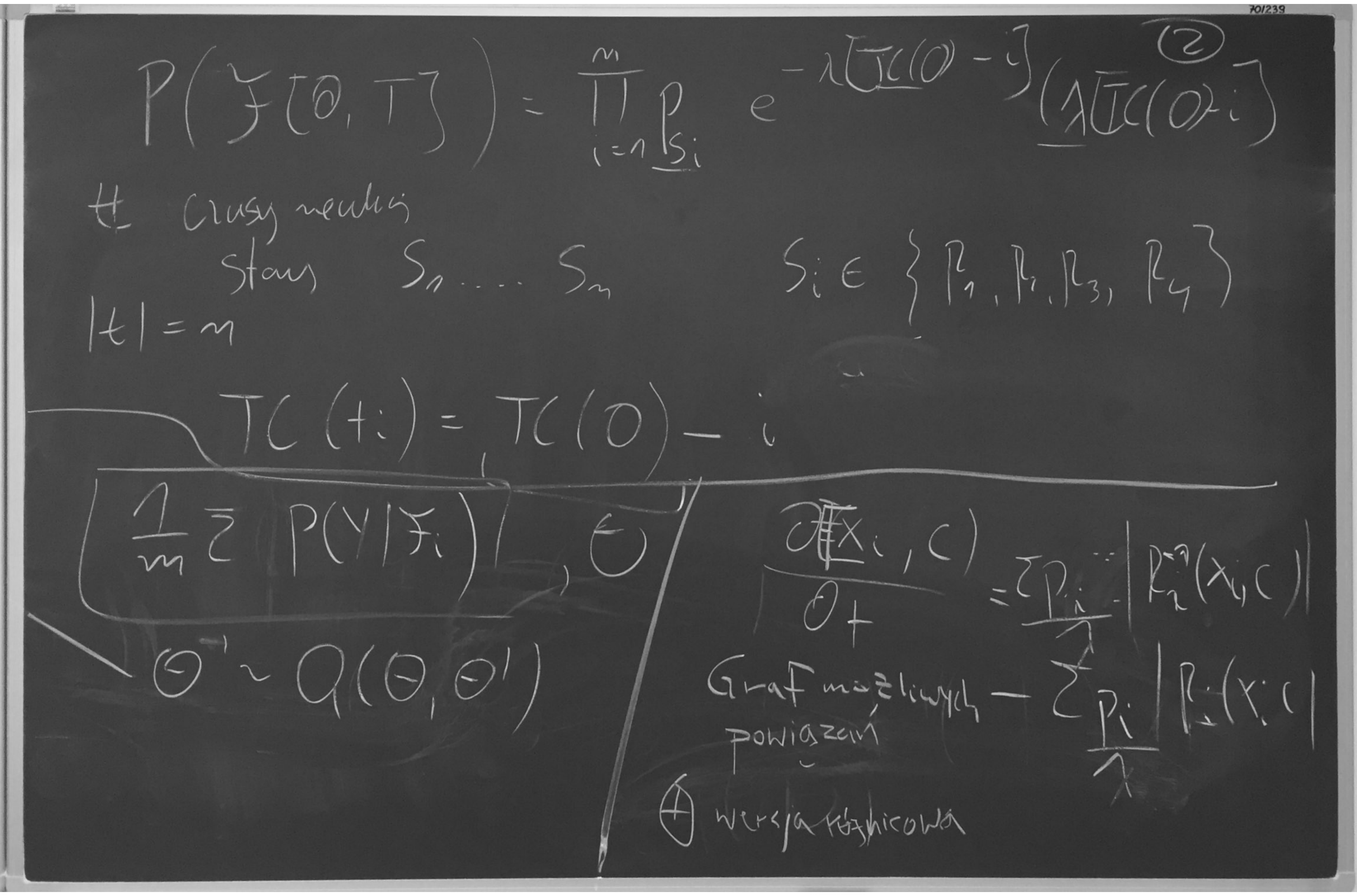
$\lambda c = \boxed{\sum a_i}\, c$

$p_i = \frac{a_i}{\sum a_i}$

$F'_1, \dots, F'_m$ iid $\sim P(F|\Theta')$

$\uparrow \uparrow \frac{1}{m} \sum \left(P(Y|F'_i)\right) Q(\Theta, \Theta')$

▨ $= \boxed{\frac{1}{m} \sum \left(P(Y|F)\right)}\, Q(\Theta, \Theta')$



$$P(\mathcal{F}[0,T]) = \prod_{i=1}^{m} P_{S_i} \, e^{-\lambda[TC(0)-i]} \left(\lambda[TC(0)-i]\right)$$ ②

