Title: Lecture - Beautiful Papers

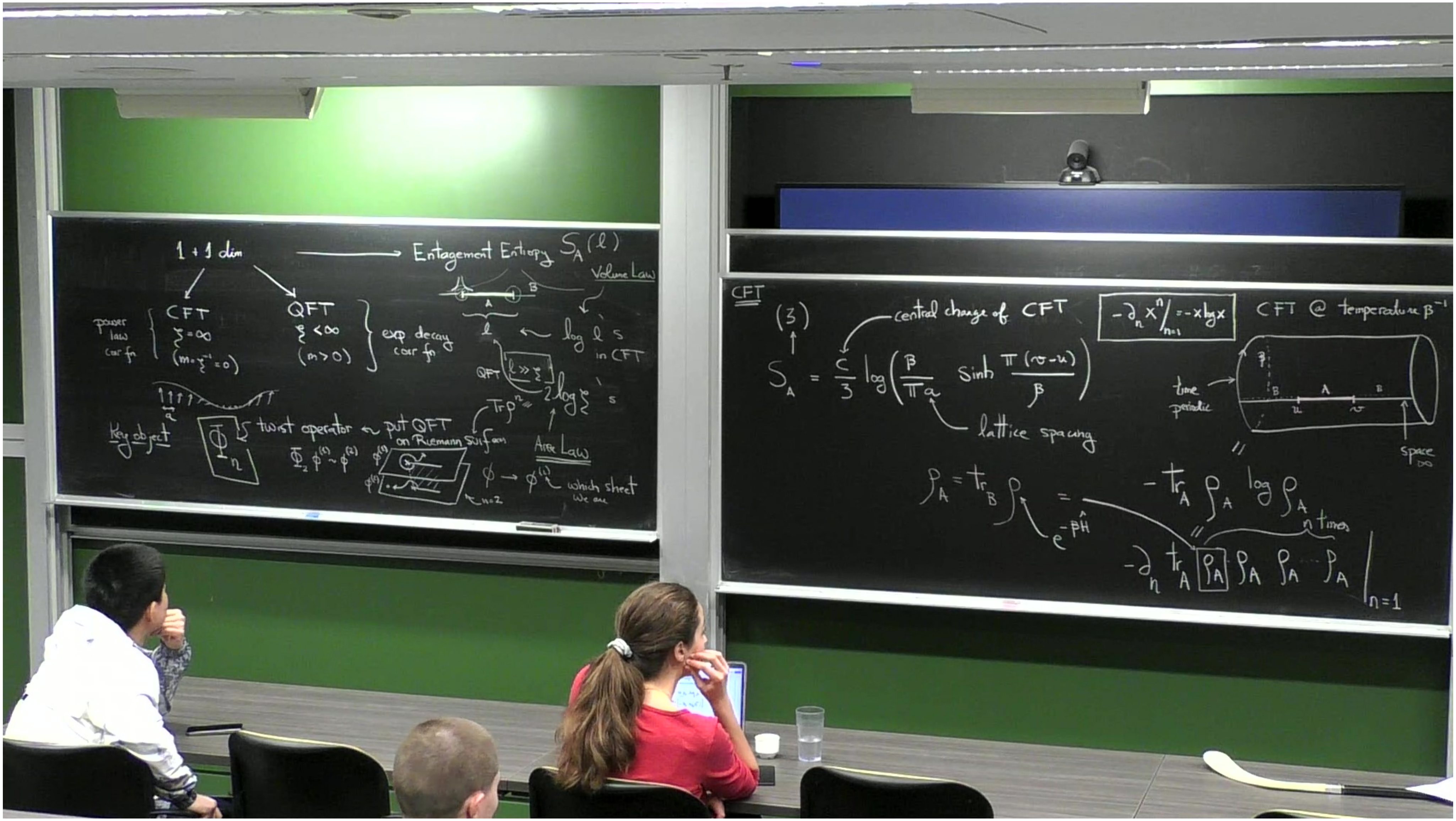
Speakers: Pedro Vieira

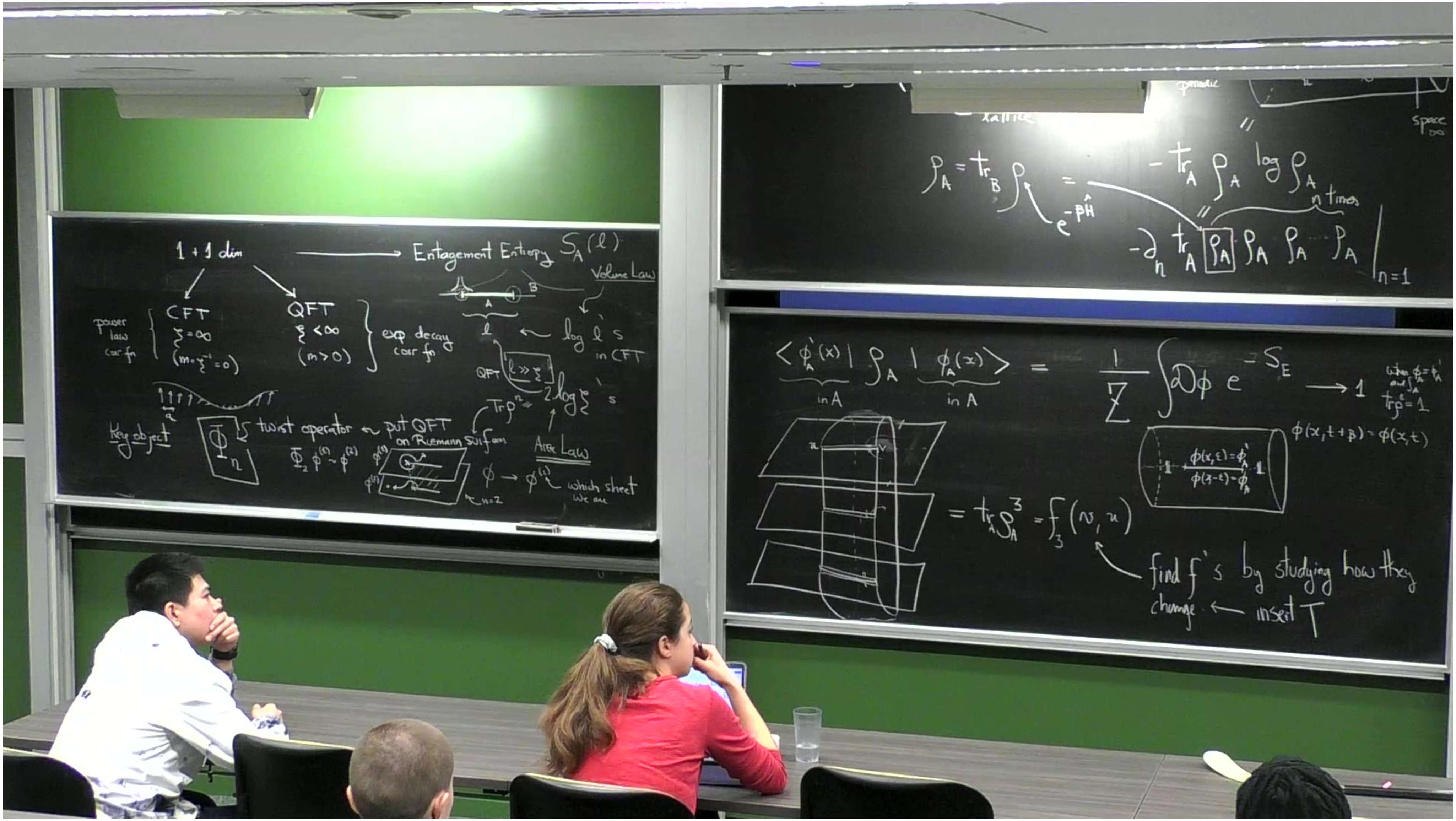
Collection/Series: Beautiful Papers - October 7, 2024 - January 31, 2025

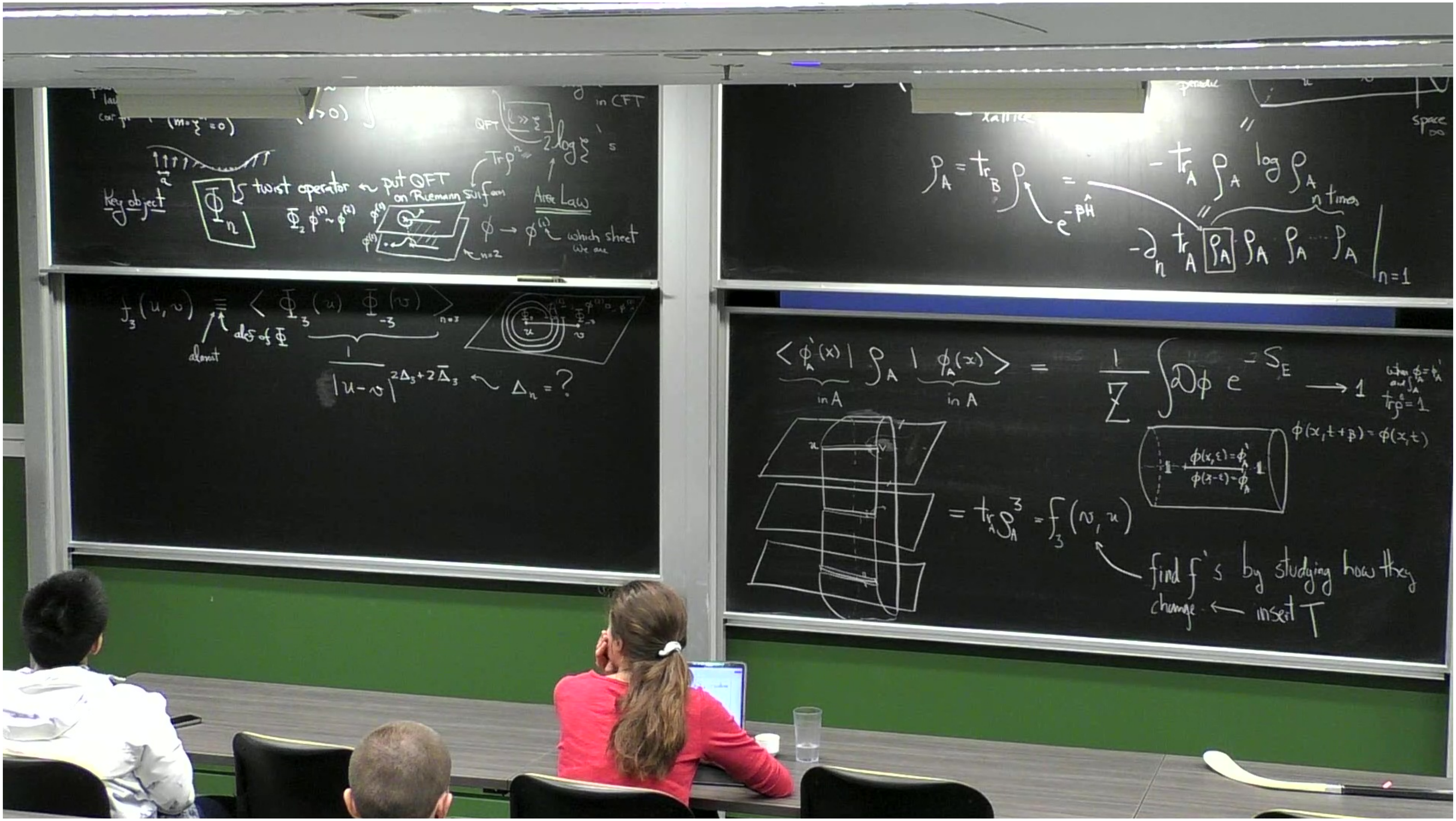
