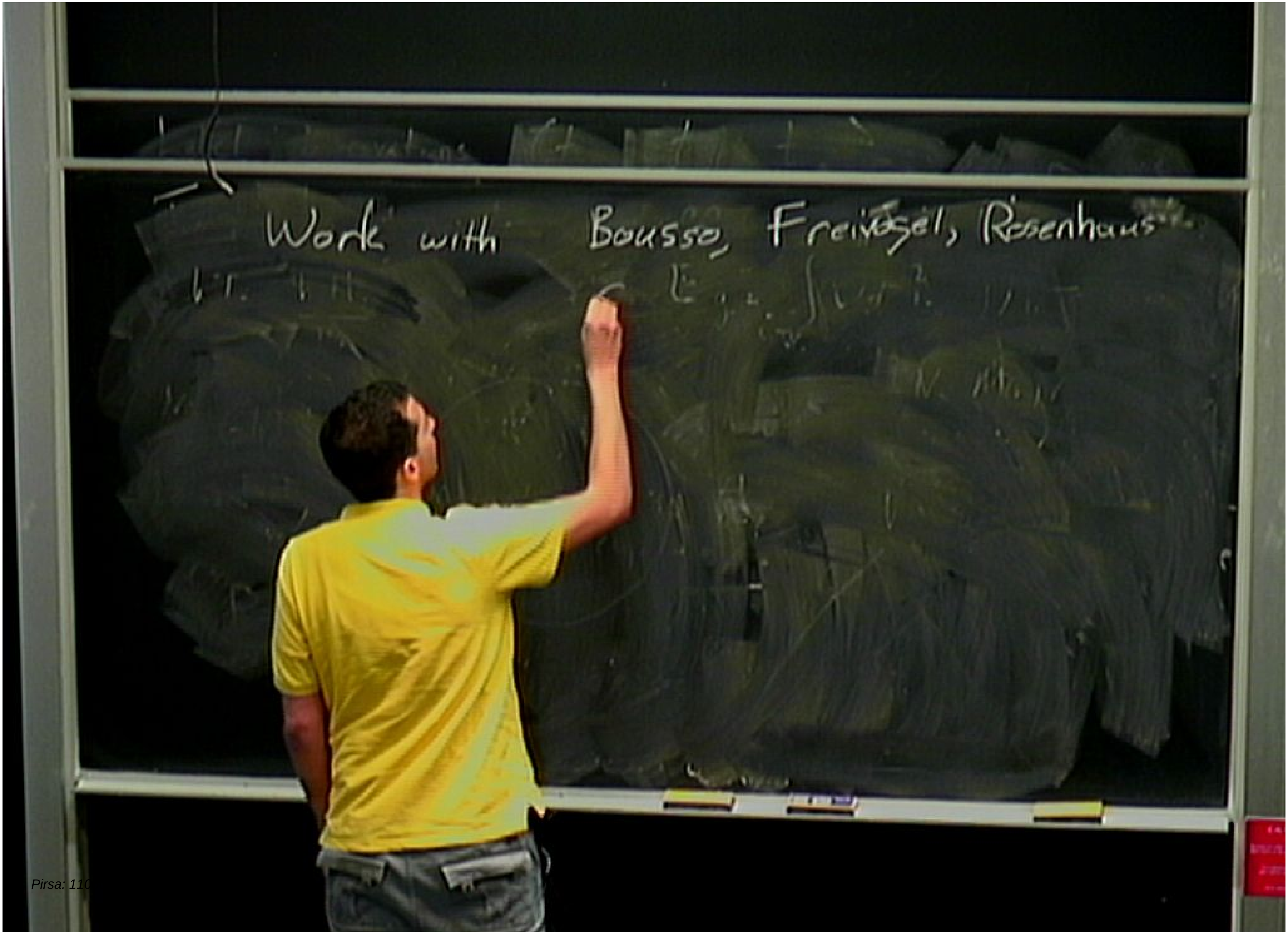
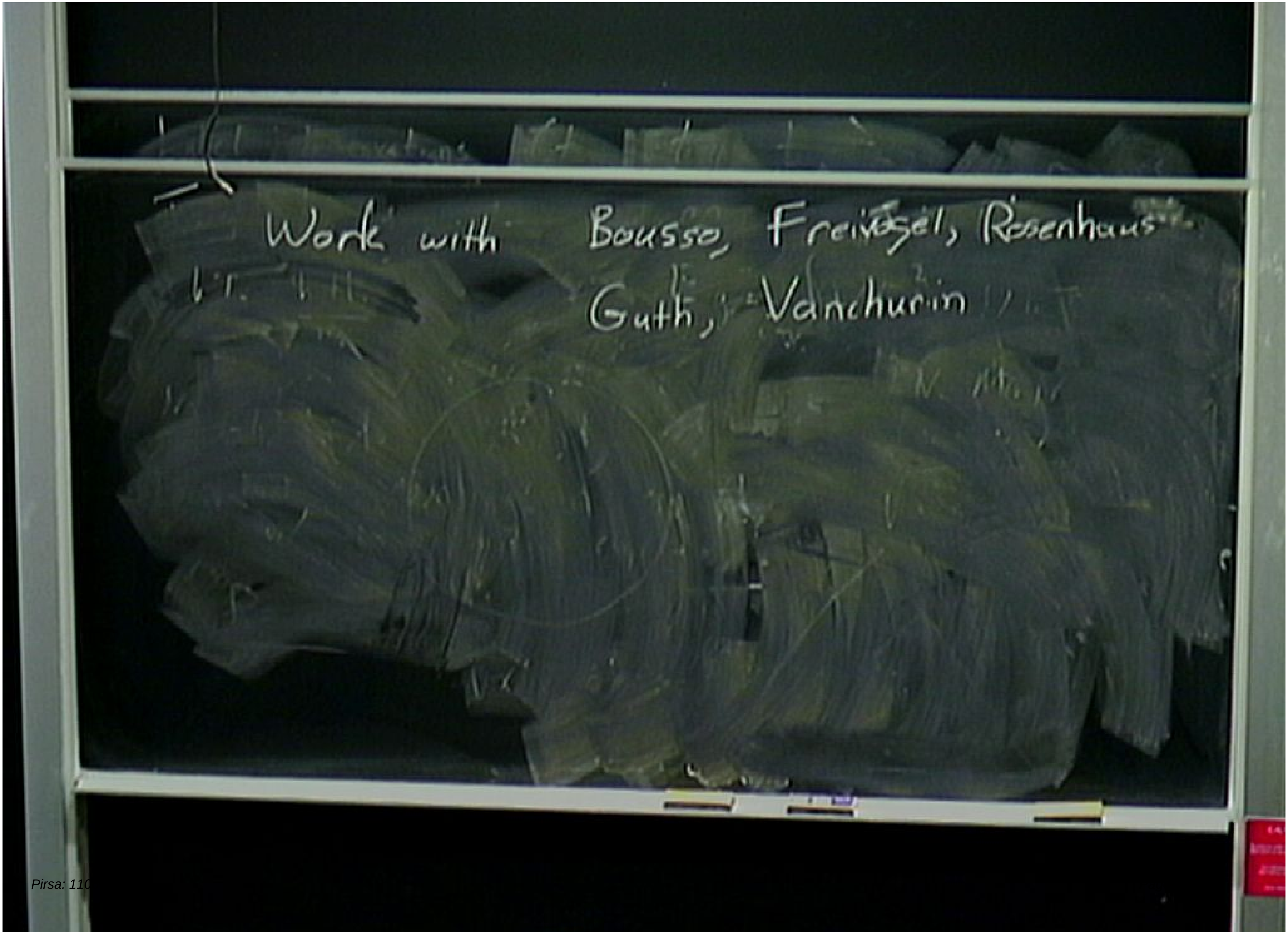
Title: Eternal inflation predicts that time will end

