Title: PSI 2015/2016 String Theory - Lecture 13

Date: Feb 18, 2016 10:15 AM

URL: http://pirsa.org/16020048

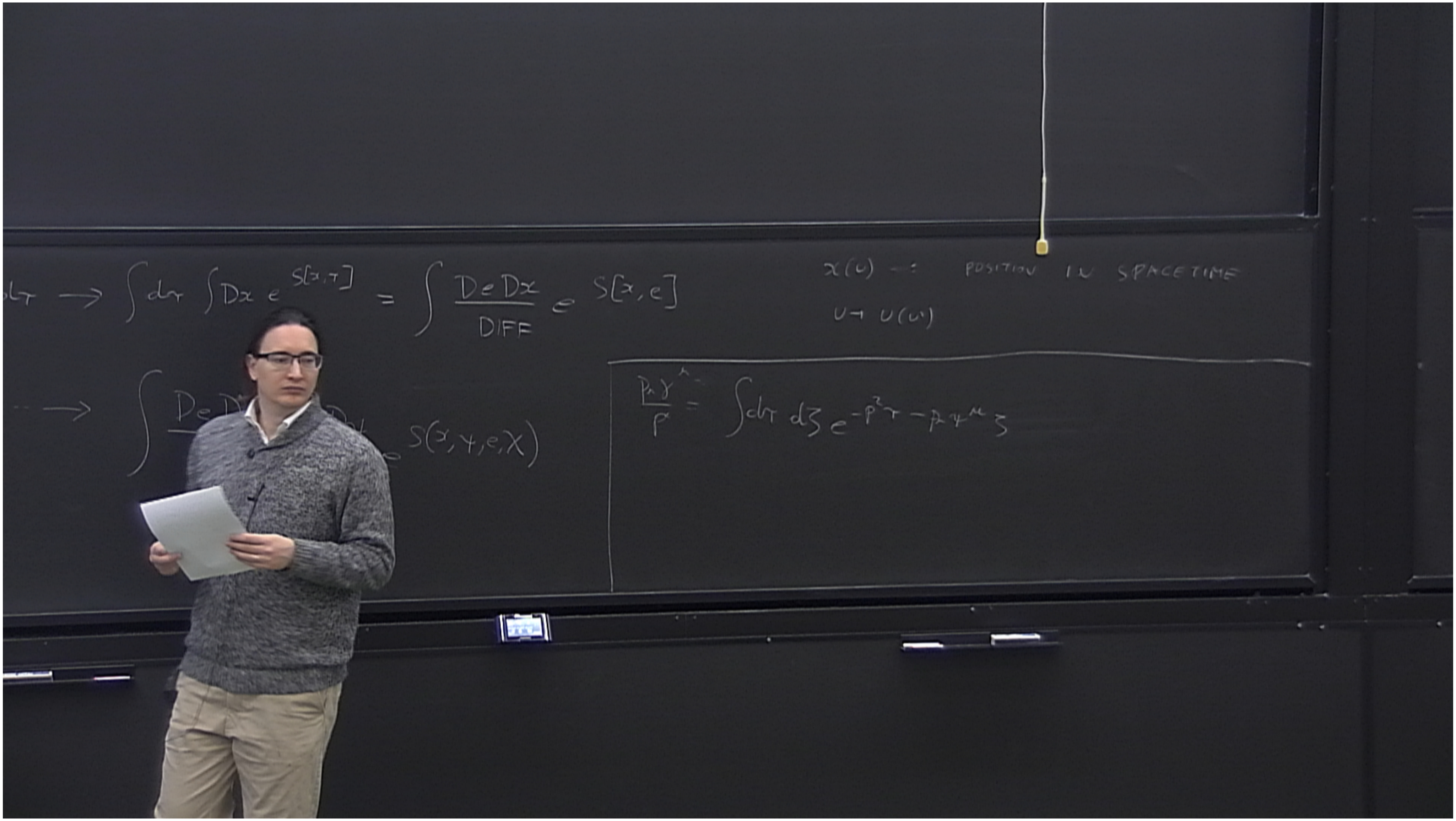
Abstract:

$$\frac{1}{p^2} \Rightarrow \int_0^\infty e^{-\tau p^2}\, d\tau \longrightarrow \int d\tau \int Dx\, e^{S[x,\tau]} = \int \frac{De\, Dx}{\mathrm{DIFF}}\, e^{S[x,e]}$$