Subject: Other

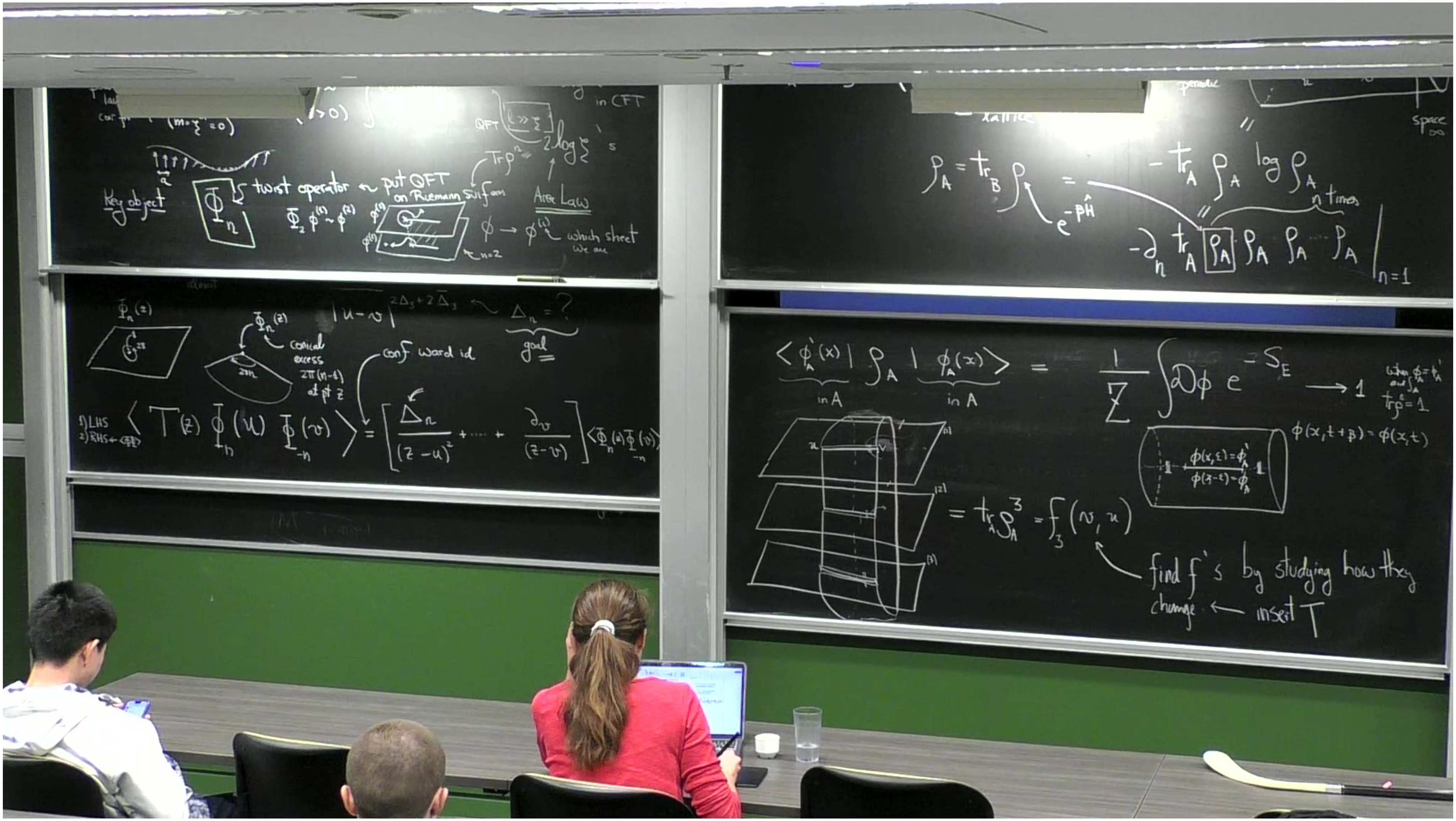
Date: January 24, 2025 - 9:15 AM

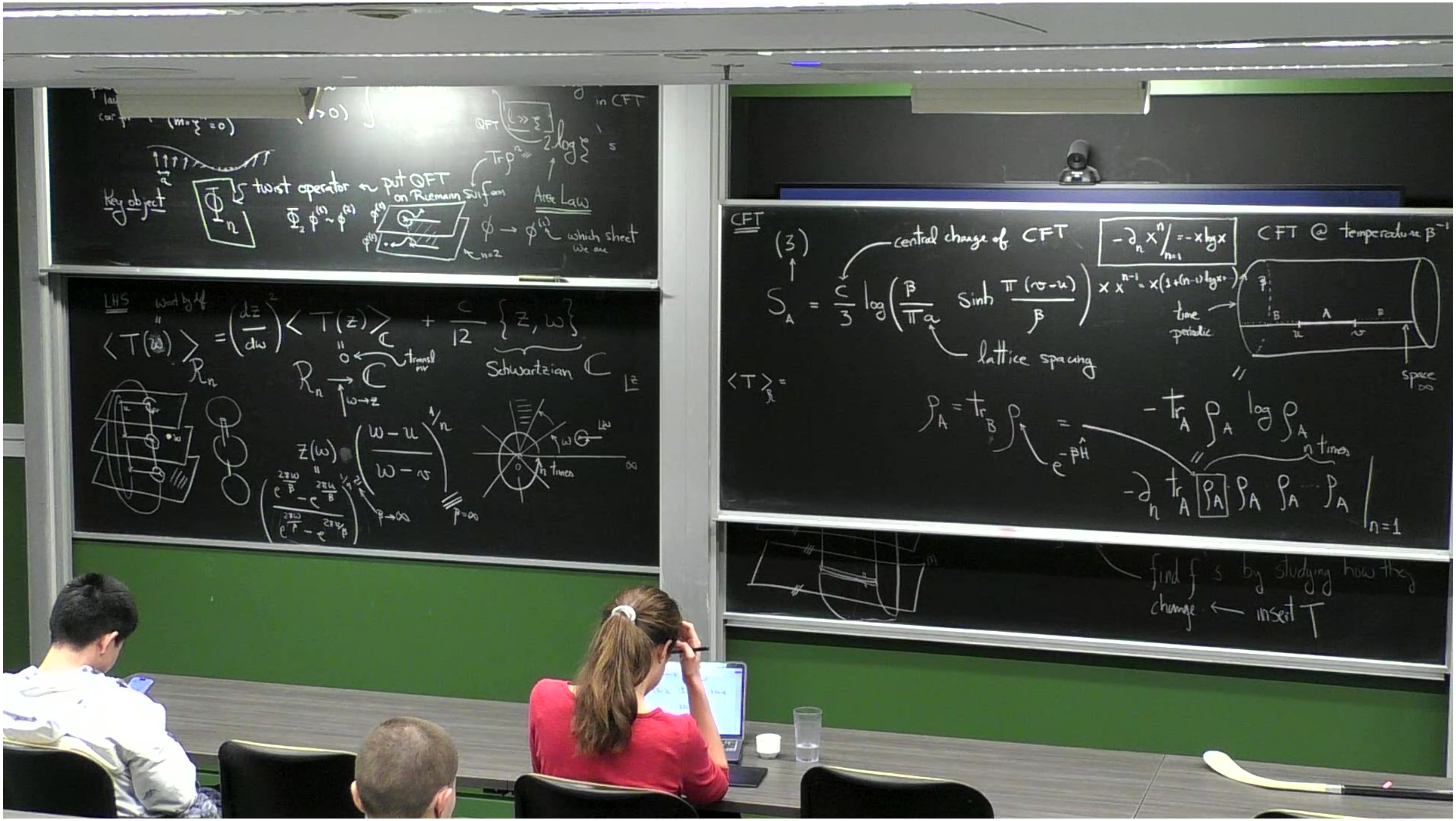
URL: https://pirsa.org/25010051

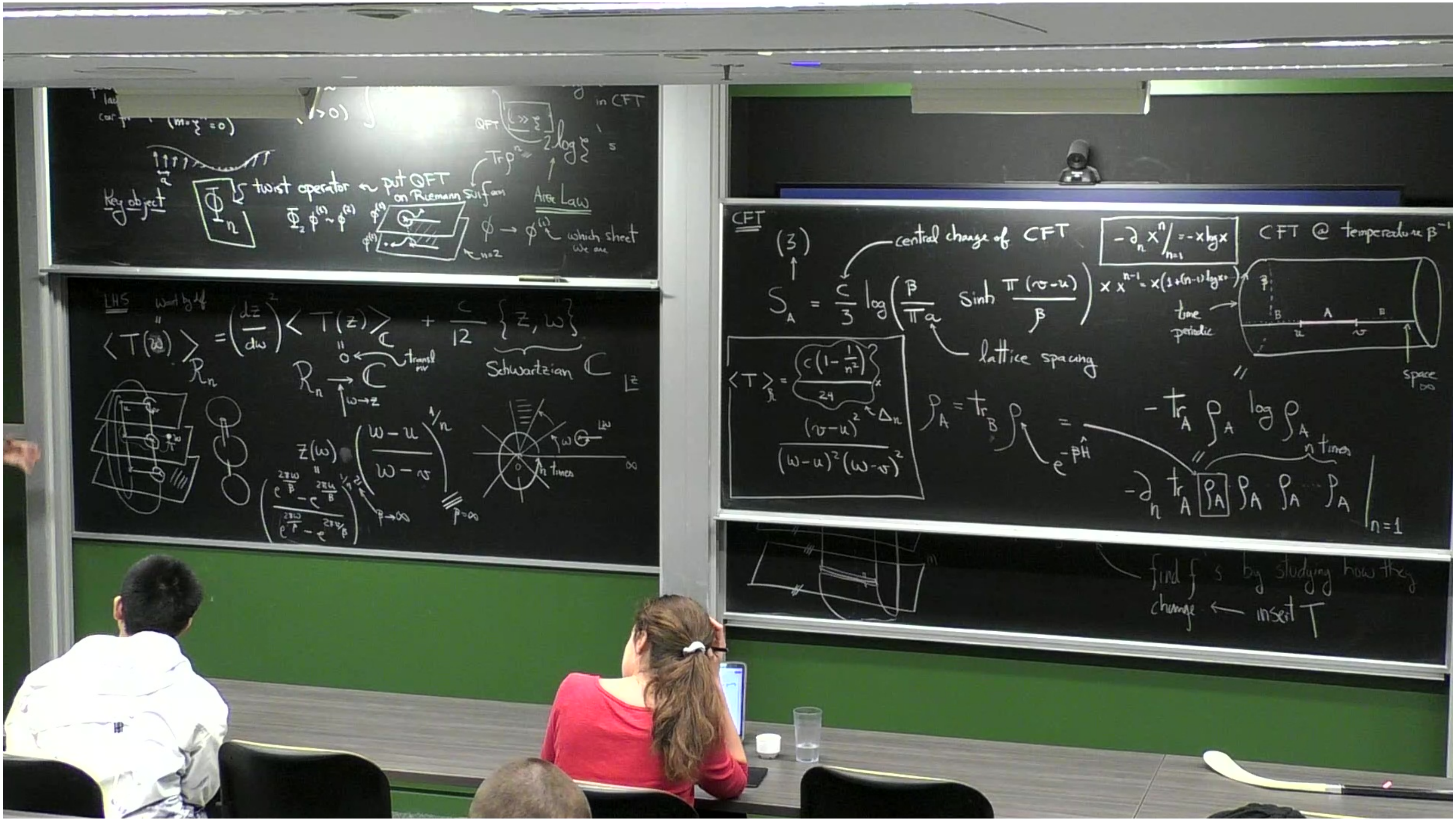

1+1 dim
Entanglement Entropy $S_A(\ell)$