t_i czasy mutacji

stany $S_1 \ldots S_m$ $S_i \in \{P_1, P_2, P_3, P_4\}$

$|t| = m$

$$TC(t_i) = TC(0) - i$$

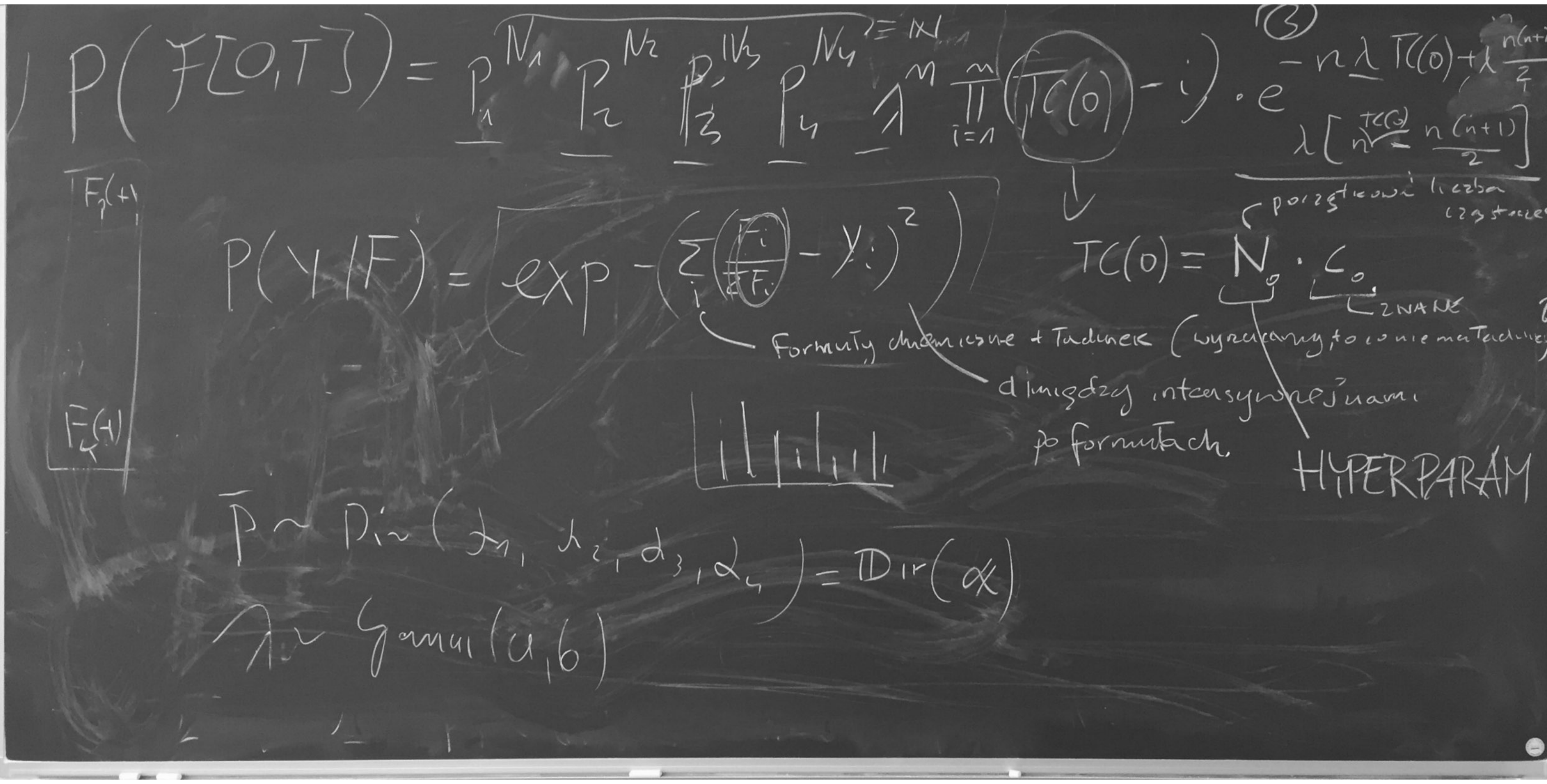
$$\frac{1}{m} \sum P(Y|\mathcal{F}_i) \; , \Theta$$