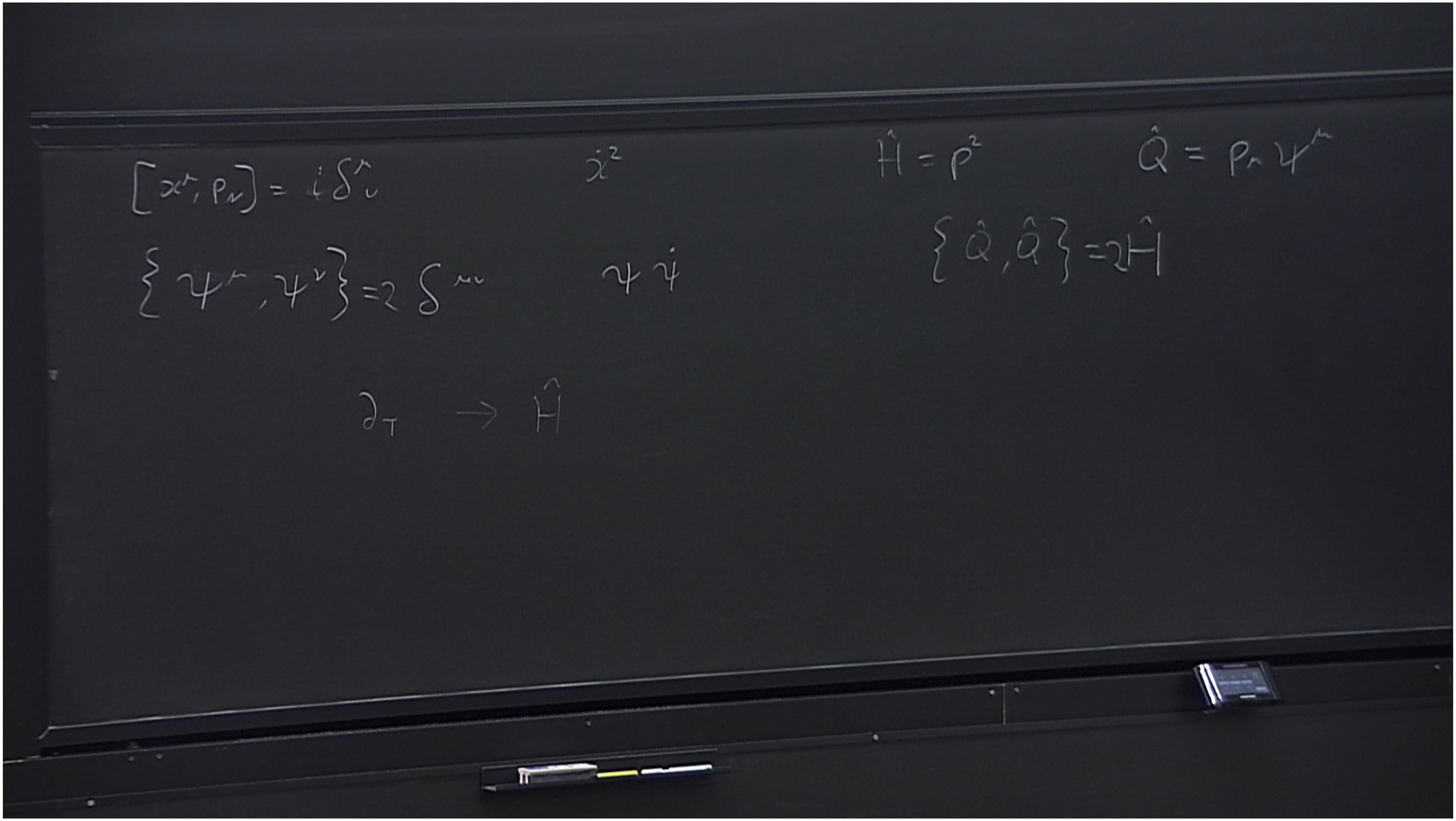
$x(u)$ -- : POSITION IN SPACETIME

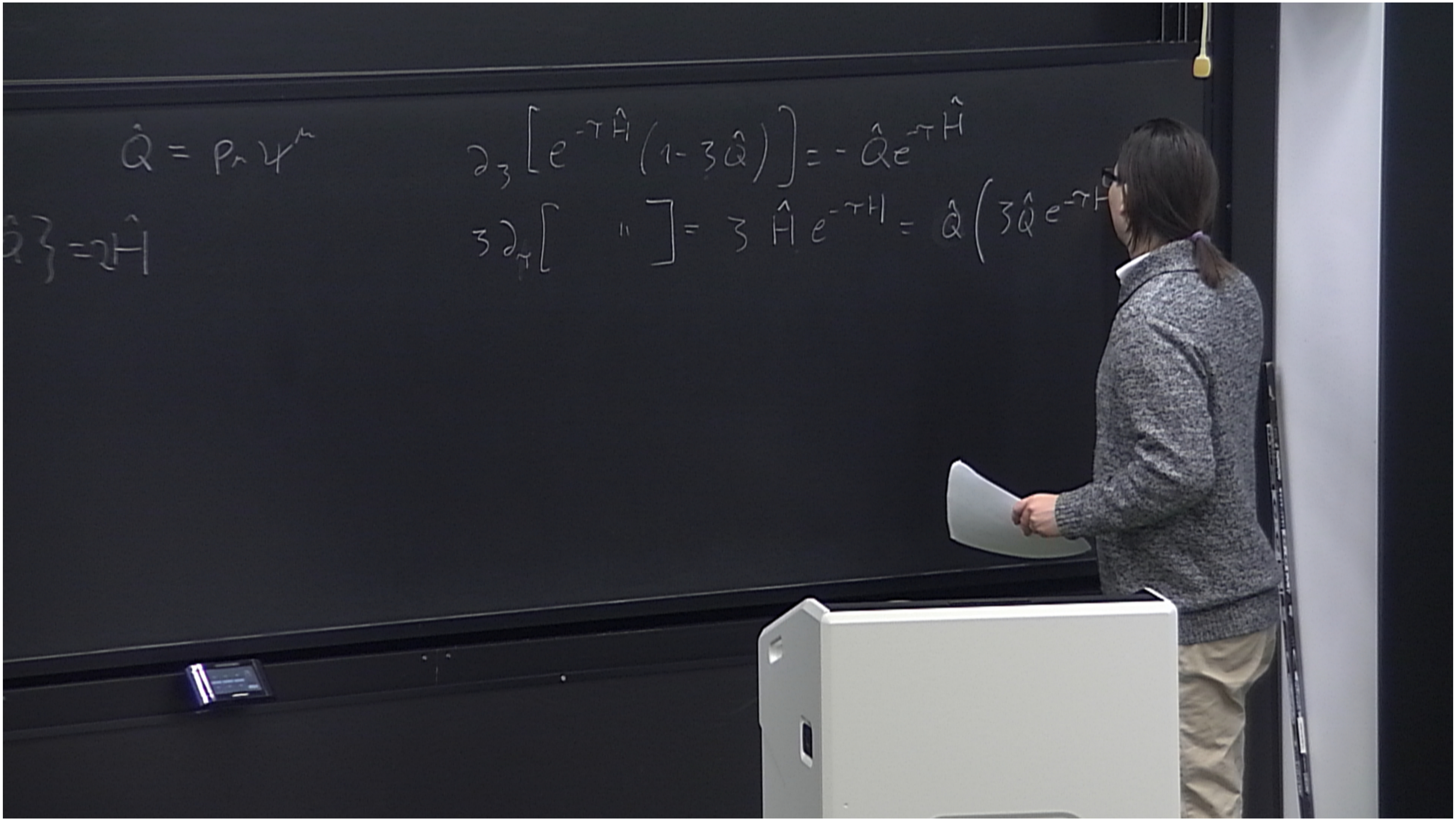
$u \to u(u')$