Volume Law
CFT
$\xi = \infty$
$(m = \xi^{-1} = 0)$
power law cor fn
QFT
$\xi < \infty$
$(m > 0)$
exp decay cor fn
log ℓ's in CFT
$\ell \gg \xi$
$2 \log \xi$'s
Area Law
Key object
twist operator ↔ put QFT on Riemann Surface
$\phi \to \phi^{(i)}$ which sheet we are
CFT
central charge of CFT
$-\partial_n x^n|_{n=1} = -x \log x$
CFT @ temperature β^{-1}
$S_A = \frac{c}{3} \log\left(\frac{\beta}{\pi a} \sinh \frac{\pi(v-u)}{\beta}\right)$
lattice spacing
time periodic
space ∞
$\rho_A = \mathrm{tr}_B\, \rho$
$e^{-\beta \hat{H}}$
$= -\mathrm{tr}_A\, \rho_A \log \rho_A$
n times
$-\partial_n \mathrm{tr}_A\, \rho_A \rho_A \rho_A \cdots \rho_A |_{n=1}$

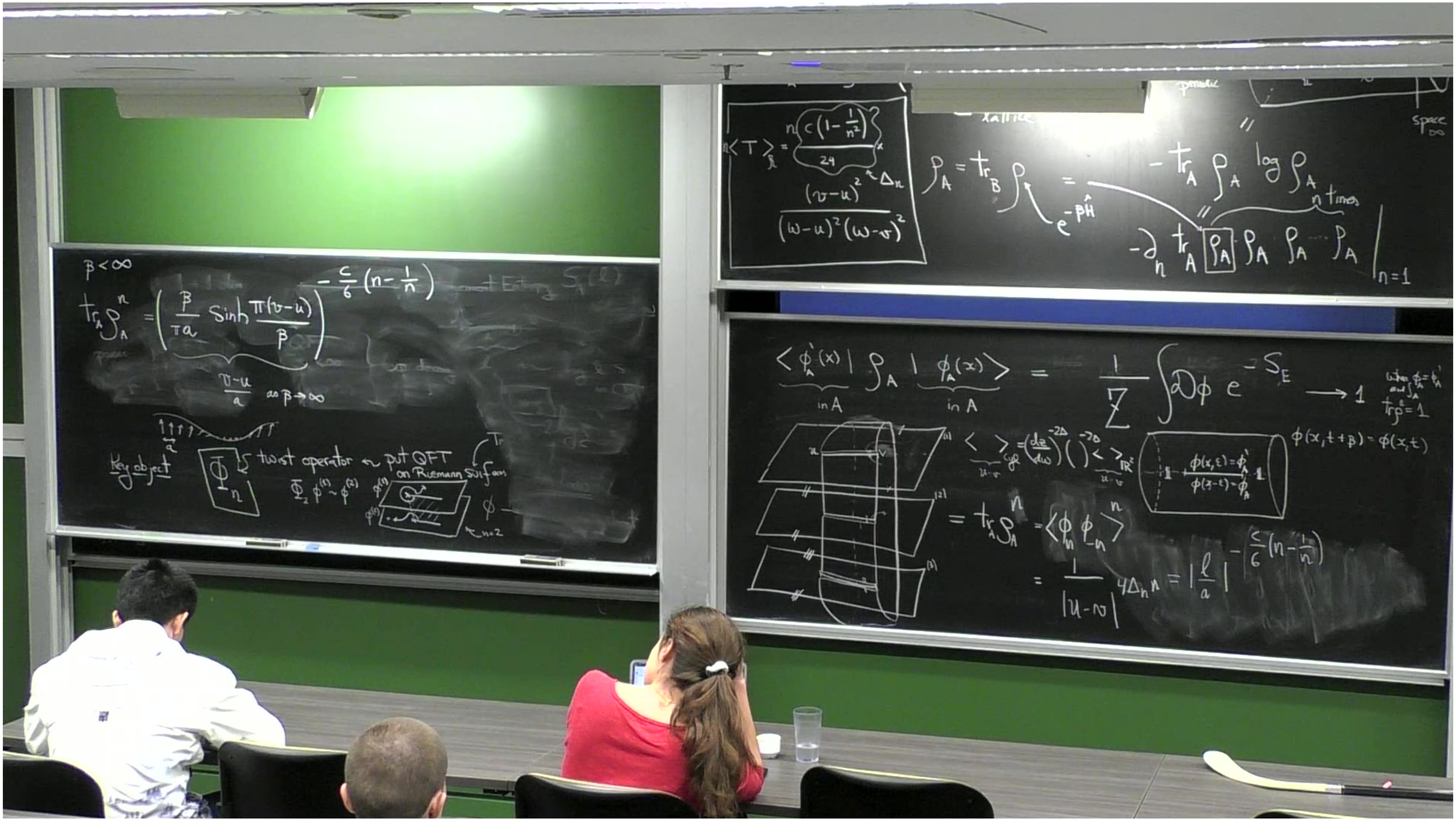

1 + 1 dim
Entagement Entropy $S_A(\ell)$
CFT
QFT
Volume Law