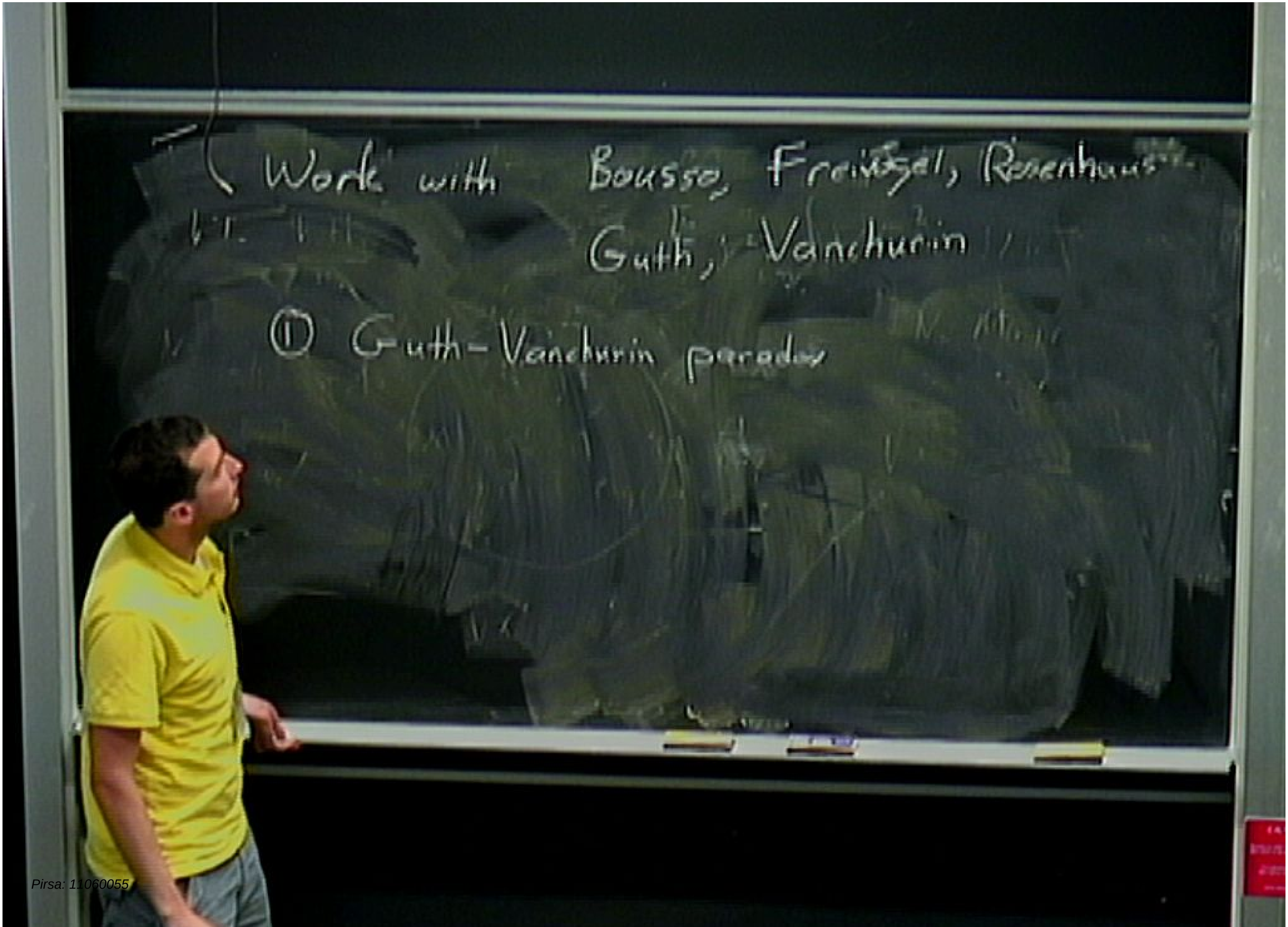
Date: Jun 22, 2011 11:55 AM

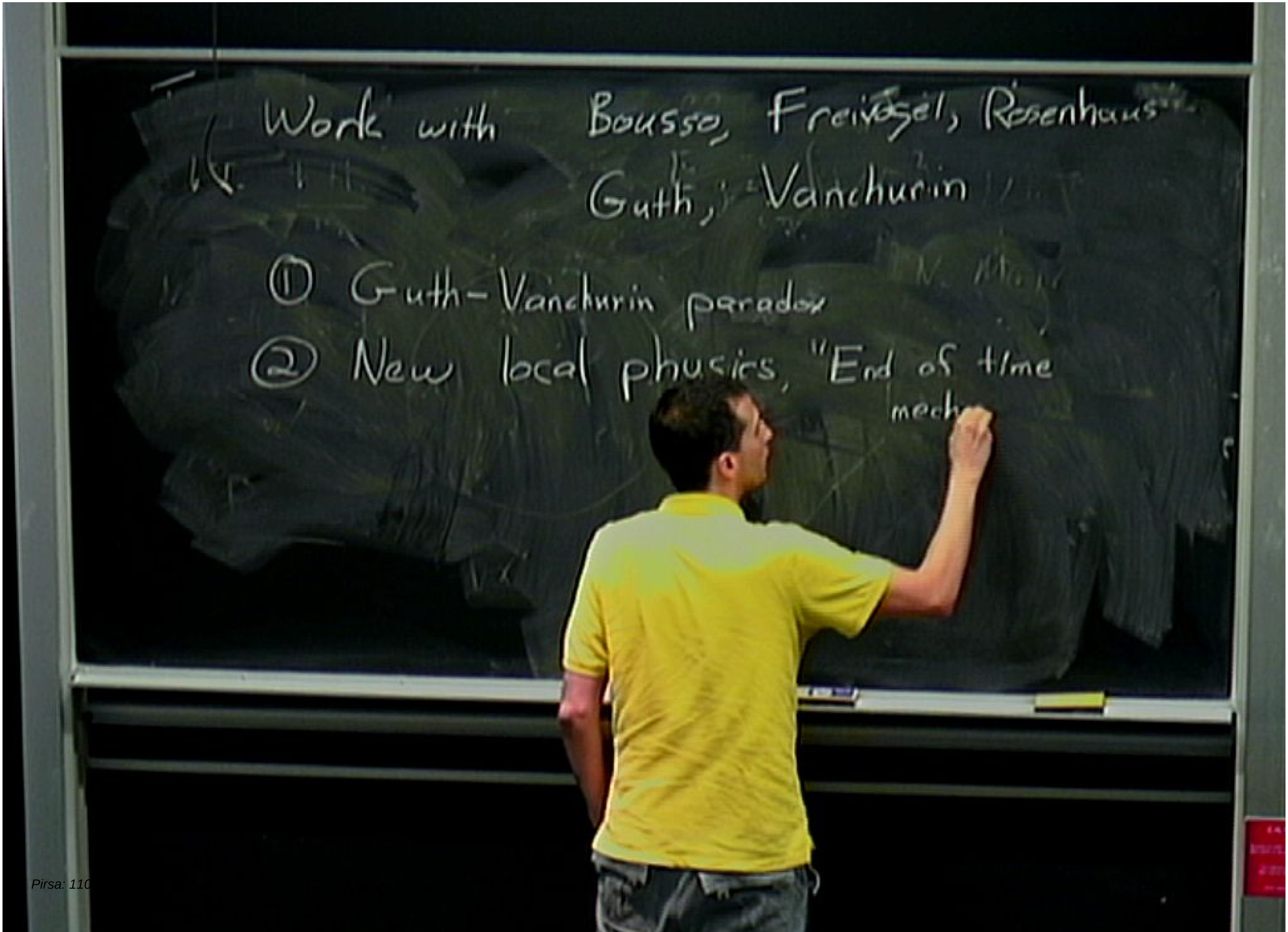
URL: http://pirsa.org/11060055

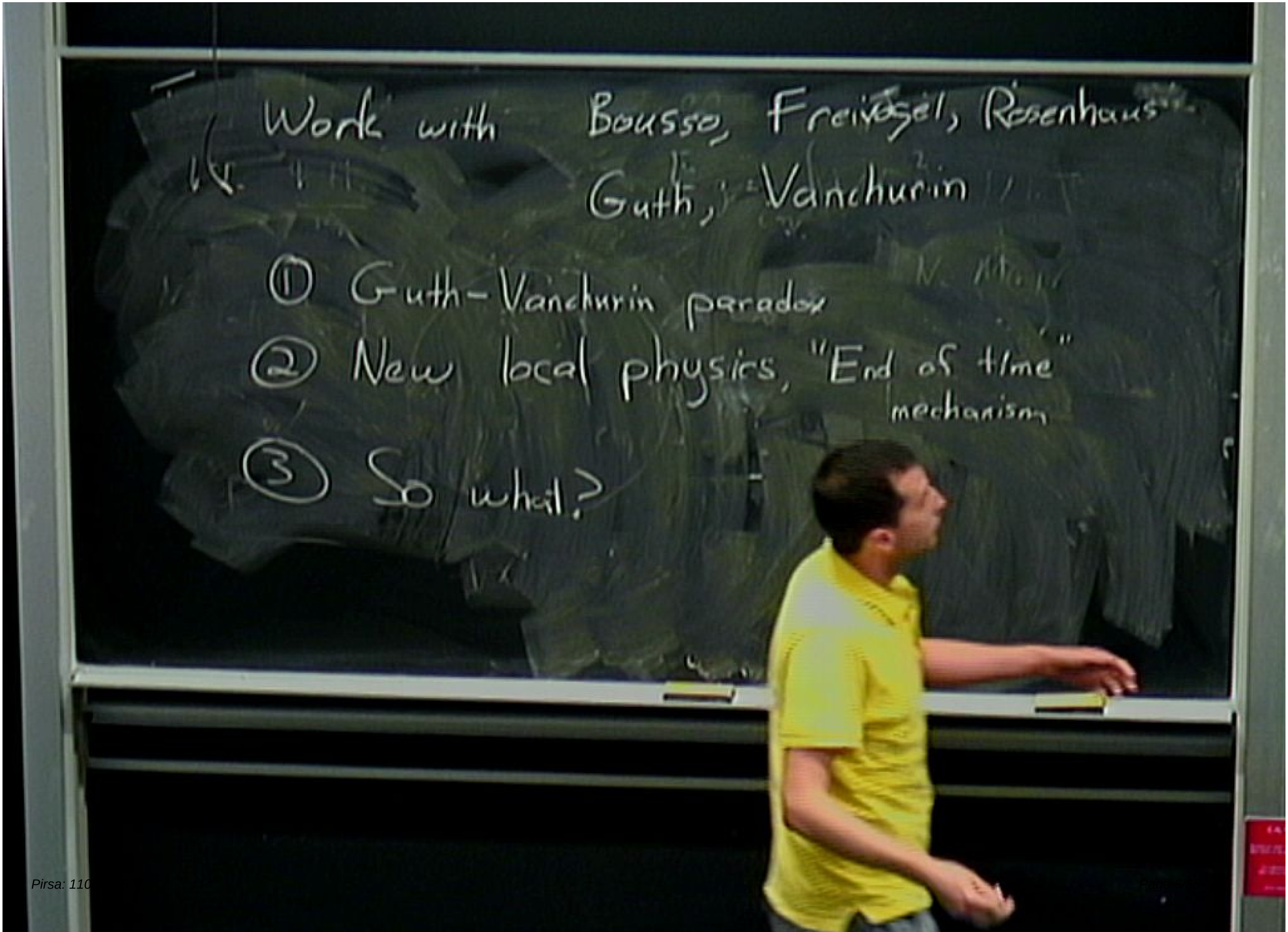
Abstract: Present treatments of eternal inflation regulate infinities by imposing a geometric cutoff. We point out that some matter systems reach the cutoff in finite time. This implies a nonzero probability for a novel type of catastrophe. According to the most successful measure proposals, our galaxy is likely to encounter the cutoff within the next 5 billion years.

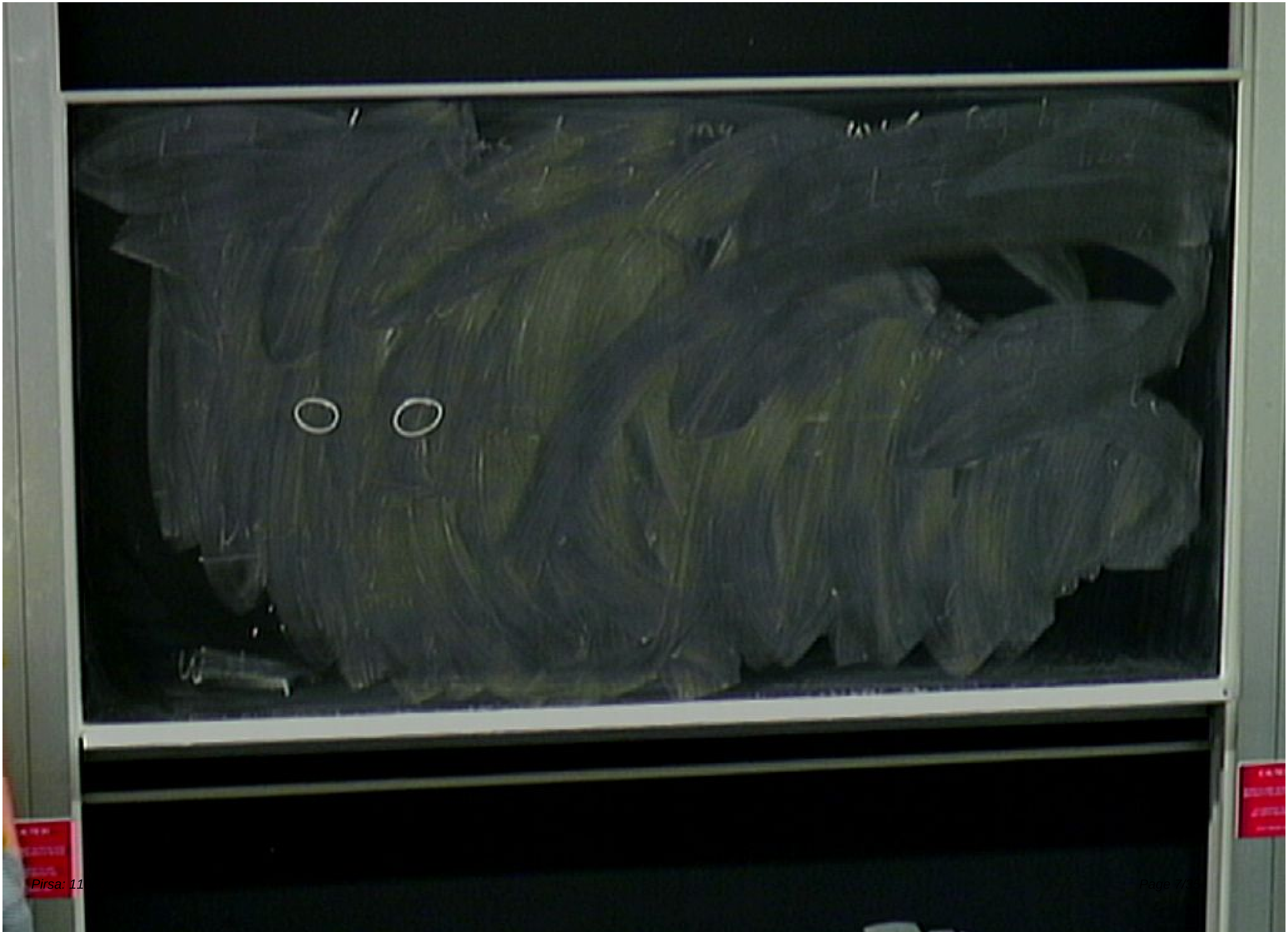

Work with Bousso, Freivogel, Rosenhaus

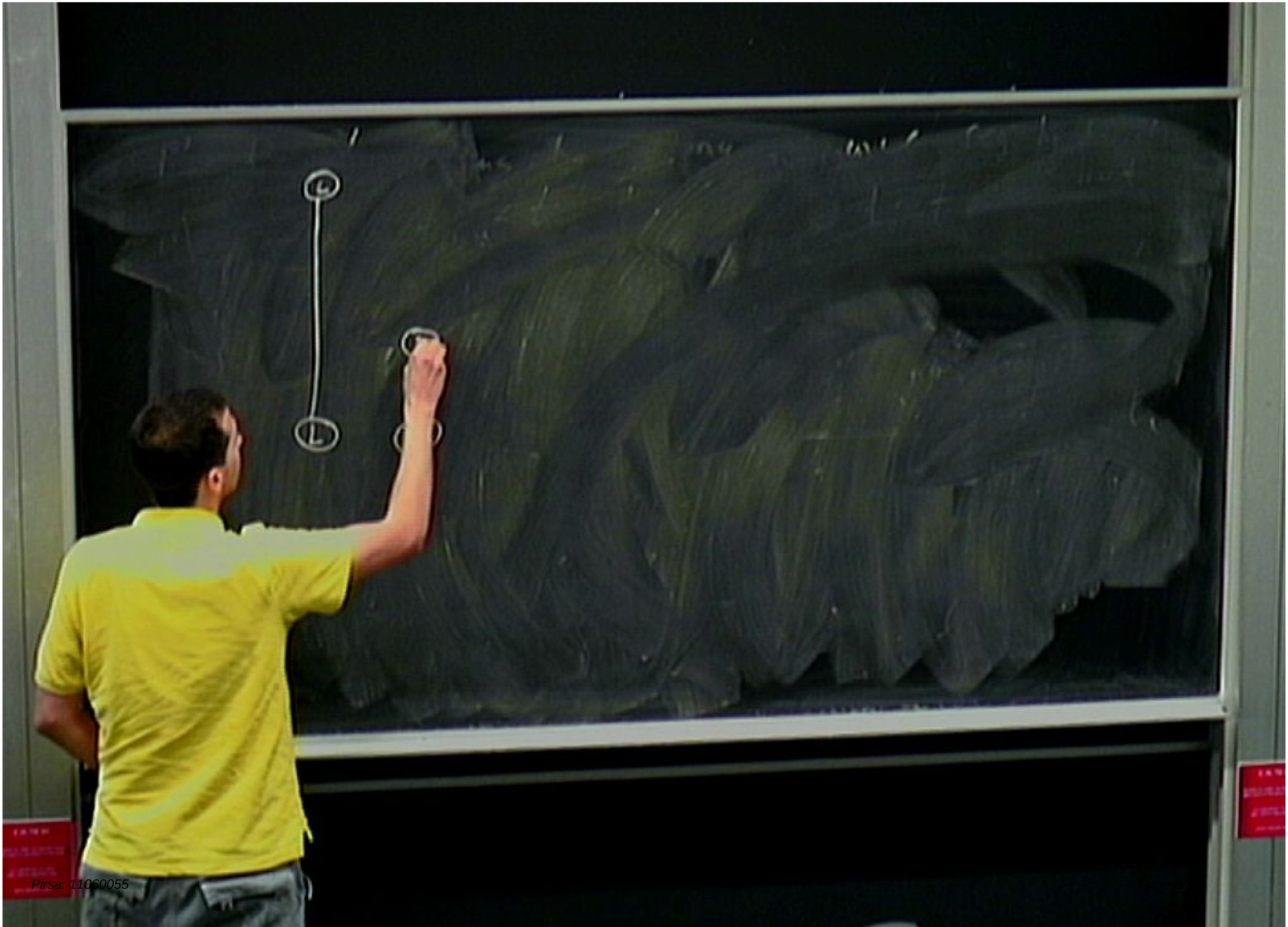

Work with Bousso, Freivogel, Rosenhaus
Guth, Vanchurin

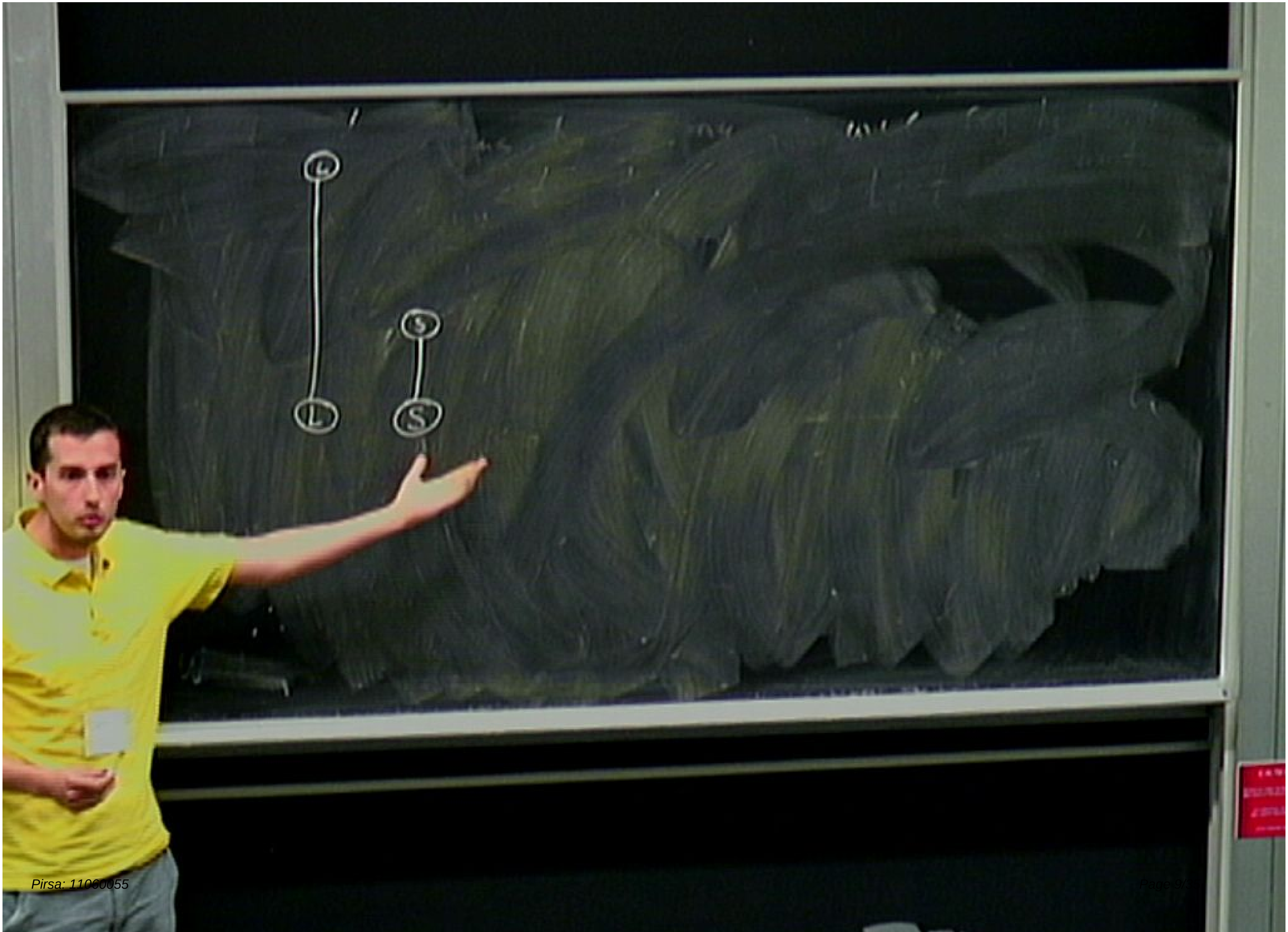

Work with Bousso, Freivogel, Rosenhaus
Guth, Vanchurin
(1) Guth-Vanchurin paradox


Work with Bousso, Freivogel, Rosenhaus
Guth, Vanchurin
① Guth-Vanchurin paradox
② New local physics, "End of time
mech


Work with Bousso, Freivogel, Rosenhaus
Guth, Vanchurin
① Guth-Vanchurin paradox
② New local physics, "End of time" mechanism
③ So what?