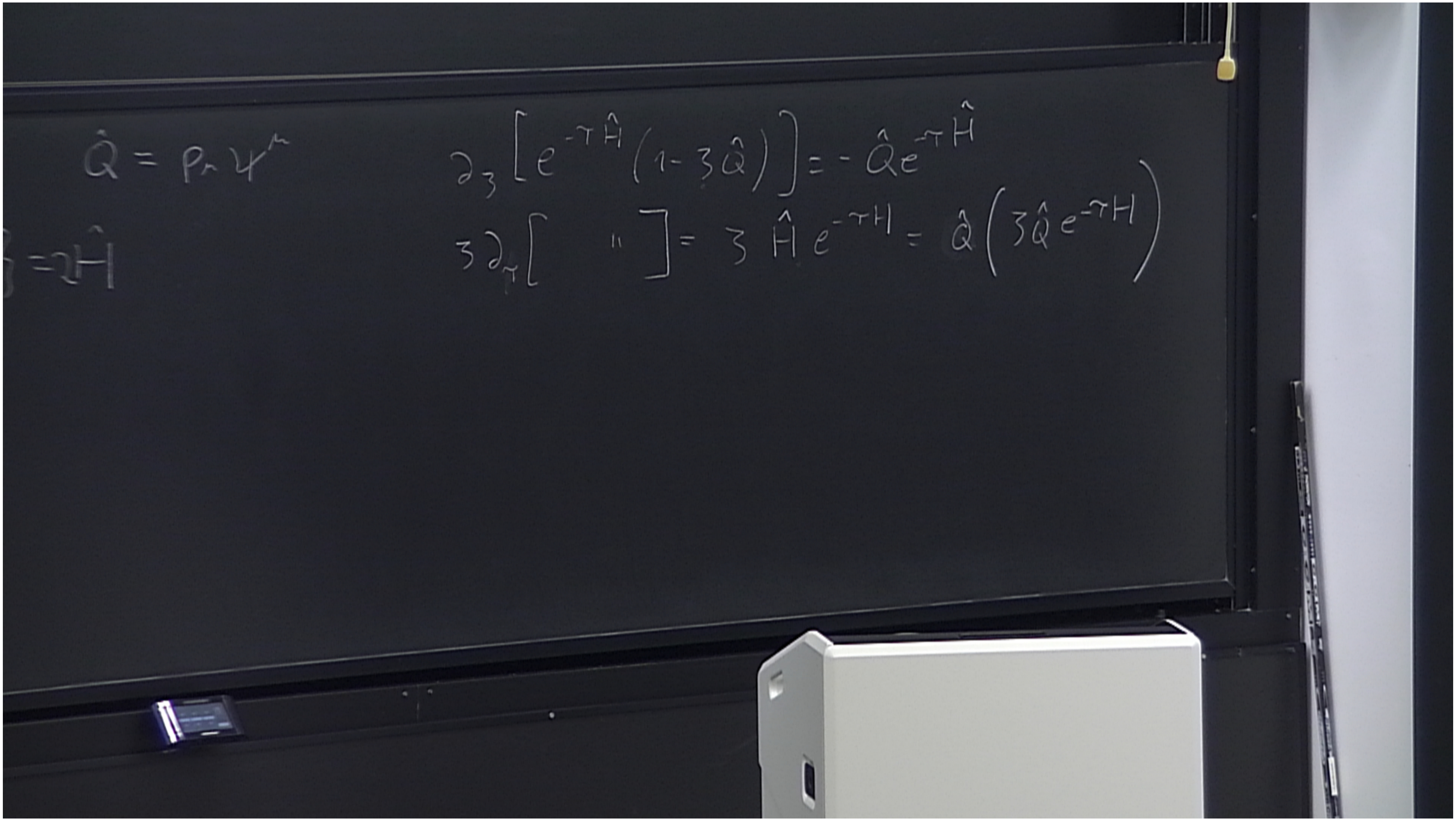
$$\frac{p_\mu \gamma^\mu}{p^2} \longrightarrow \int \frac{De\, D\chi\, Dx\, D\psi}{\mathrm{SDIFF}}\, e^{S(x,\psi,e,\chi)}$$