$$\Theta' \sim Q(\Theta, \Theta')$$

$$\frac{\partial E(x_i, c)}{\theta_t} = \sum \frac{P_i}{\lambda} \left| P_i^{-1}(x_i, c) \right|$$

Graf możliwych powiązań — $\sum \frac{P_i}{\lambda} \left| P_i(x_i, c) \right|$

⊕ wersja różnicowa



$$P(\mathcal{F}[0,T]) = \underline{p_1}^{N_1}\,\underline{p_2}^{N_2}\,\underline{p_3}^{N_3}\,\underline{p_4}^{N_4}\;\underline{\lambda}^{n}\prod_{i=1}^{n}\left(\boxed{TC(0)} - i\right)\cdot e^{-n\underline{\lambda}\,TC(0)+\lambda\frac{n(n+1)}{2}}$$

$\Sigma = N$

③

$$\lambda\left[n^{TC(0)} - \frac{n(n+1)}{2}\right]$$

$F_1(t)$

$F_4(t)$

$$P(Y|F) = \exp -\left(\sum_i \left(\frac{F_i}{\Sigma F_i} - y_i\right)^2\right)$$

Formuły chemiczne + ładunek (wyrażany, to co nie ma ładunku)

d l między intensywnościami po formułach.

$$TC(0) = \underbrace{N_0}\cdot \underline{c_0}$$

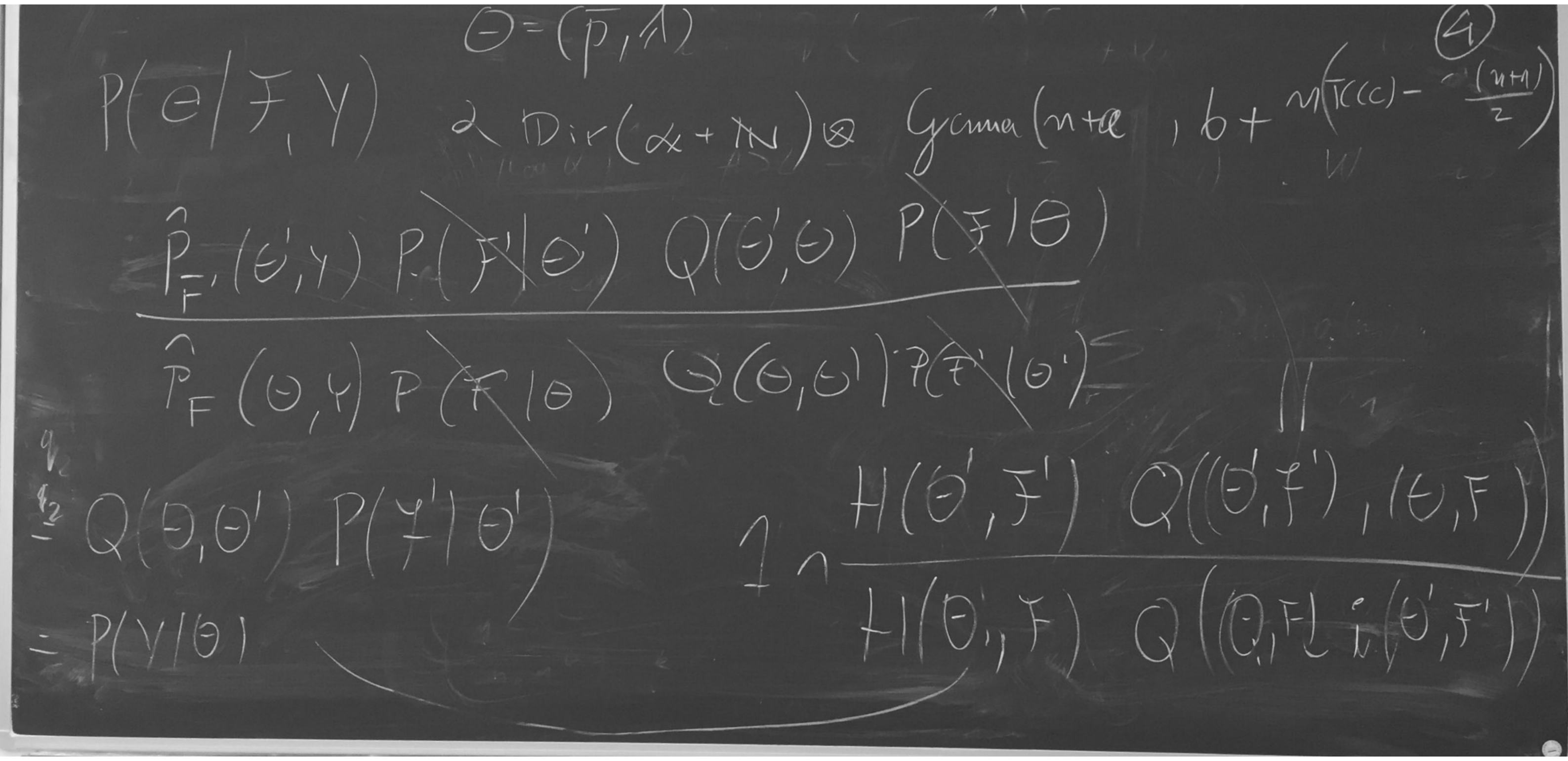
początkowa liczba cząsteczek

ZNANE

HYPERPARAM

$$\bar{p} \sim Dir(\alpha_1, \alpha_2, \alpha_3, \alpha_4) = Dir(\alpha)$$

$$\lambda \sim Gamma(a, b)$$



④

$$\Theta = (\bar{p}, \lambda)$$