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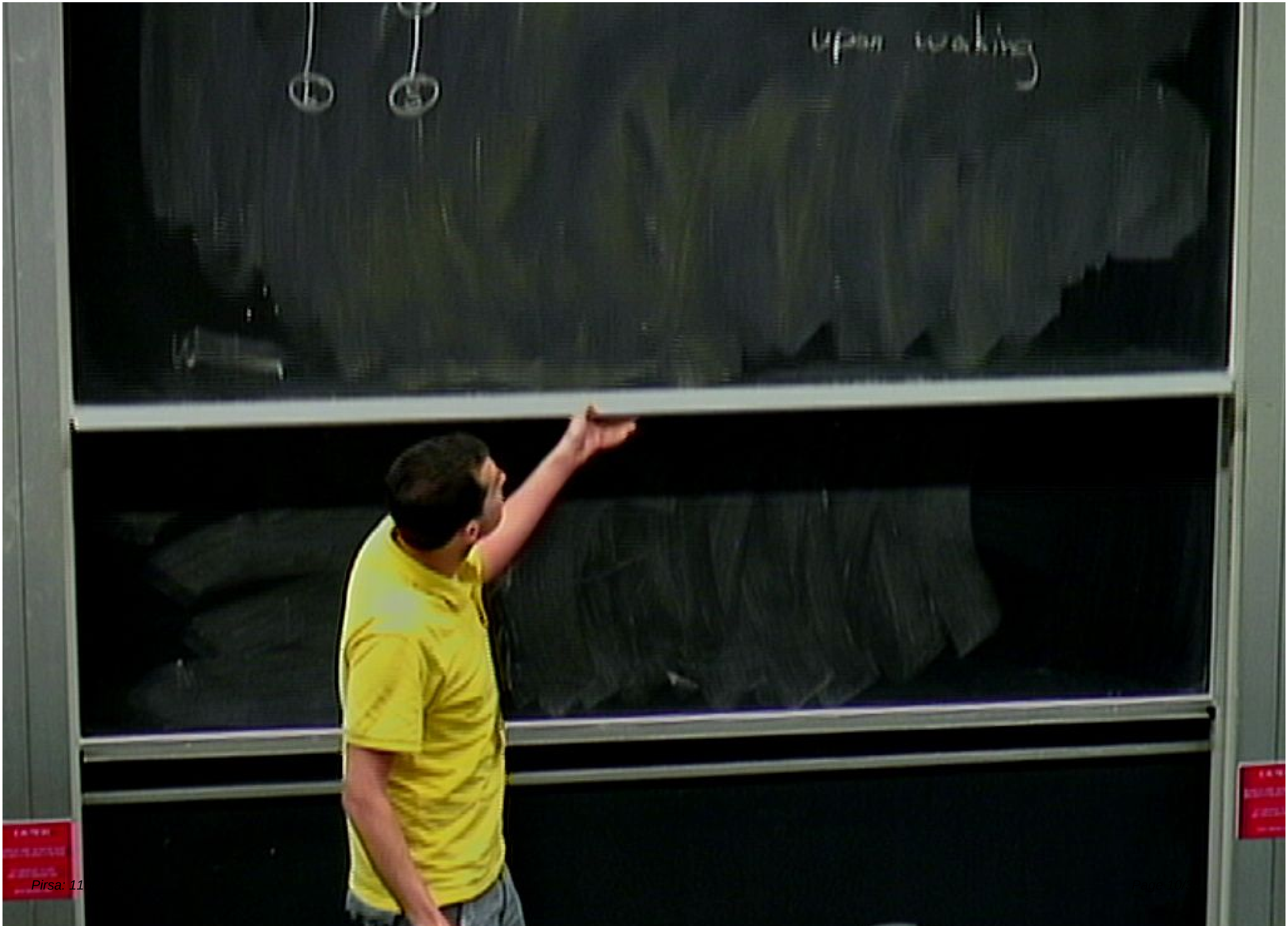
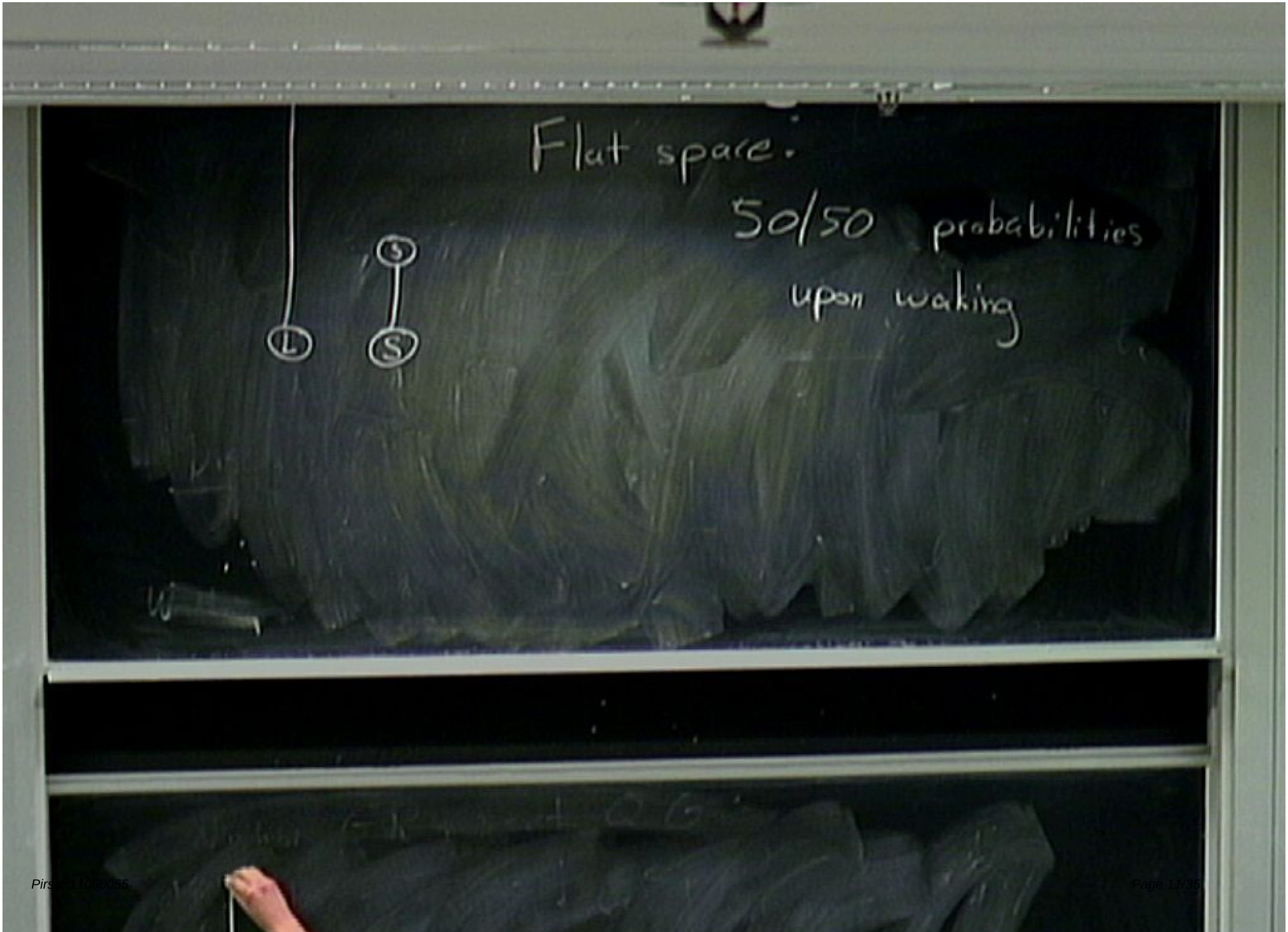
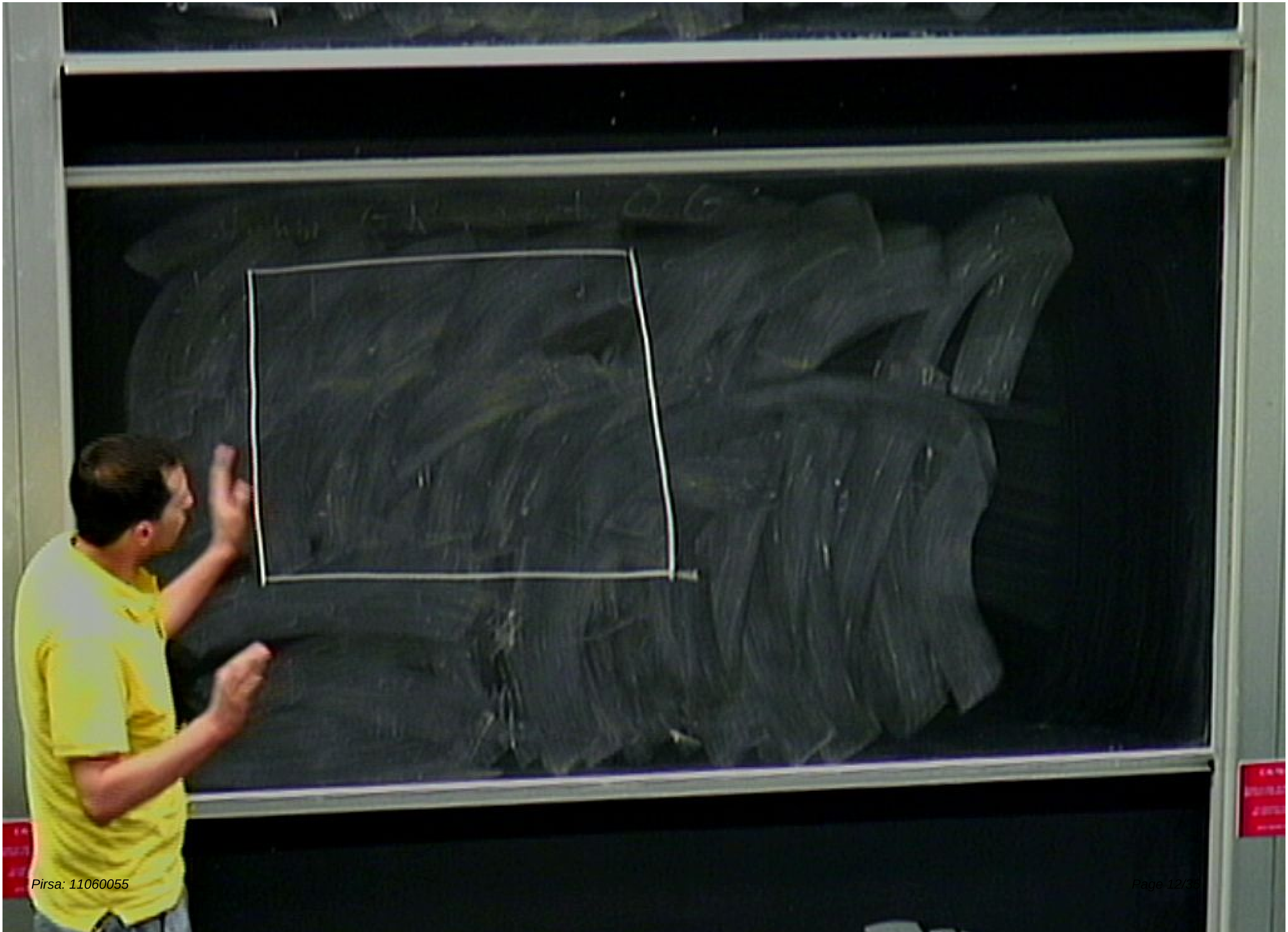
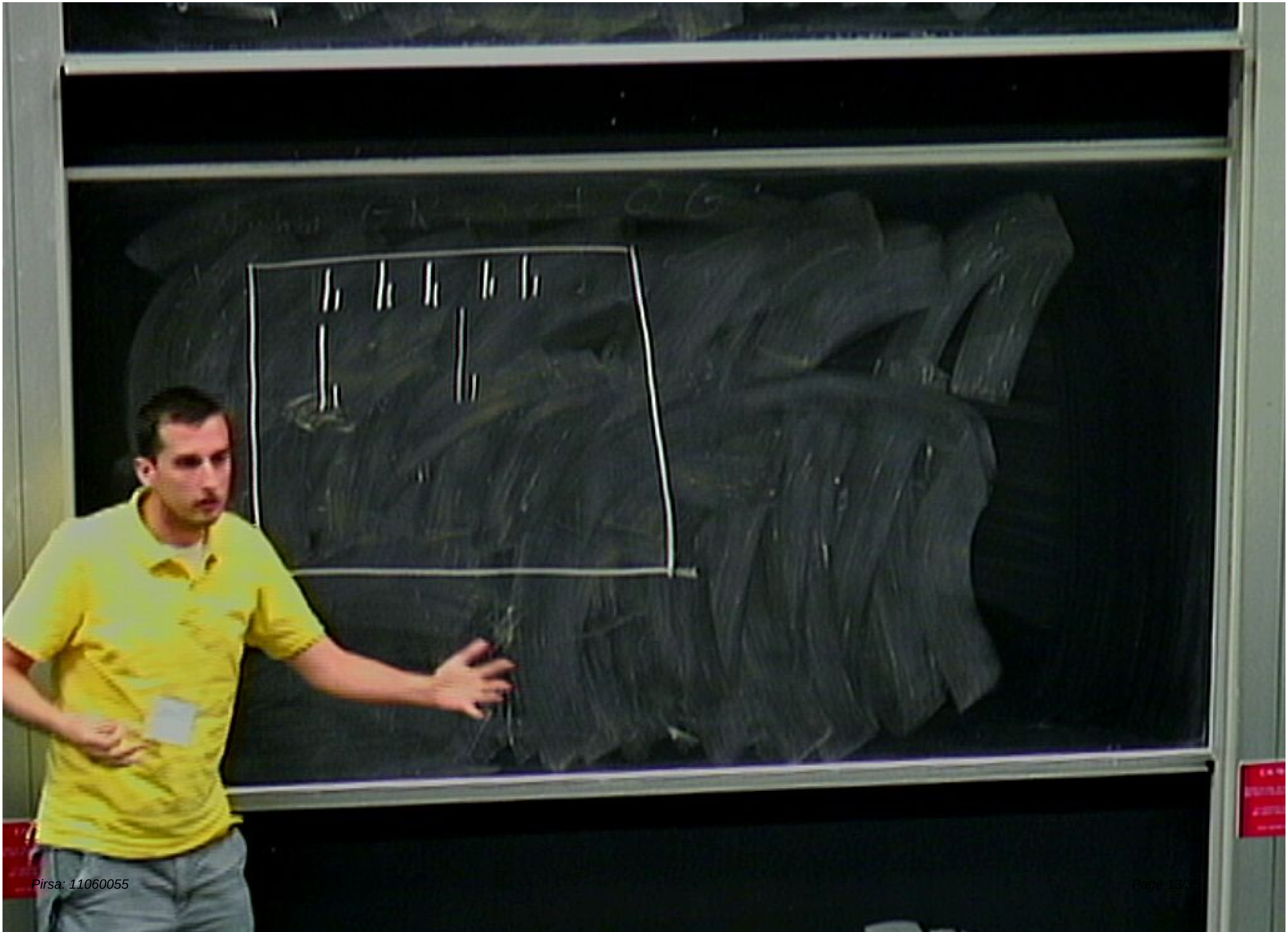
S