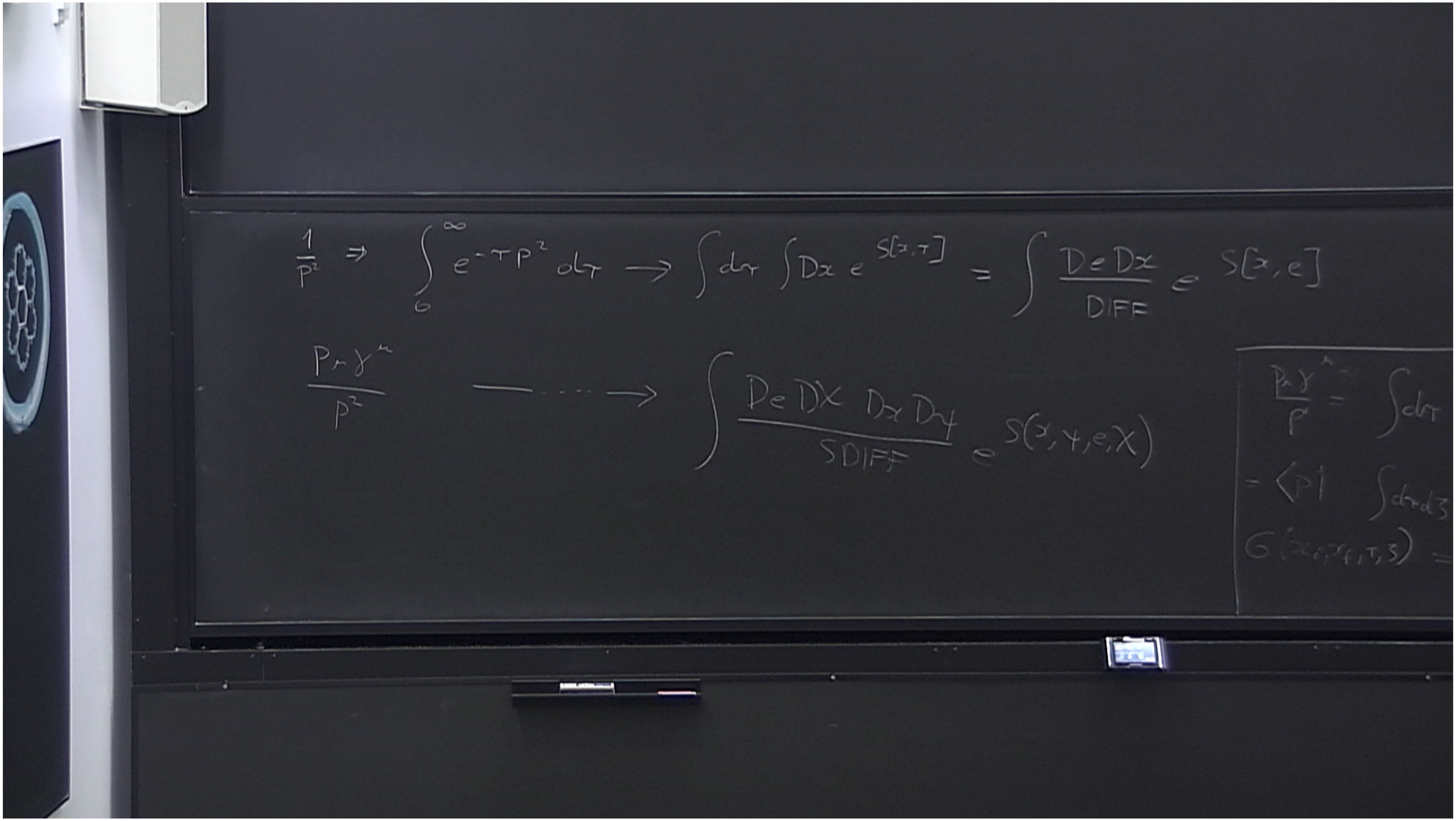


∫dτ ∫Dx e^{S[x,τ]} = ∫ DeDx/DIFF e^{S[x,e]}
x(u) — POSITION IN SPACETIME
u → u(u')
S(x,ψ,e,χ)
p_μγ^μ/p² = ∫dτ dζ e^{-p²τ - p_μγ^μ ζ}


$[x^\mu, p_\nu] = i\delta^\mu_\nu$
$\dot{x}^2$
$\hat{H} = p^2$
$\hat{Q} = p_\mu \psi^\mu$
$\{\hat{Q}, \hat{Q}\} = 2\hat{H}$
$\{\psi^\mu, \psi^\nu\} = 2\delta^{\mu\nu}$
$\psi\dot{\psi}$
$\partial_\tau \to \hat{H}$


$\hat{Q} = p_\mu \psi^\mu$
$\partial_3 \left[e^{-\tau \hat{H}} (1 - 3\hat{Q}) \right] = - \hat{Q} e^{-\tau \hat{H}}$
$3 \partial_\tau [\quad " \quad] = 3 \hat{H} e^{-\tau H} = \hat{Q} (3 \hat{Q} e^{-\tau H}$
$\} = 2\hat{H}$


$\hat{Q} = p_\mu \psi^\mu$
$\partial_3 \left[e^{-\tau \hat{H}} (1 - 3\hat{Q}) \right] = -\hat{Q} e^{-\tau \hat{H}}$
$= 2\hat{H}$
$3 \partial_\tau [\;\; " \;\;] = 3 \hat{H} e^{-\tau H} = \hat{Q} \left(3 \hat{Q} e^{-\tau H} \right)$


$\frac{1}{p^2} \Rightarrow \int_0^\infty e^{-\tau p^2} d\tau \longrightarrow \int d\tau \int Dx\, e^{S[x,\tau]} = \int \frac{De\, Dx}{DIFF} e^{S[x,e]}$
$\frac{p_\mu \gamma^\mu}{p^2} \longrightarrow \int \frac{De\, DX\, Dx\, D\psi}{SDIFF} e^{S(x,\psi,e,X)}$
$\frac{p_\mu \gamma^\mu}{p^2} = \int d\tau$
$= \langle p|$ $\int d\tau d\zeta$
$G(x_i, x_f, \tau, \zeta) =$

$$\frac{DeDx}{\mathrm{DIFF}} e^{S[x,e]}$$

$x(u)$ --: POSITION IN SPACETIME

$u \to u(u')$

(x, e, X)

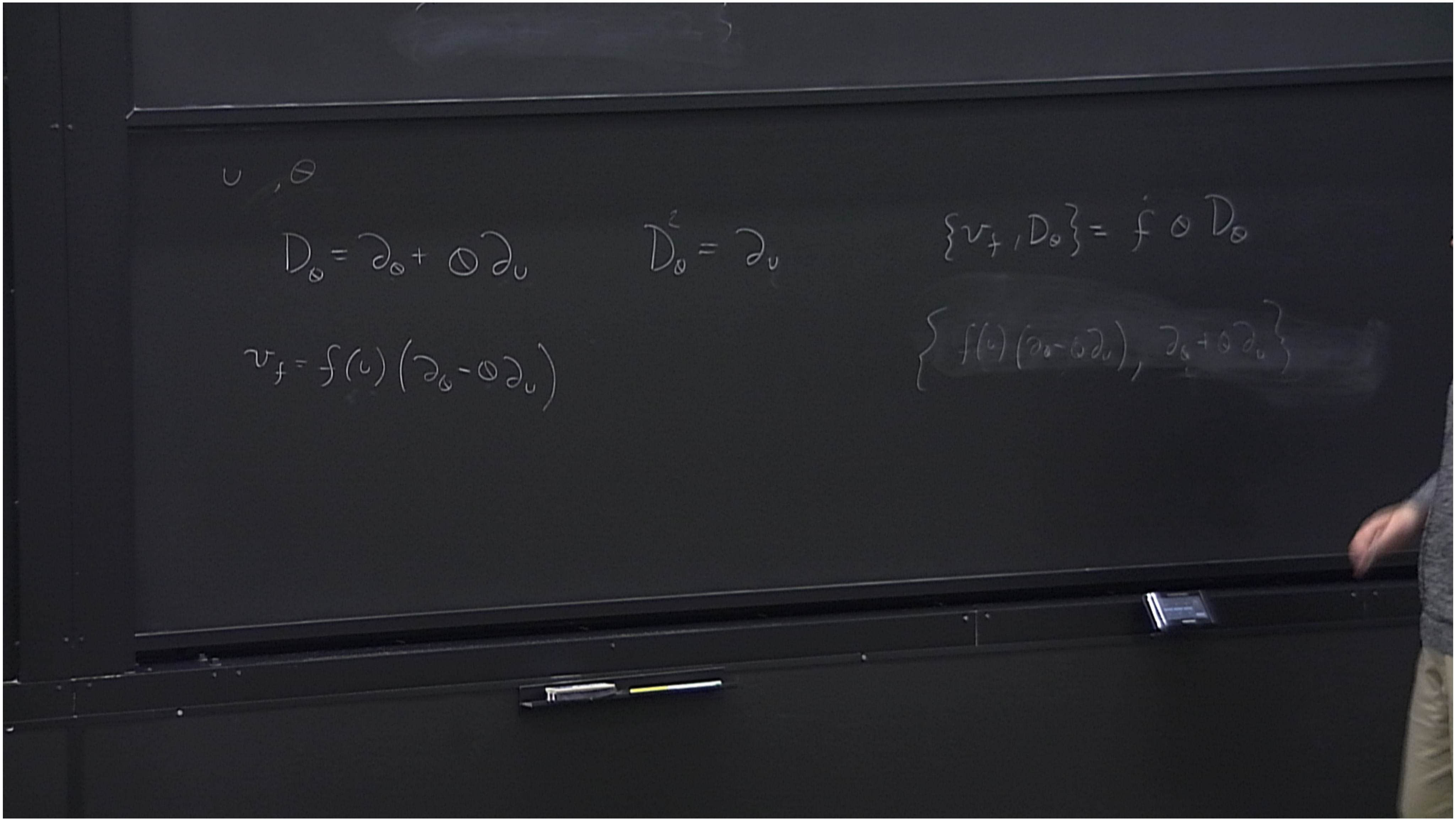
$$\frac{p_\mu \gamma^\mu}{p^2} = \int d\tau\, d\zeta\, e^{-p^2\tau - p_\mu \gamma^\mu \zeta}$$