$$P(\Theta / \mathcal{F}, Y) \propto \mathrm{Dir}(\alpha + N) \otimes \mathrm{Gama}\left(n + a,\ b + n\left(\bar{x}(c) - \frac{(n+1)}{2}\right)\right)$$

W

$$\frac{\hat{P}_{F'}(\Theta', Y)\ \cancel{P(\mathcal{F}' | \Theta')}\ Q(\Theta', \Theta)\ \cancel{P(\mathcal{F} | \Theta)}}{\hat{P}_{F}(\Theta, Y)\ \cancel{P(\mathcal{F} | \Theta)}\ Q(\Theta, \Theta')\ \cancel{P(\mathcal{F}' | \Theta')}}$$

$$\|$$

$$q_2$$

$$\overset{q_2}{=} Q(\Theta, \Theta')\ P(Y' | \Theta')$$

$$= P(Y | \Theta)$$

$$1 \wedge \frac{H(\Theta', \mathcal{F}')\ Q((\Theta', \mathcal{F}'), (\Theta, F))}{H(\Theta, \mathcal{F})\ Q((\Theta, F), (\Theta', F'))}$$

$F \sim P(F \mid \Theta)$

$= P(\Theta \mid Y)$

$\hat{P}_F(\Theta, Y) = P(Y \mid F)$

$\Theta' \sim Q(\Theta, \Theta')$

$F' \sim P(F \mid \Theta')$

$$1 \wedge \frac{\hat{P}_{F'}(\Theta', Y)\, Q(\Theta', \Theta)}{\hat{P}_F(\Theta, Y)\, Q(\Theta, \Theta')}$$

$H(\Theta, F) = \hat{P}_F(\Theta, Y) \,|\, P(F \mid \Theta)$

$Q((\Theta, F), (\Theta', F'))$

$$\int H(\Theta, F)\, dF = \int \hat{P}_F(\Theta, Y)\, dF = \int P(Y \mid F)\, P(F \mid \Theta)\, dF$$