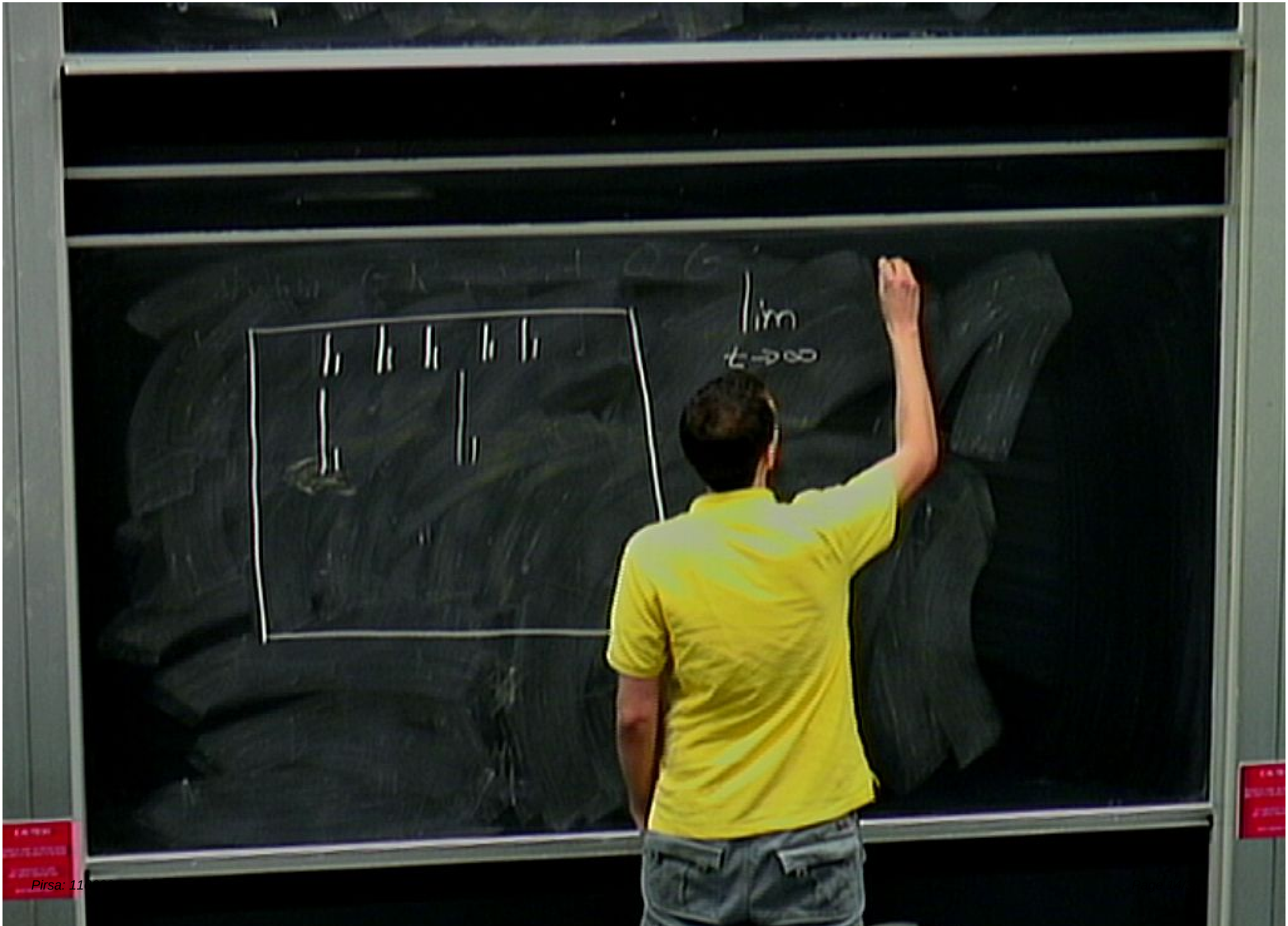

upon waking

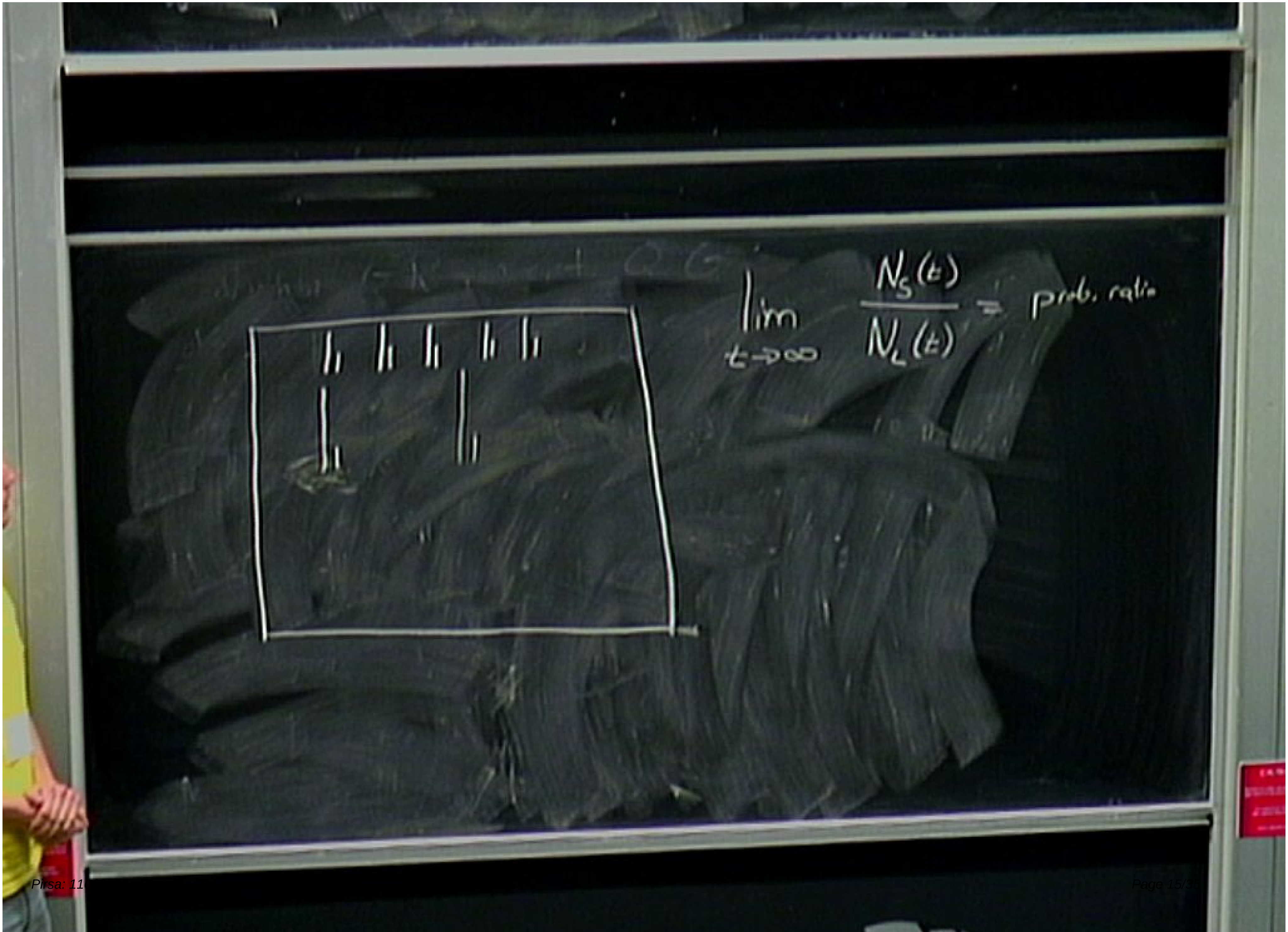


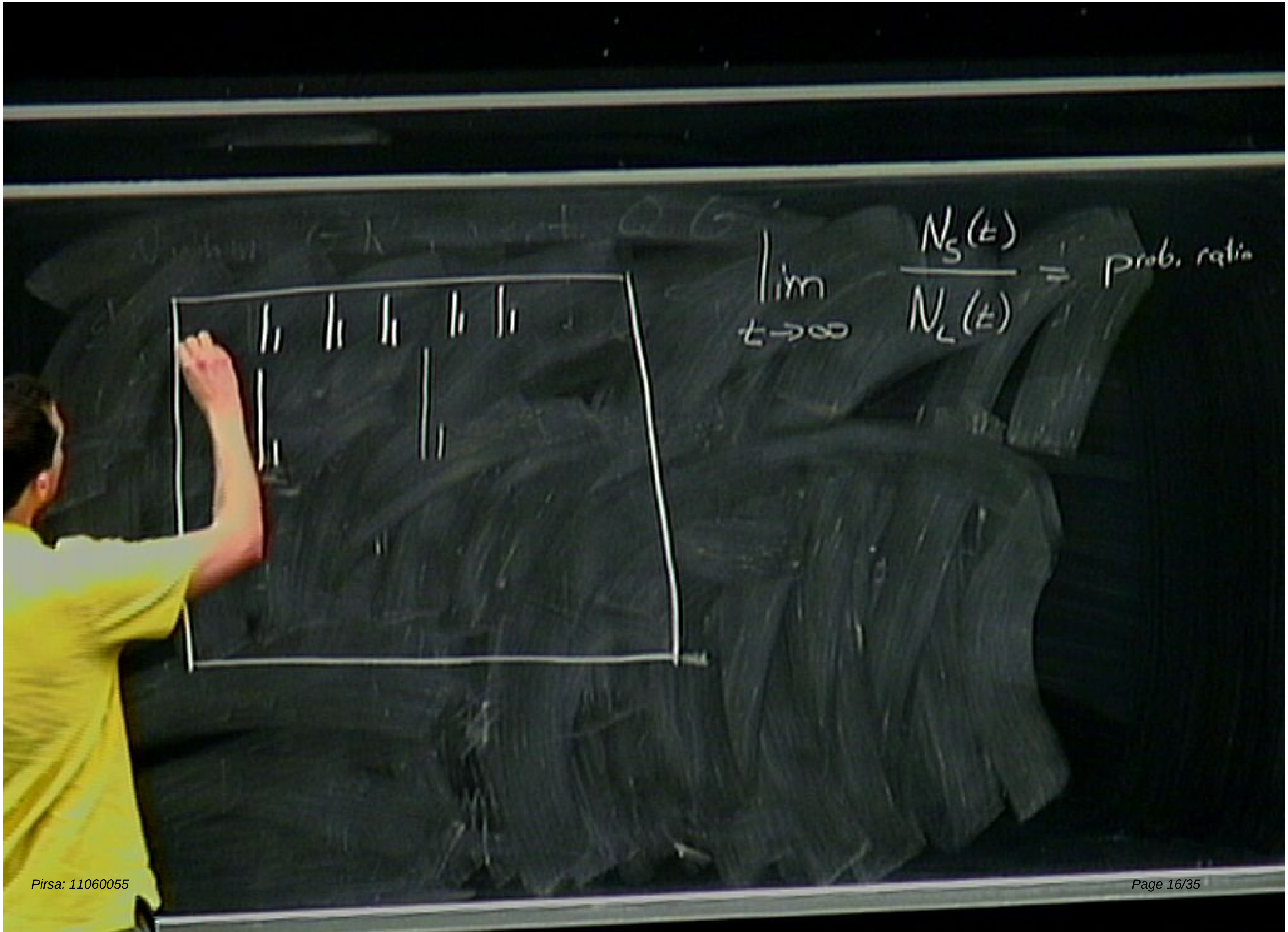
Flat space.
50/50 probabilities
upon waking






lim
t→∞


$\lim_{t \to \infty} \frac{N_S(t)}{N_L(t)}$ = prob. ratio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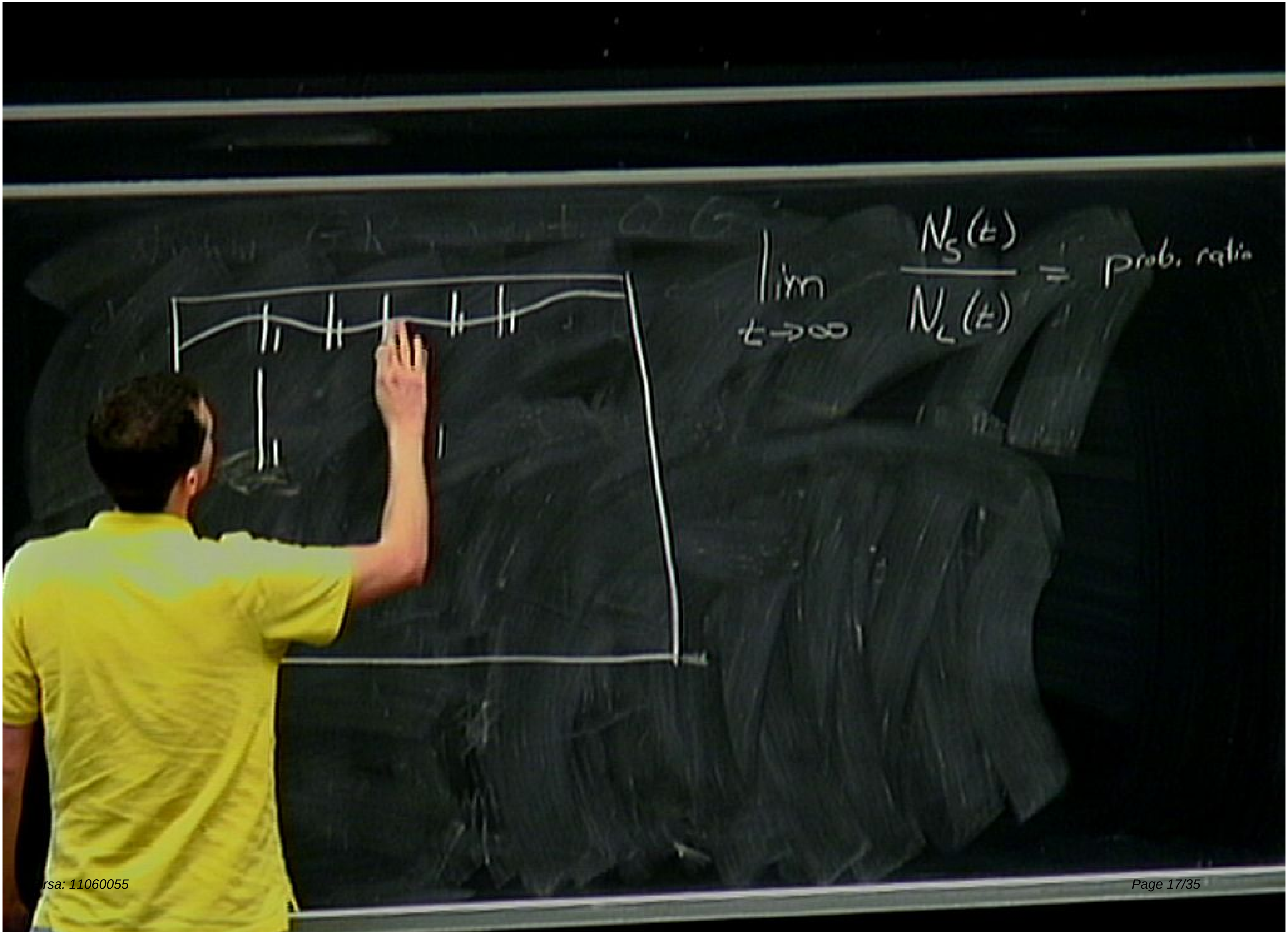
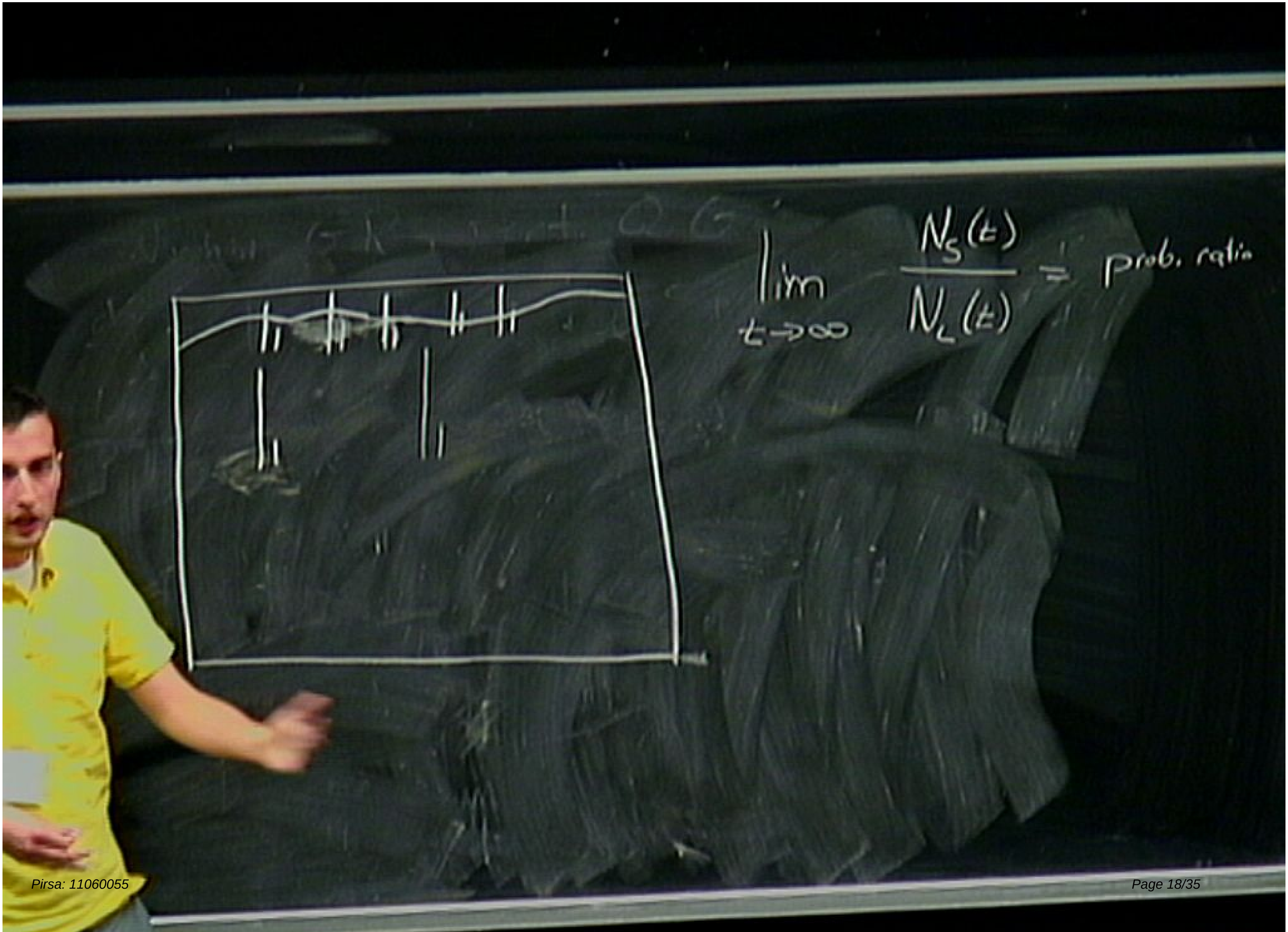