τ "PROPER TIME"

ζ "PROPER SUPER-TIME"

$$= \langle p | \int d\tau\, d\zeta\, e^{-\tau \hat{H} - \zeta \hat{Q}} | p \rangle$$

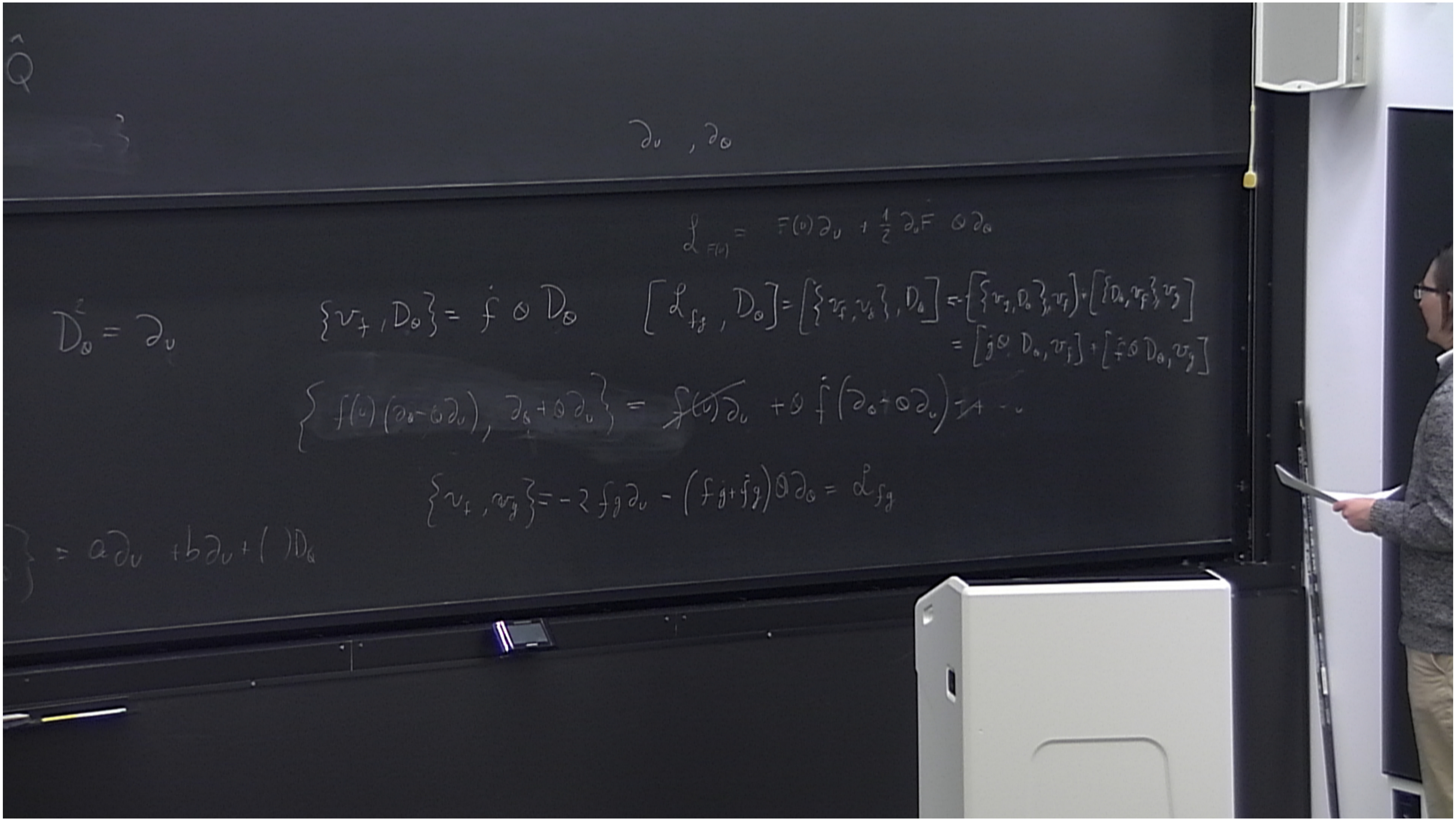
$$G(x_i, x_f, \tau, \zeta) = \langle x_f | e^{-\tau \hat{H} - \zeta \hat{Q}} | x_i \rangle$$