lim
t→∞
N_S(t)
N_L(t)
= prob. ratio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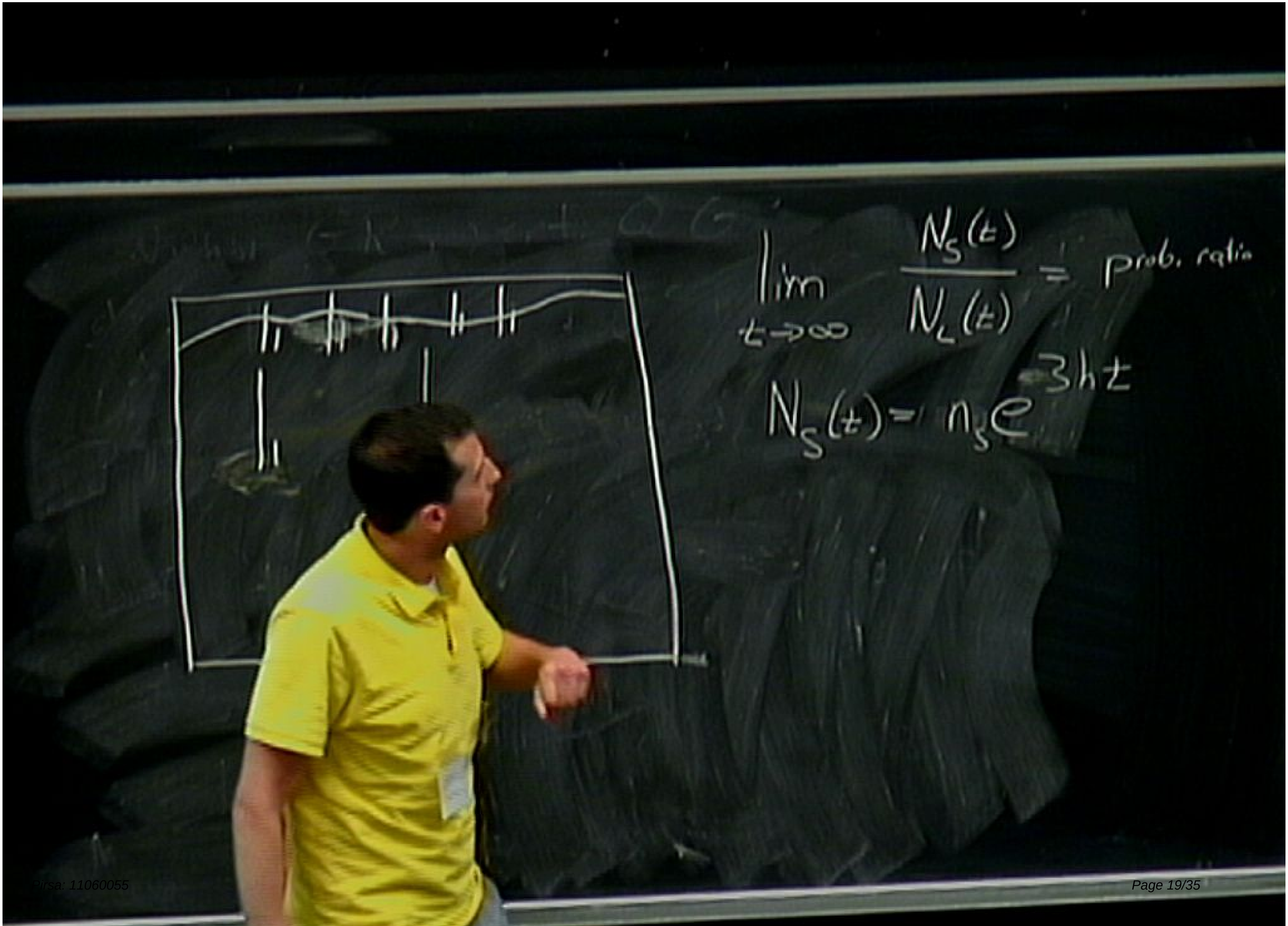
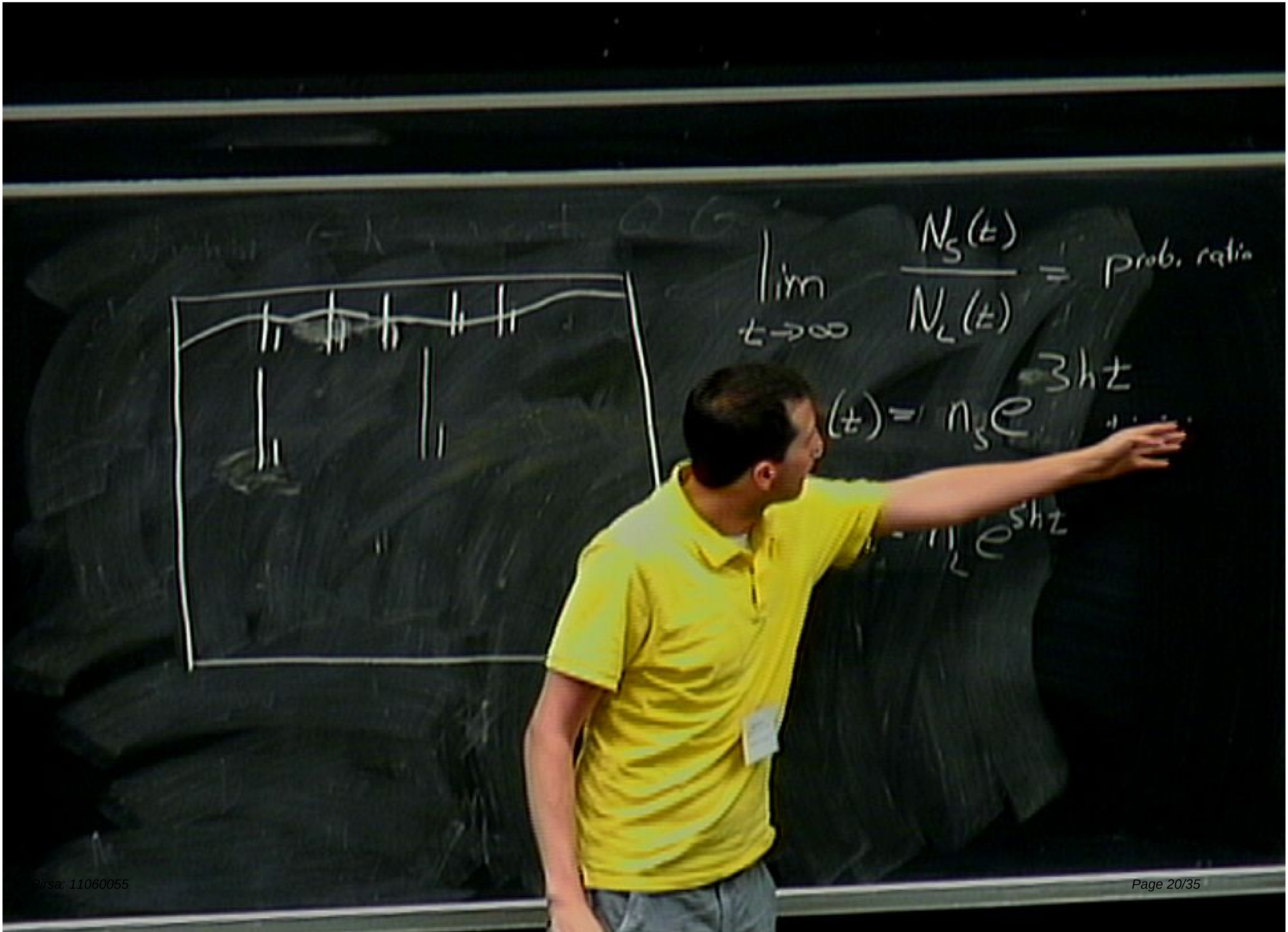
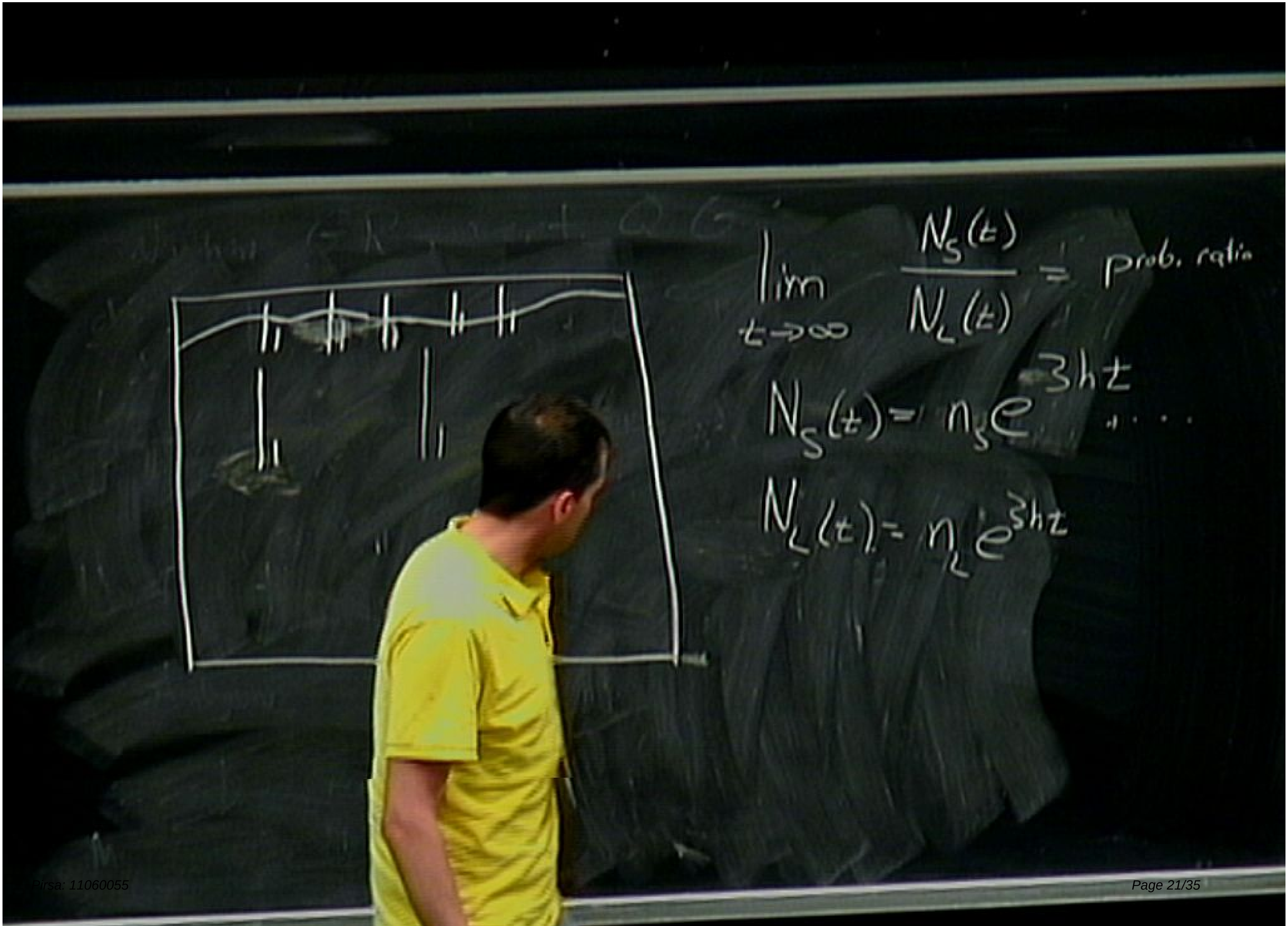
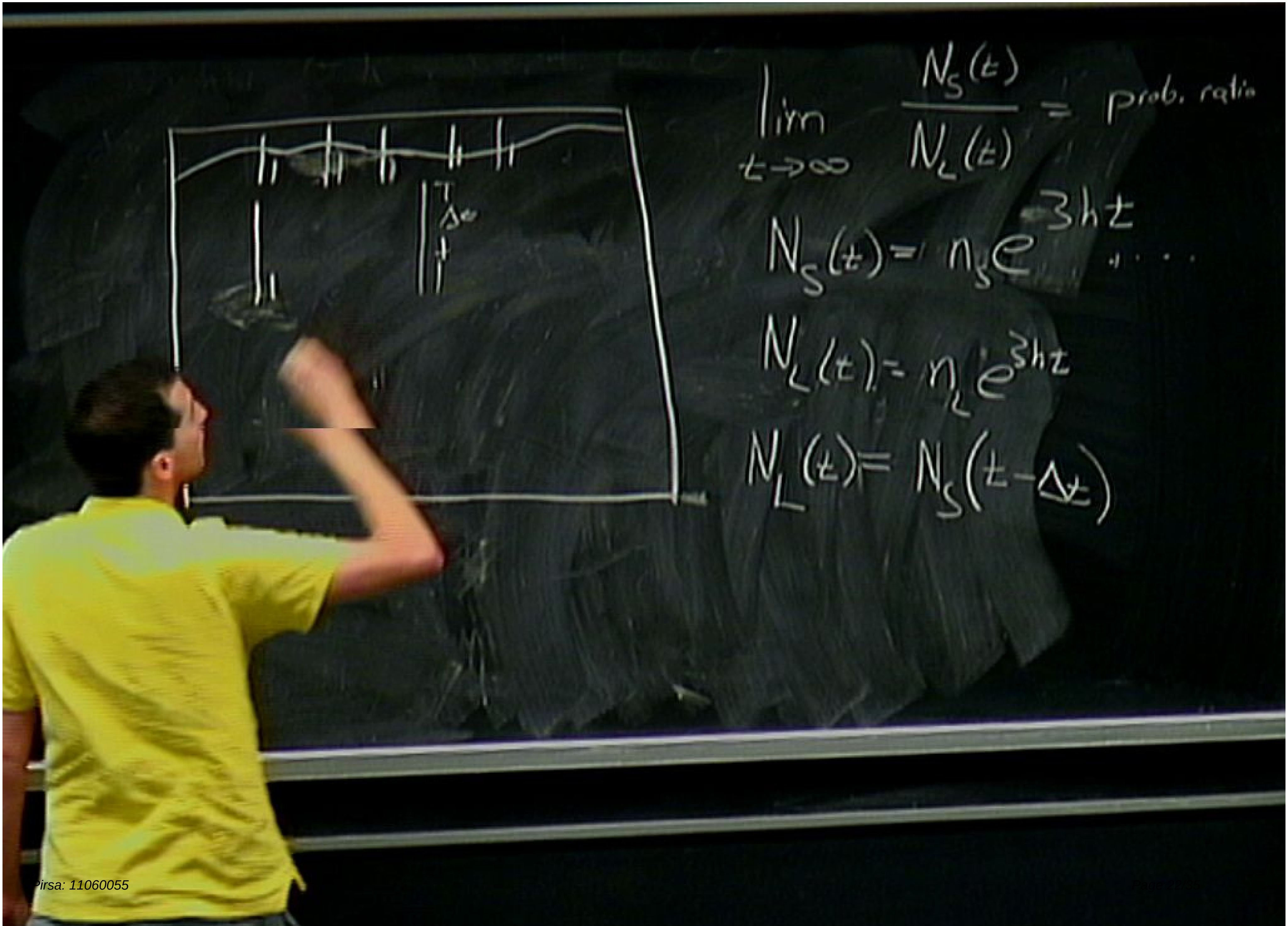
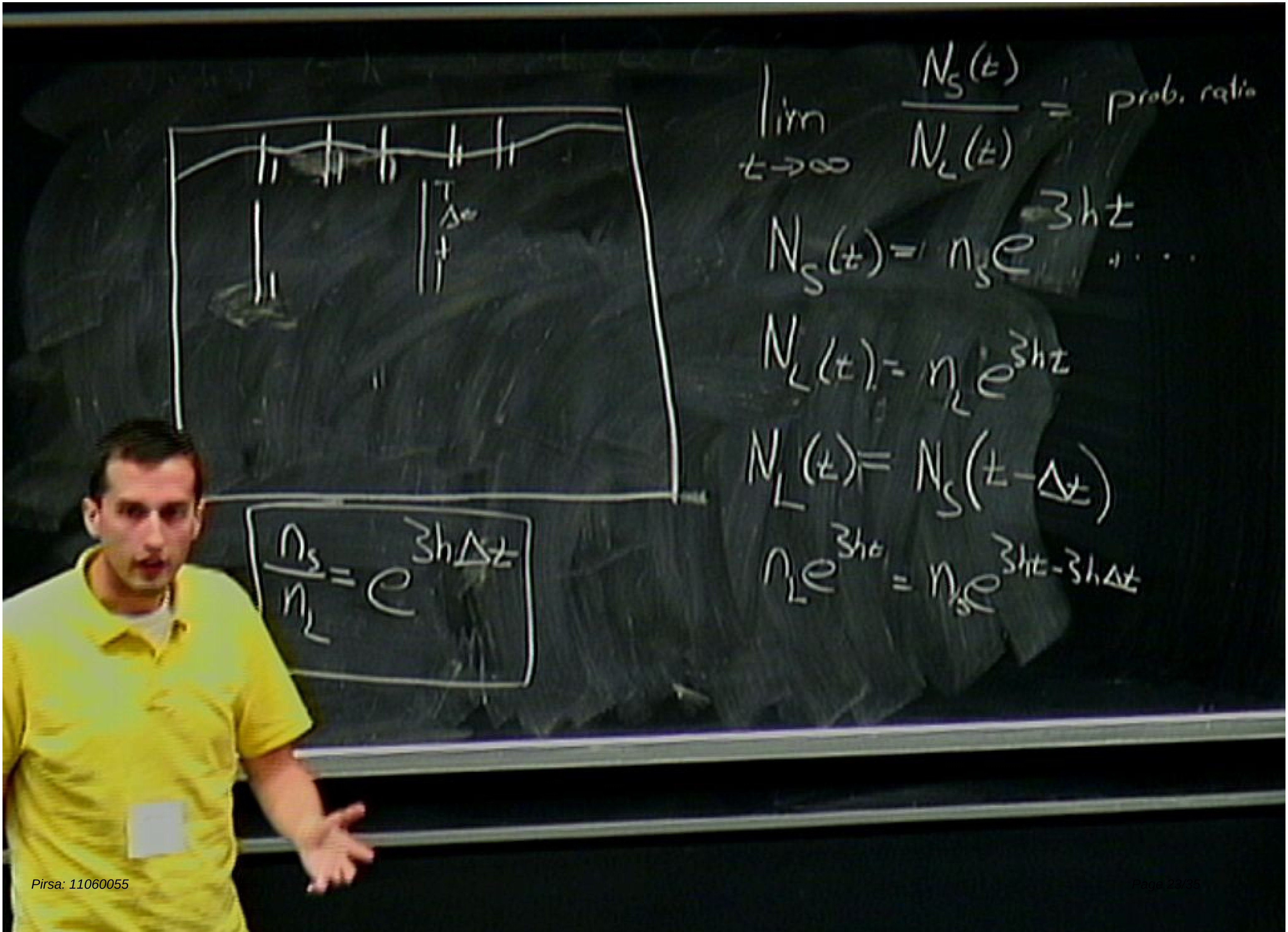

$\lim_{t \to \infty} \frac{N_S(t)}{N_L(t)} =$ prob. ratio
$N_S(t) = n_S e^{3ht}$

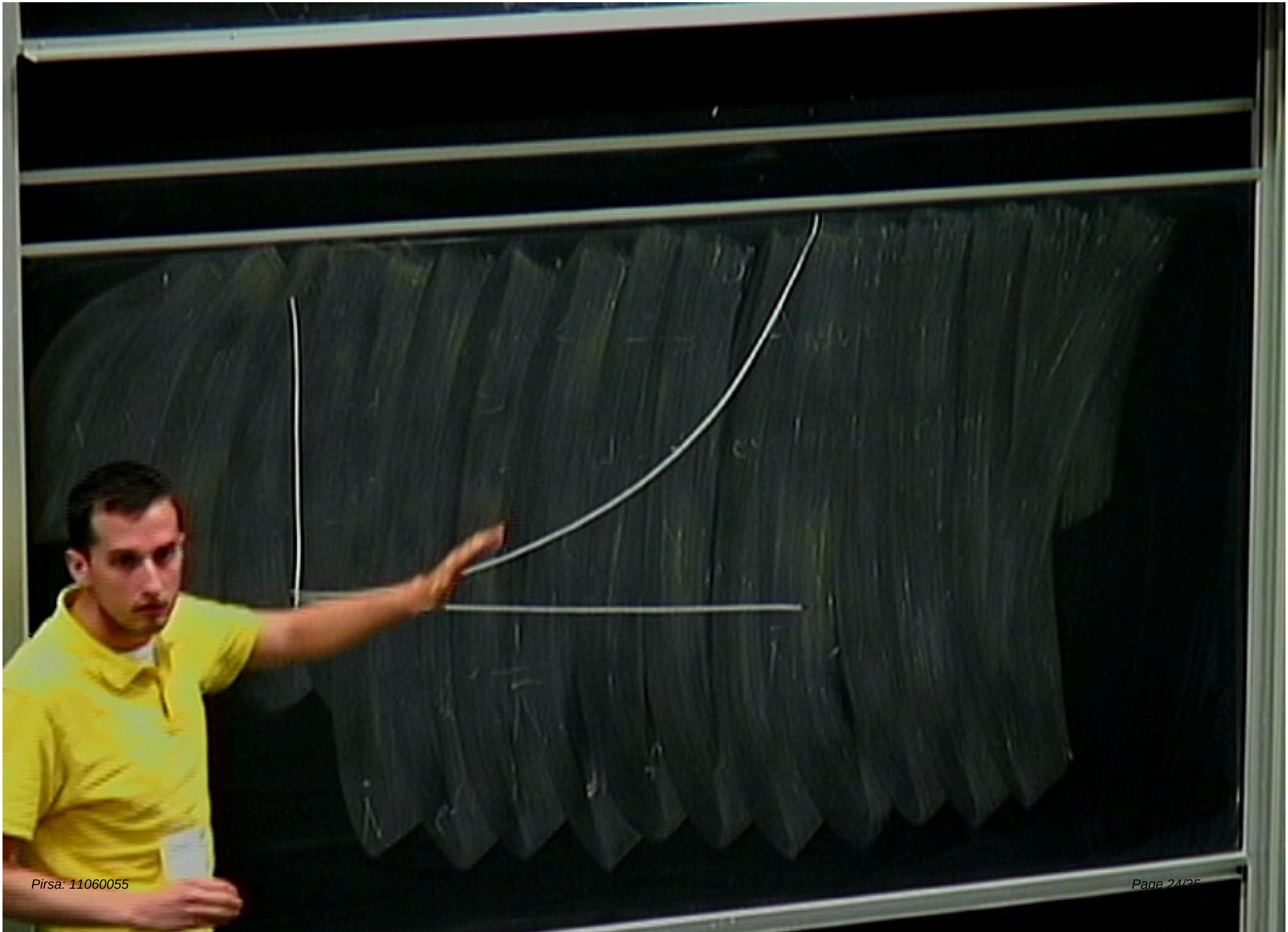


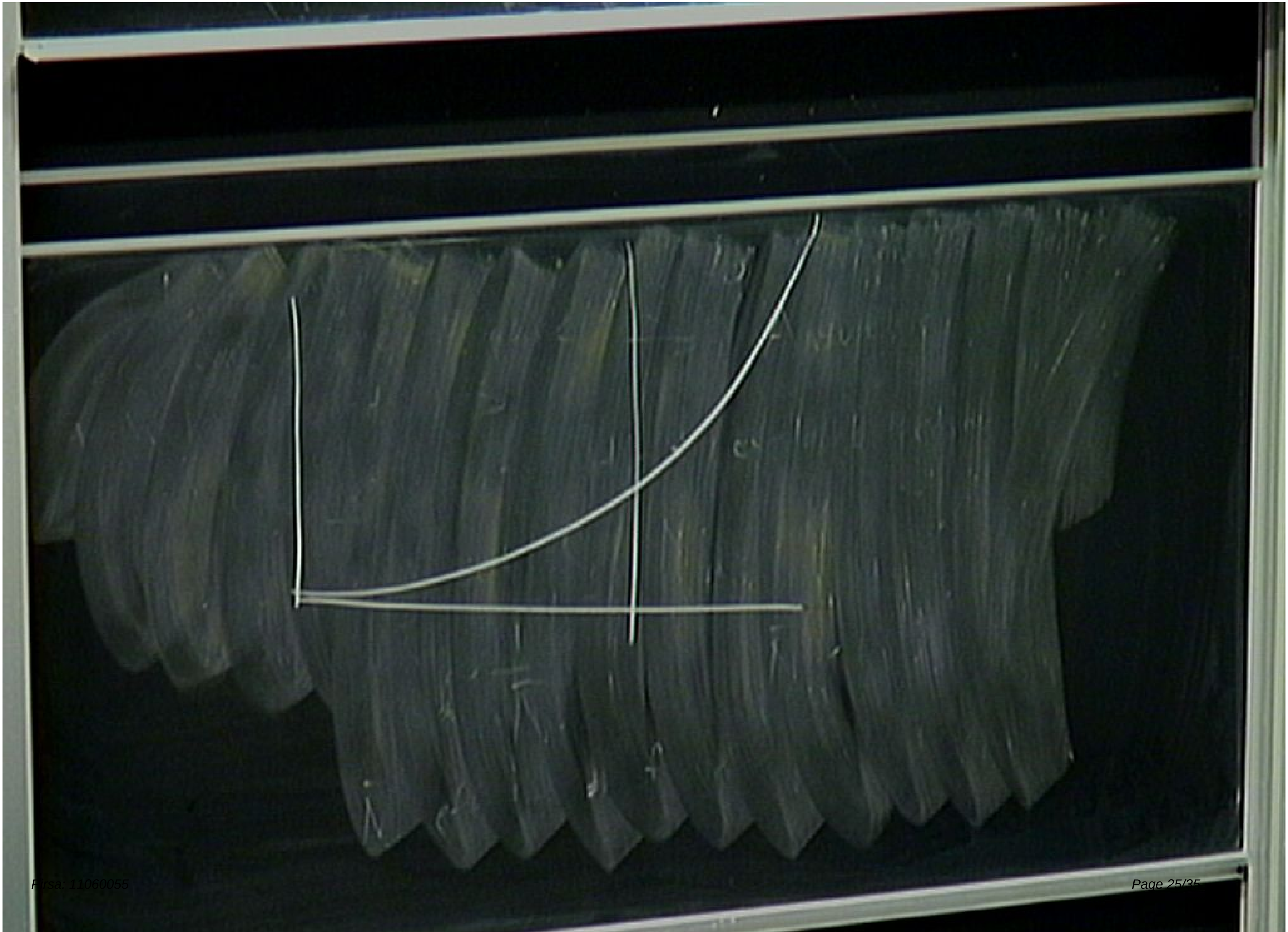
$\lim_{t\to\infty} \frac{N_S(t)}{N_L(t)}$ = prob. ratio
$(t) = n_S e^{3ht}$