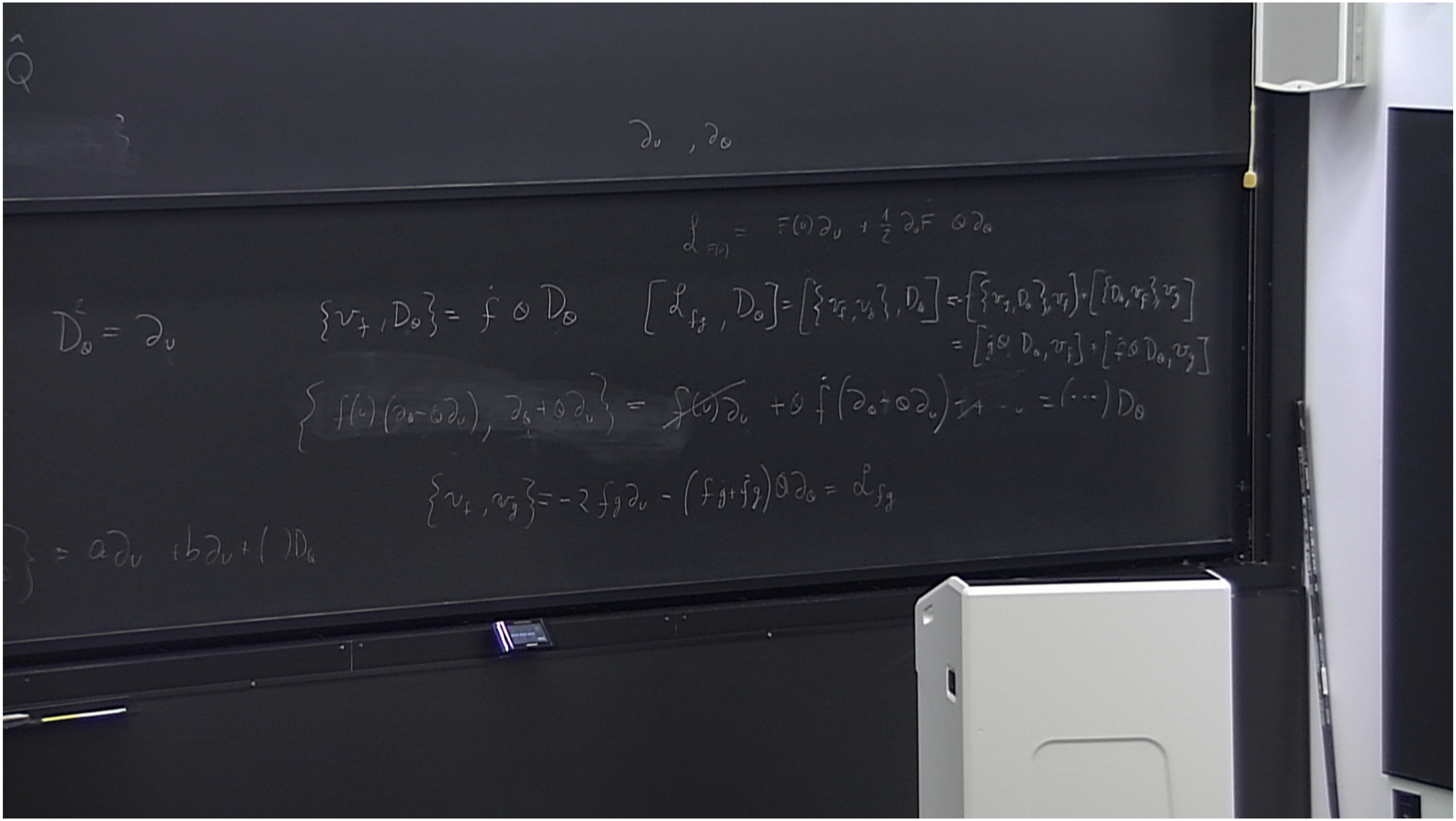

u, θ
$D_\theta = \partial_\theta + \theta \partial_u$
$D_\theta^2 = \partial_u$
$\{v_f, D_\theta\} = f' \theta D_\theta$
$v_f = f(u)(\partial_\theta - \theta \partial_u)$
$\{f(u)(\partial_\theta - \theta\partial_u), \partial_\theta + \theta \partial_u\}$

$$D_\theta^2 = \partial_u$$

$$\{\nu_f, D_\theta\} = \dot{f}\,\theta\, D_\theta$$

$$\{f(u)(\partial_\theta - \theta\partial_u), \partial_\theta + \theta\partial_u\} = \cancel{f(u)\partial_u} + \theta \dot{f}(\partial_\theta + \theta\partial_u) \cancel{+ f\partial_u}$$


∂_v , ∂_θ
D_θ² = ∂_v
{v_f , D_θ} = ḟ θ D_θ



$\partial_v \ , \partial_\theta$
$\mathcal{L}_{F(v)} = F(v)\partial_v + \frac{1}{2}\partial_v F\ \theta\partial_\theta$
$D_\theta^2 = \partial_v$
$\{v_f , D_\theta\} = \dot{f}\ \theta\ D_\theta$
$[\mathcal{L}_{fg} , D_\theta] = [\{v_f, v_g\}, D_\theta]$
$\{v_f , v_g\} = -2 fg\partial_v - (f\dot{g} + \dot{f}g)\theta\partial_\theta = \mathcal{L}_{fg}$
$= a\partial_v + b\partial_v + (\ )D_\theta$

$$\partial_u \ , \partial_\theta$$

$$\int du\, d\theta$$

$$\mathcal{L}_{F(u)} = F(u)\partial_u + \frac{1}{2}\partial_u F\ \theta\partial_\theta$$

$$\{v_f, D_\theta\} = \dot{f}\ \theta\ D_\theta$$

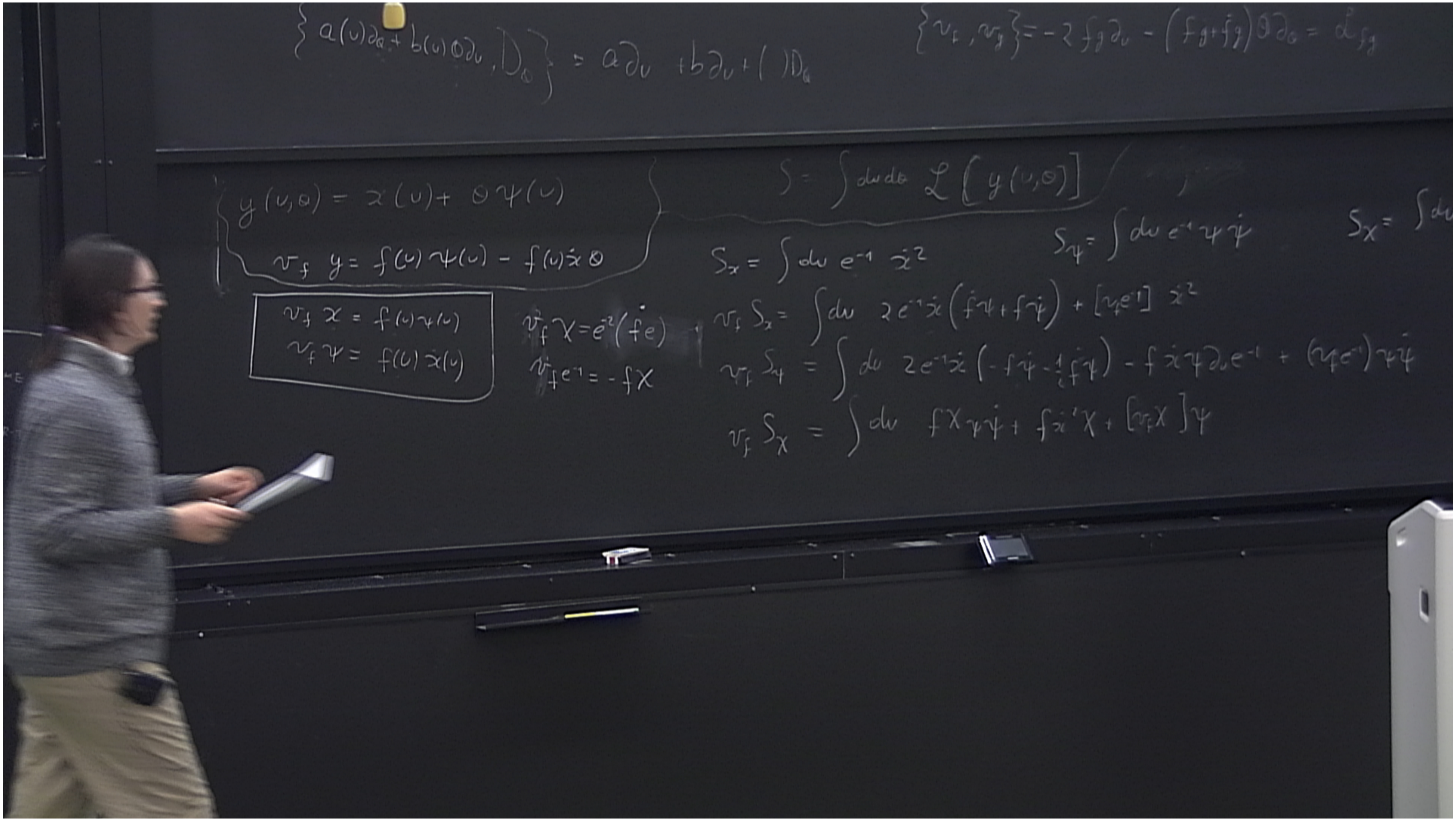
$$[\mathcal{L}_{fg}, D_\theta] = [\{v_f, v_g\}, D_\theta] = -[\{v_g, D_\theta\}, v_f] + [\{D_\theta, v_f\}, v_g]$$

$$= [\dot{g}\theta D_\theta, v_f] + [\dot{f}\theta D_\theta, v_g]$$

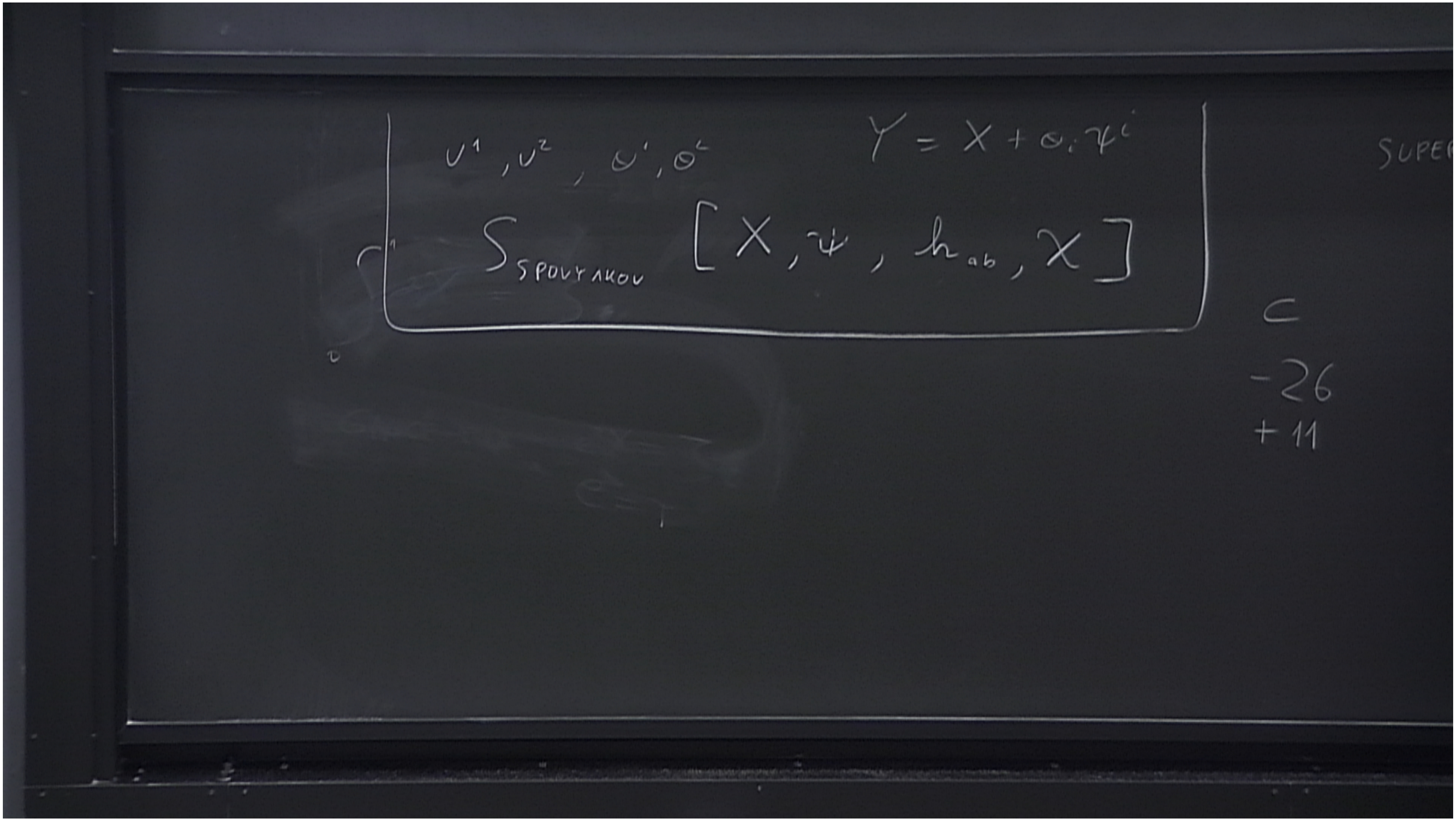
$$\{f(u)(\partial_\theta - \theta\partial_u), \partial_\theta + \theta\partial_u\} = \cancel{f(u)\partial_u} + \theta\dot{f}(\partial_\theta + \theta\partial_u) \cancel{+f} \dots = (\cdots)D_\theta$$