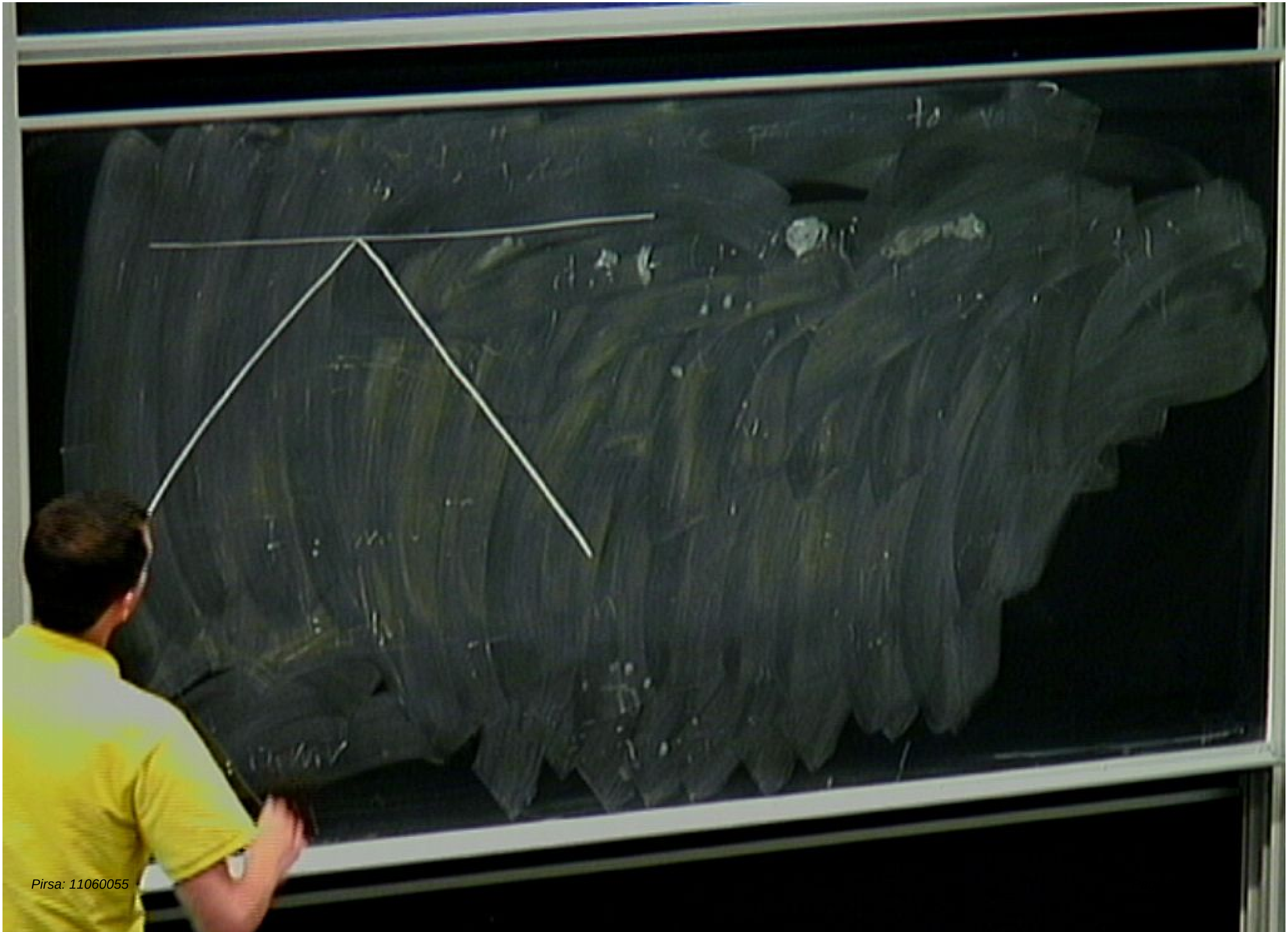

$\lim_{t \to \infty} \frac{N_S(t)}{N_L(t)} = $ prob. ratio
$N_S(t) = n_S e^{3ht} + \ldots$
$N_L(t) = n_L e^{3ht}$

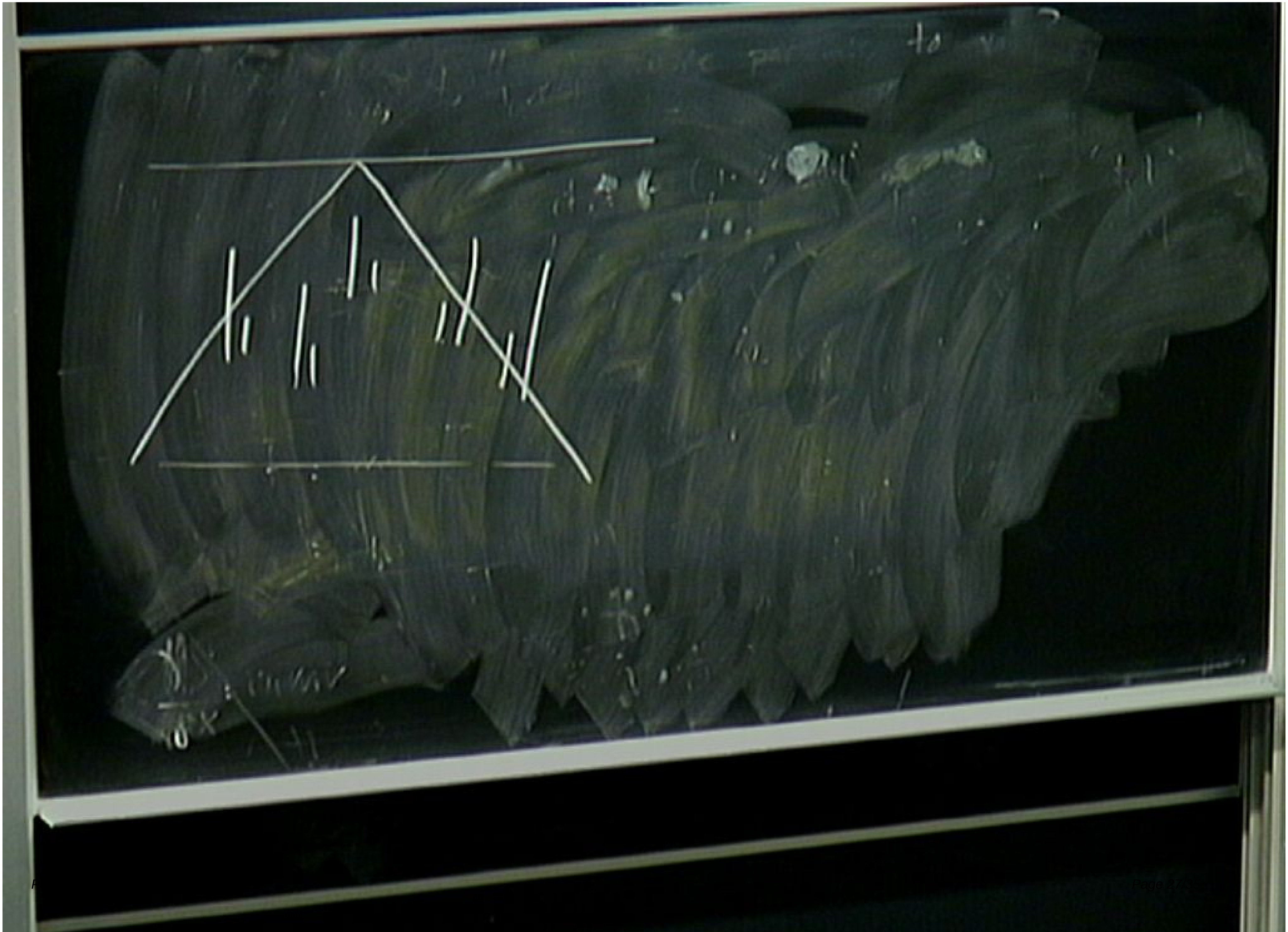

$\lim_{t \to \infty} \frac{N_S(t)}{N_L(t)} =$ prob. ratio
$N_S(t) = n_S e^{3ht}$ . . .
$N_L(t) = n_L e^{3ht}$
$N_L(t) = N_S(t - \Delta t)$
Δt

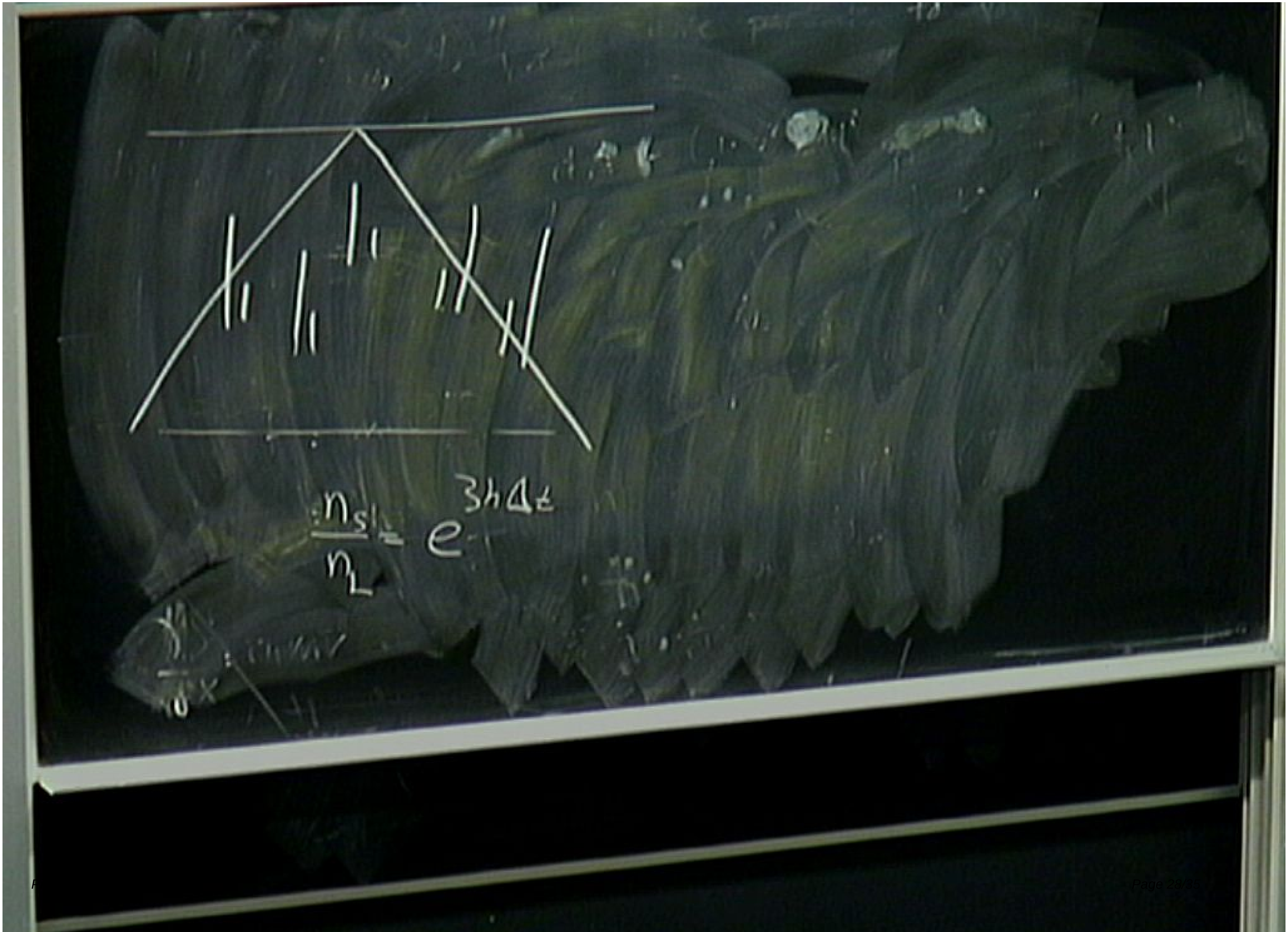

$\lim_{t\to\infty} \frac{N_S(t)}{N_L(t)}$ = prob. ratio
$N_S(t) = n_S e^{3ht}$
$N_L(t) = n_L e^{3ht}$
$N_L(t) = N_S(t-\Delta t)$
$n_L e^{3ht} = n_S e^{3ht-3h\Delta t}$
$\frac{n_S}{n_L} = e^{3h\Delta t}$