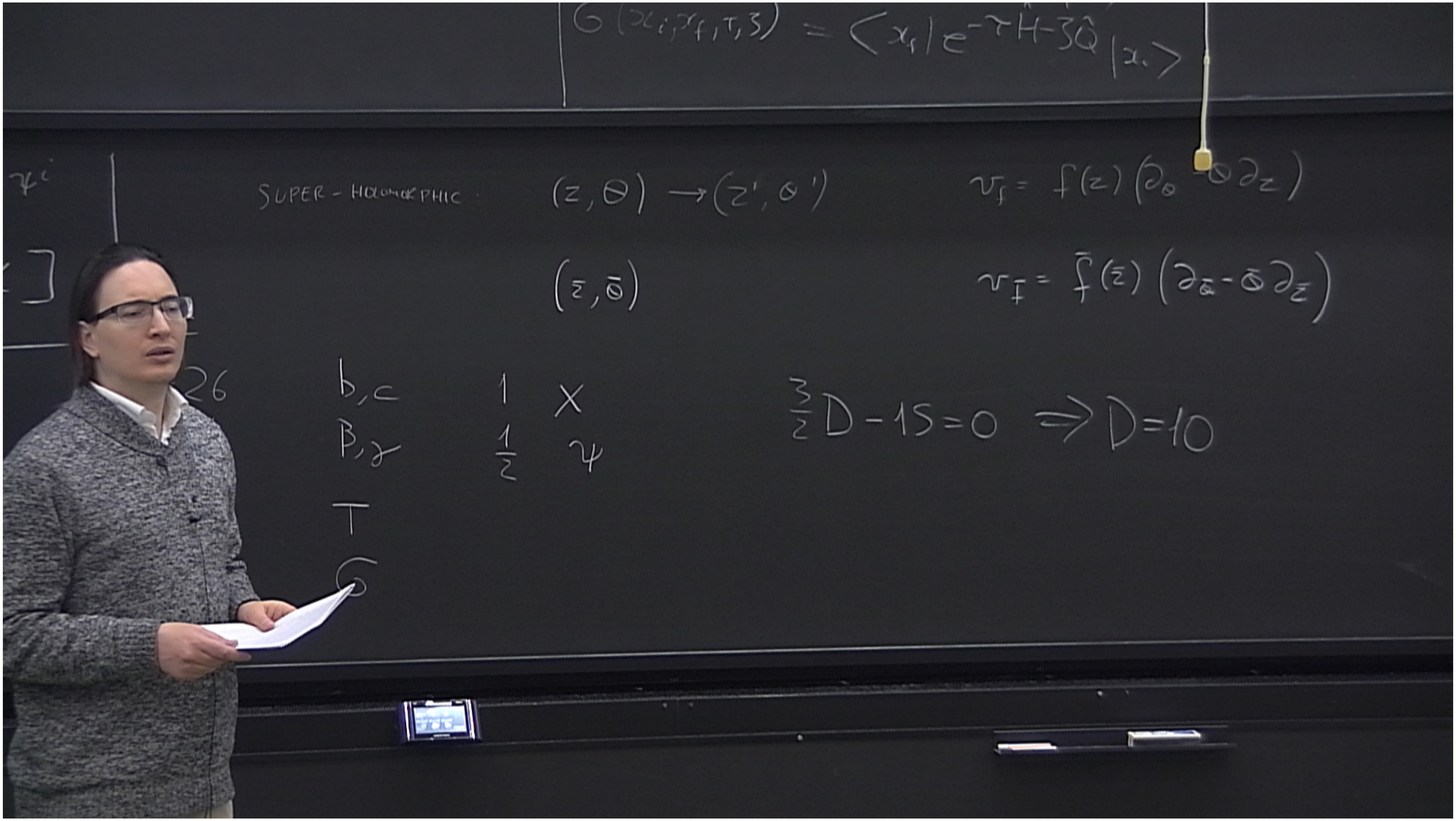
$$\{v_f, v_g\} = -2fg\partial_u - (f\dot{g} + \dot{f}g)\theta\partial_\theta = \mathcal{L}_{fg}$$

$$+(\ )D_\theta$$



y(u,θ) = x(u) + θ ψ(u)
S = ∫ du dθ L[y(u,θ)]
S_x = ∫ du e^-1 ẋ^2
S_ψ = ∫ du e^-1 ψ ψ̇
v_f x = f(u) ψ(u)
v_f ψ = f(u) ẋ(u)


$v^1, v^2, \theta^1, \theta^2$
$Y = X + \theta_i \psi^i$
$S_{SPOLYAKOV} [X, \psi, h_{ab}, \chi]$
SUPE
c
-26
+11


SUPER - HOLOMORPHIC
(z, θ) → (z', θ')
(z̄, θ̄)
b, c 1 X
β, γ 1/2 ψ
T
G
3/2 D - 15 = 0 ⇒ D = 10
26