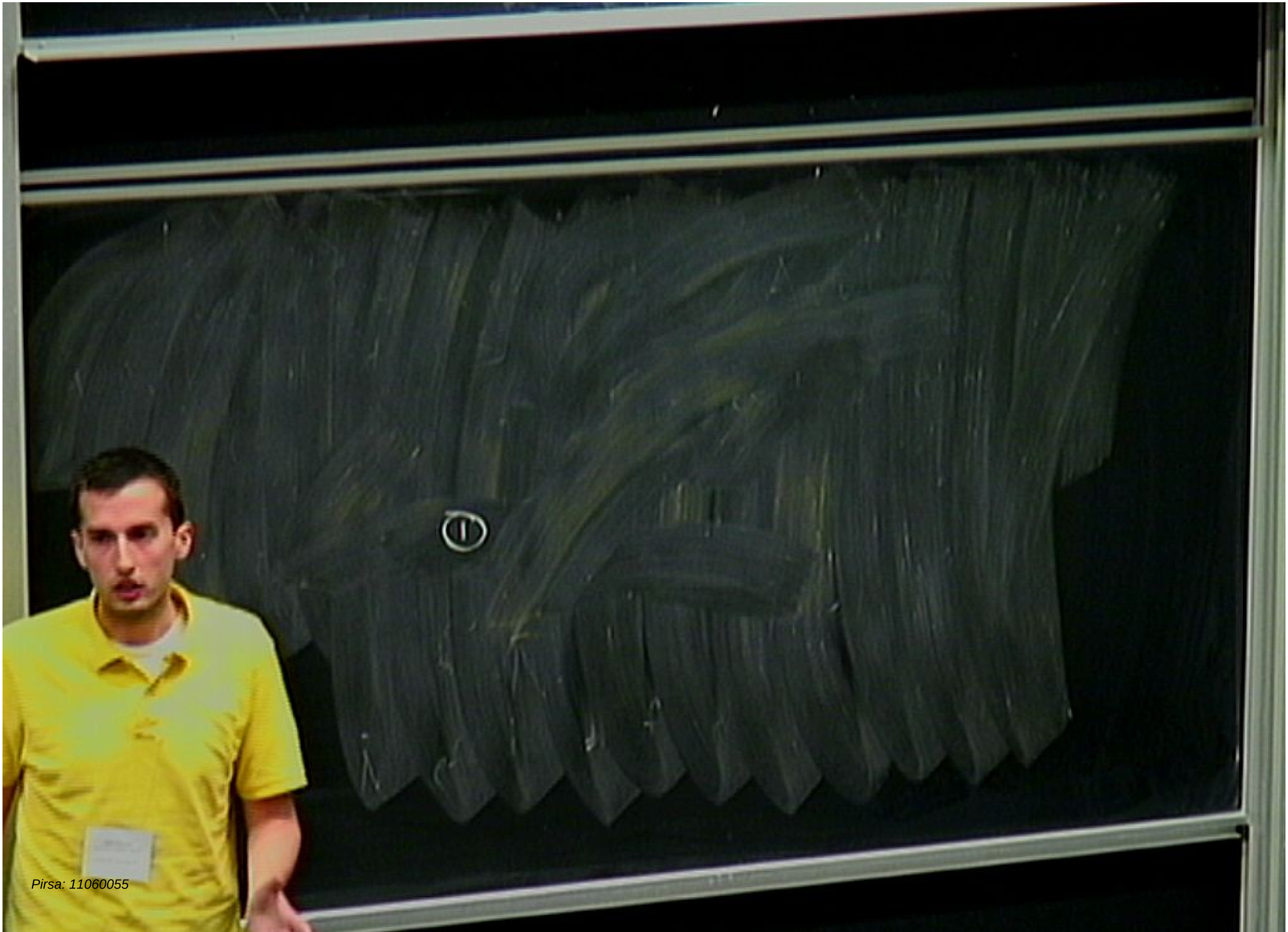









$\frac{n_s|_2}{n_L} = e^{3H\Delta t}$



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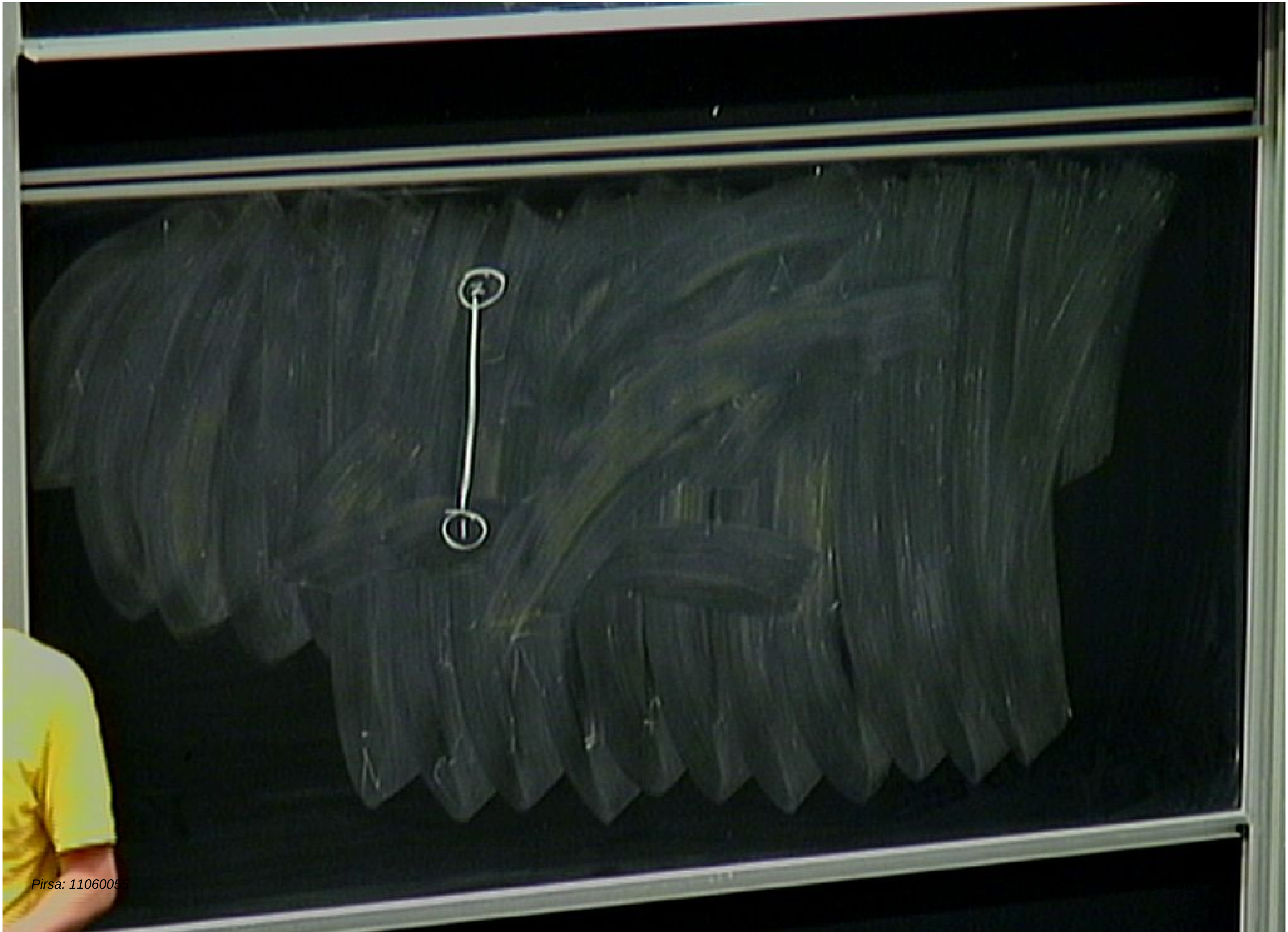
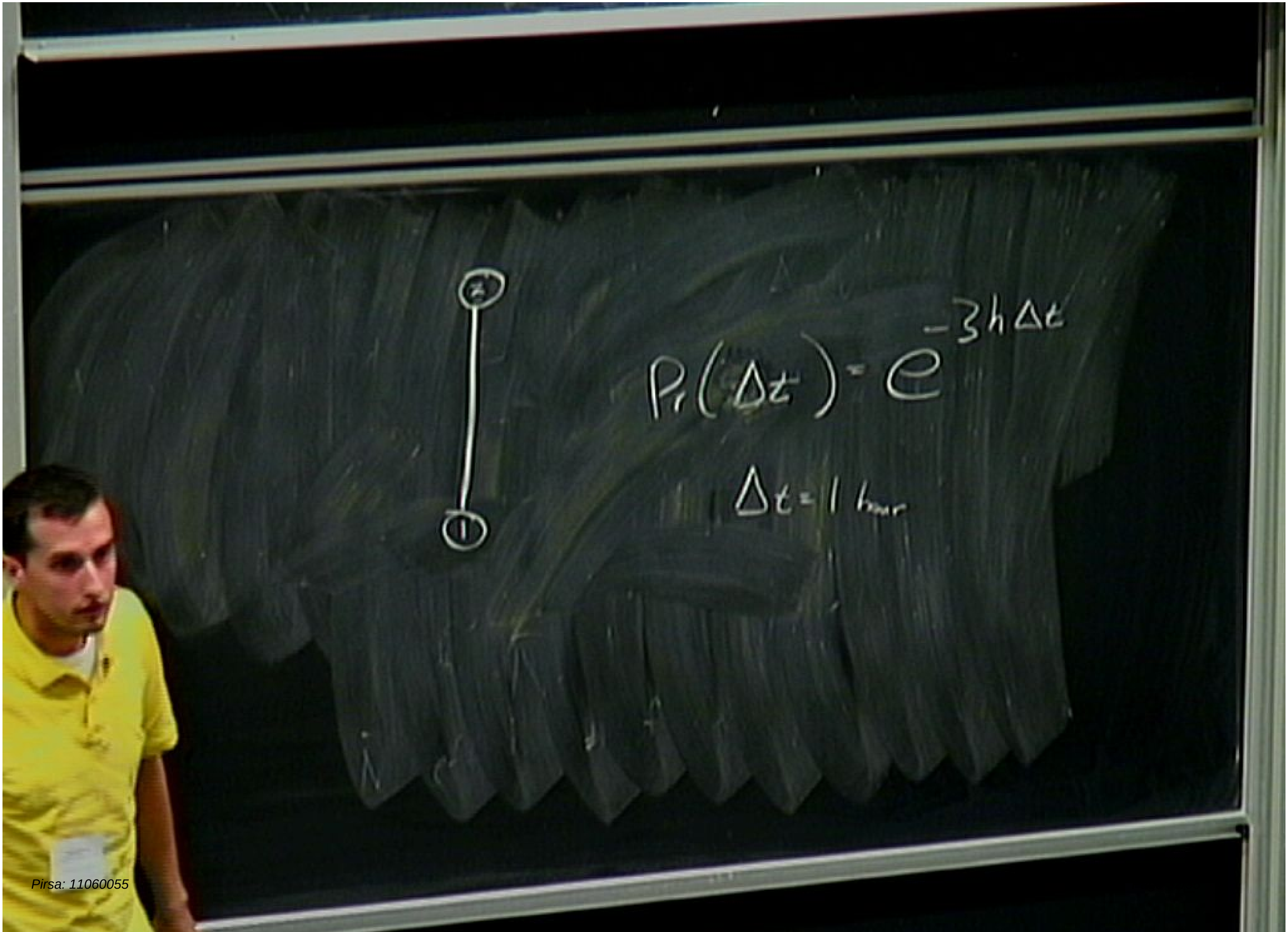
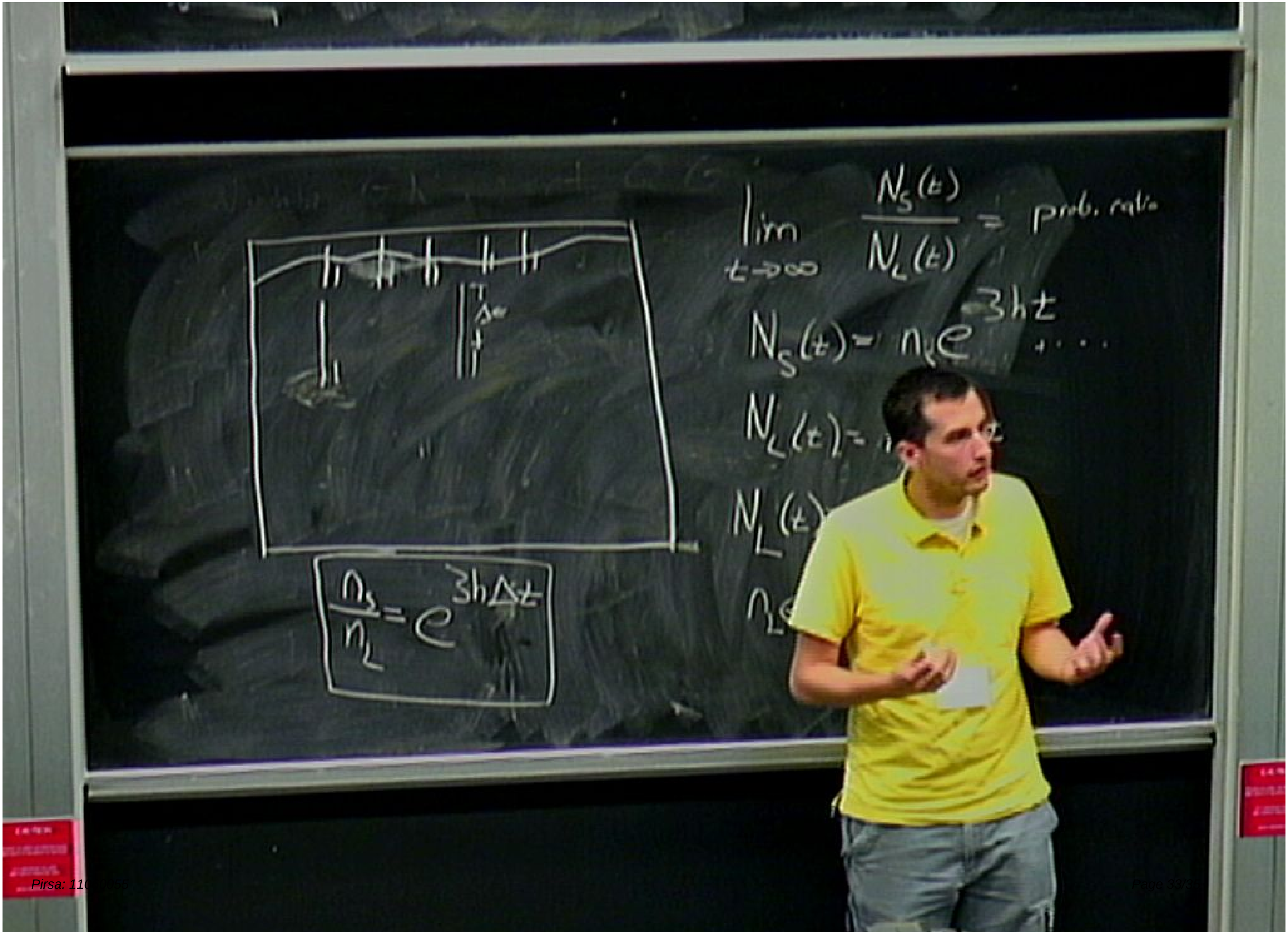

1

$$P_r(\Delta t) = e^{-3h\Delta t}$$

$\Delta t = 1$ hour


2
1
Pr(Δt) = e^{-3hΔt}
Δt = 1 hour


lim t→∞ N_S(t)/N_L(t) = prob. ratio
N_S(t) = n_s e^{3ht} + ...
N_L(t) =
n_s/n_L = e^{3hΔt}

$$\frac{n_{SL}}{n_L} = e^{3h\Delta t}$$

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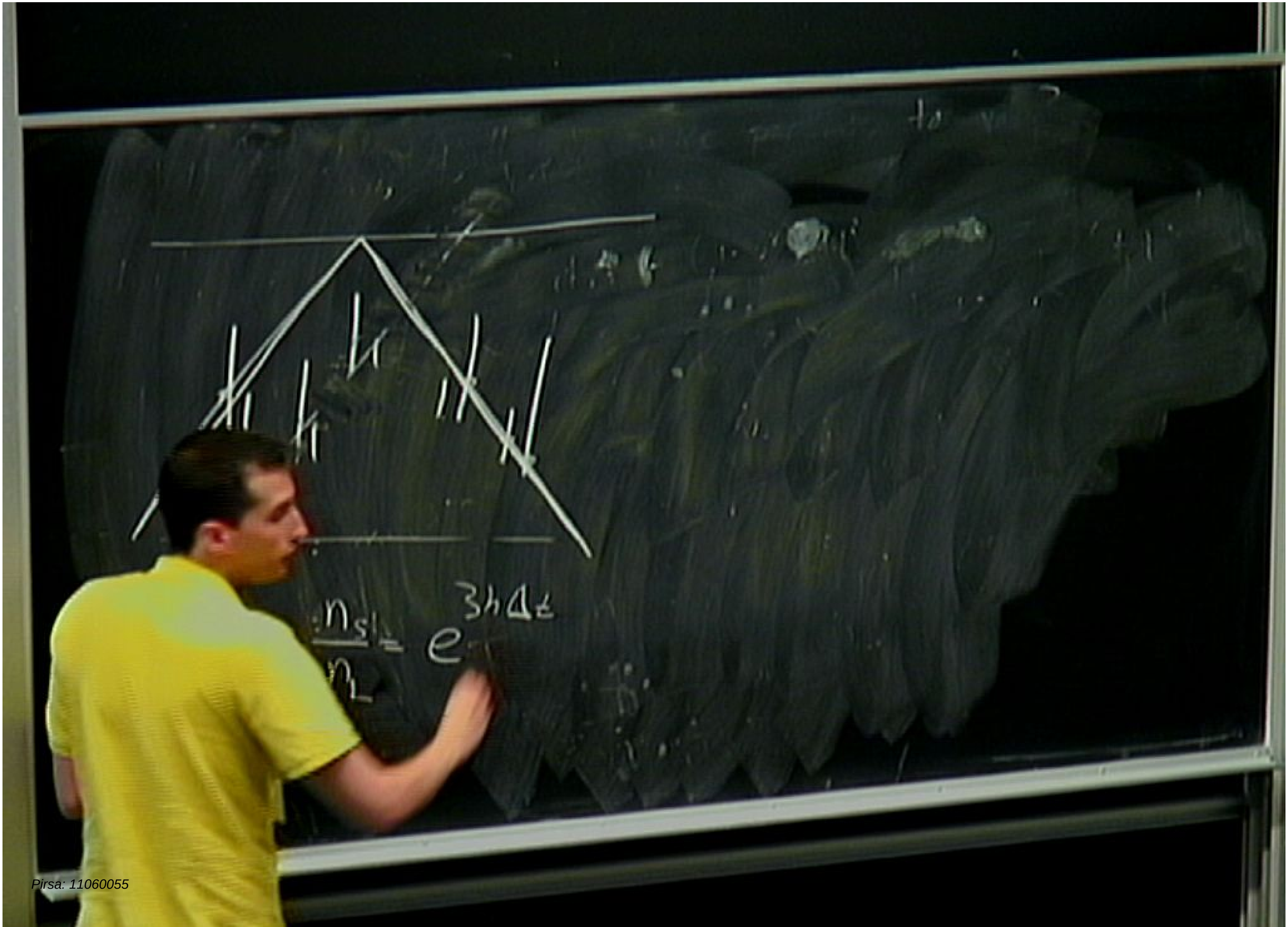
3hΔt