Key object
twist operator
put QFT on Riemann surface
Area Law
which sheet we are
find f's by studying how they change ← insert T

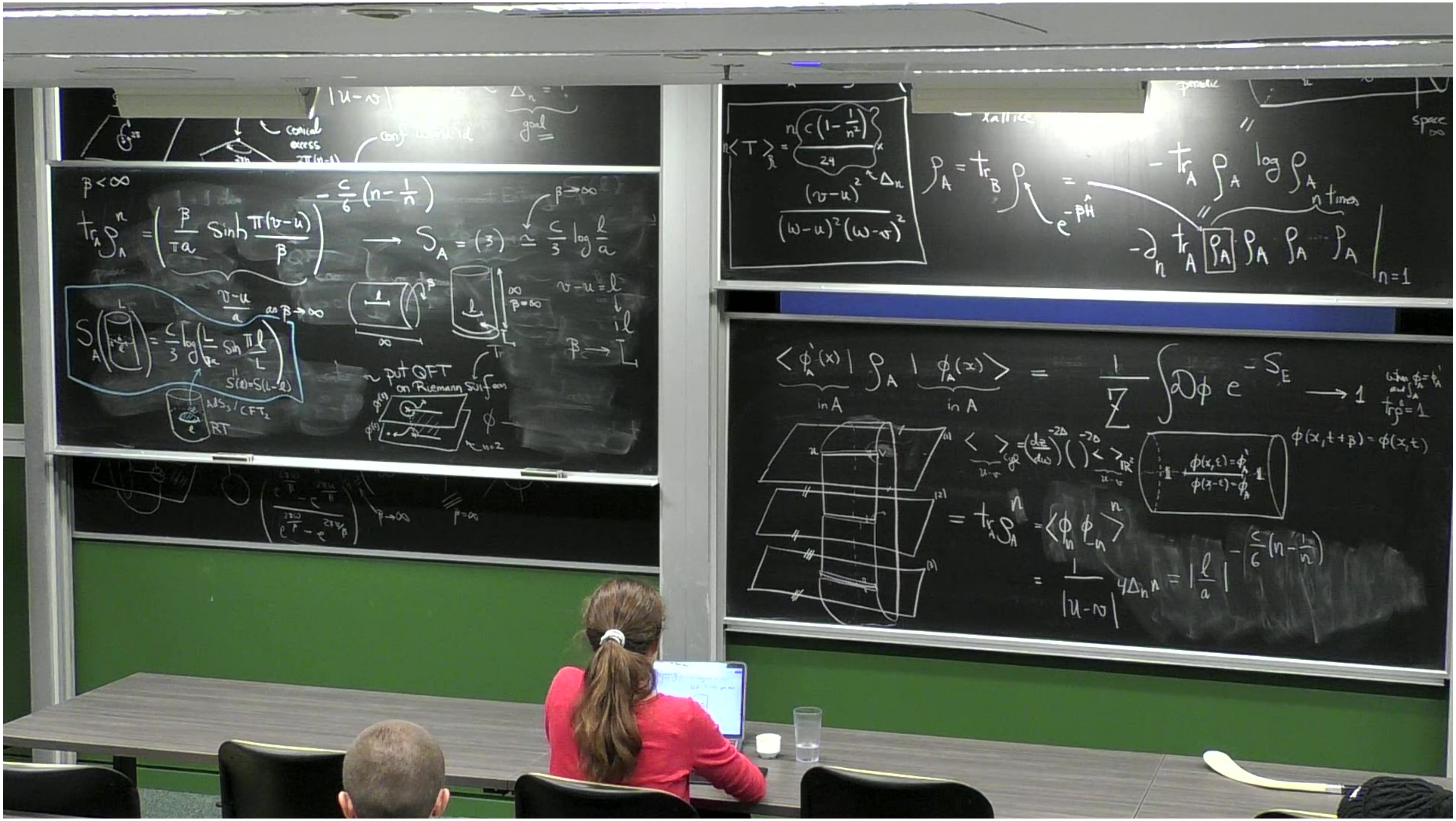


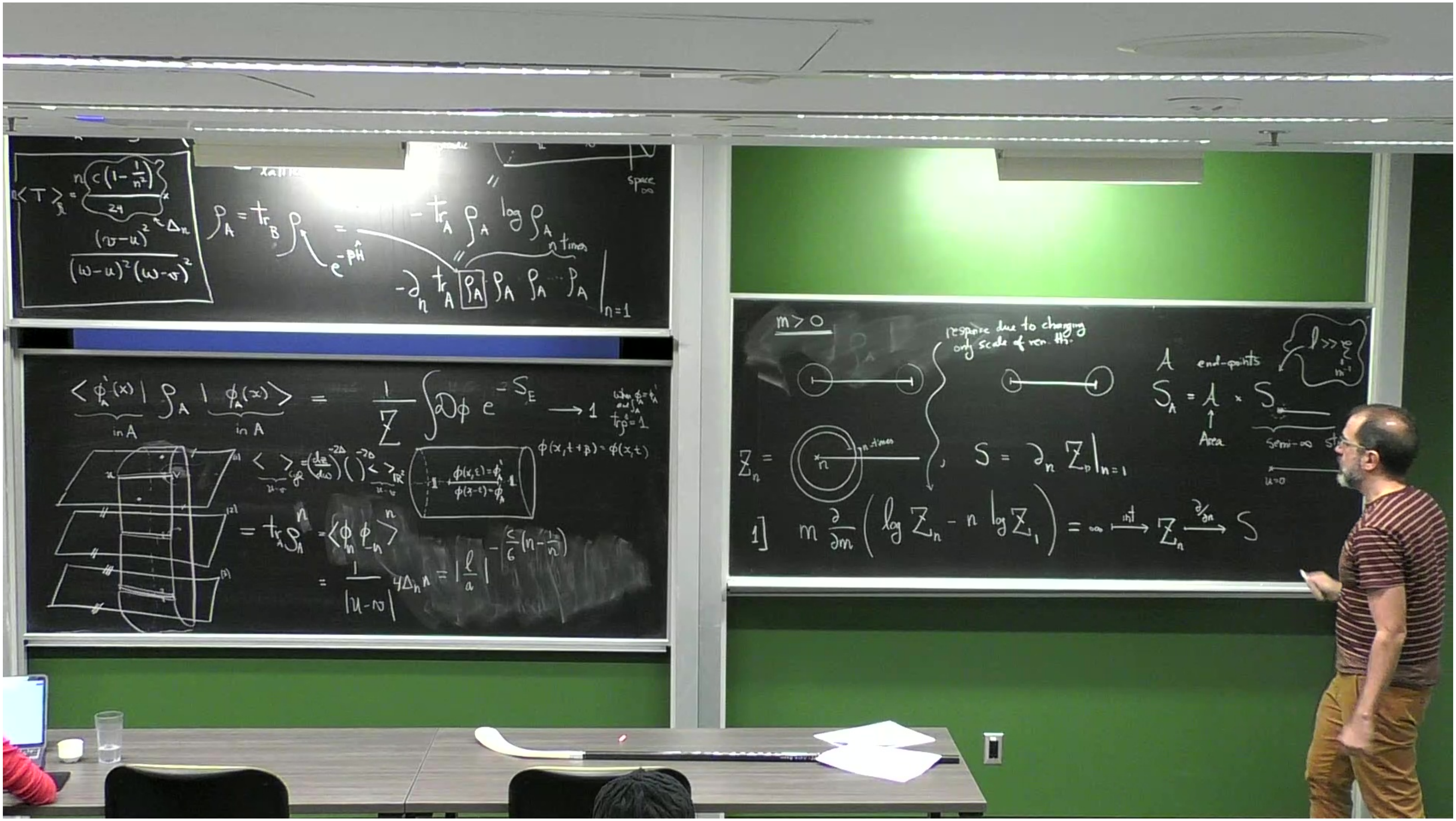

in CFT
Key object
twist operator ~ put QFT on Riemann surfaces
Area Law
which sheet we are
n=2
ρ_A = tr_B ρ
e^{-βĤ}
- tr_A ρ_A log ρ_A
n times
-∂_n tr_A ρ_A ρ_A ρ_A ... ρ_A |_{n=1}
space
conical excess 2π(n-1) at pt z
conf ward id
goal
|u-v|^{2Δ_3+2Δ̄_3} ~ Δ_n = ?
1) LHS
2) RHS
⟨T(z) Φ_n(u) Φ_{-n}(v)⟩ = [Δ_n/(z-u)^2 + ... + ∂_v/(z-v)] ⟨Φ_n(u) Φ_{-n}(v)⟩
⟨φ'_A(x)| ρ_A |φ_A(x)⟩ = 1/Z ∫Dφ e^{-S_E} → 1
in A
in A
tr ρ = 1
φ(x, t+β) = φ(x,t)
φ(x,ε) = φ'_A
φ(x,-ε) = φ_A
= tr_A ρ_A^3 = f_3(v,u)
find f's by studying how they change ← insert T

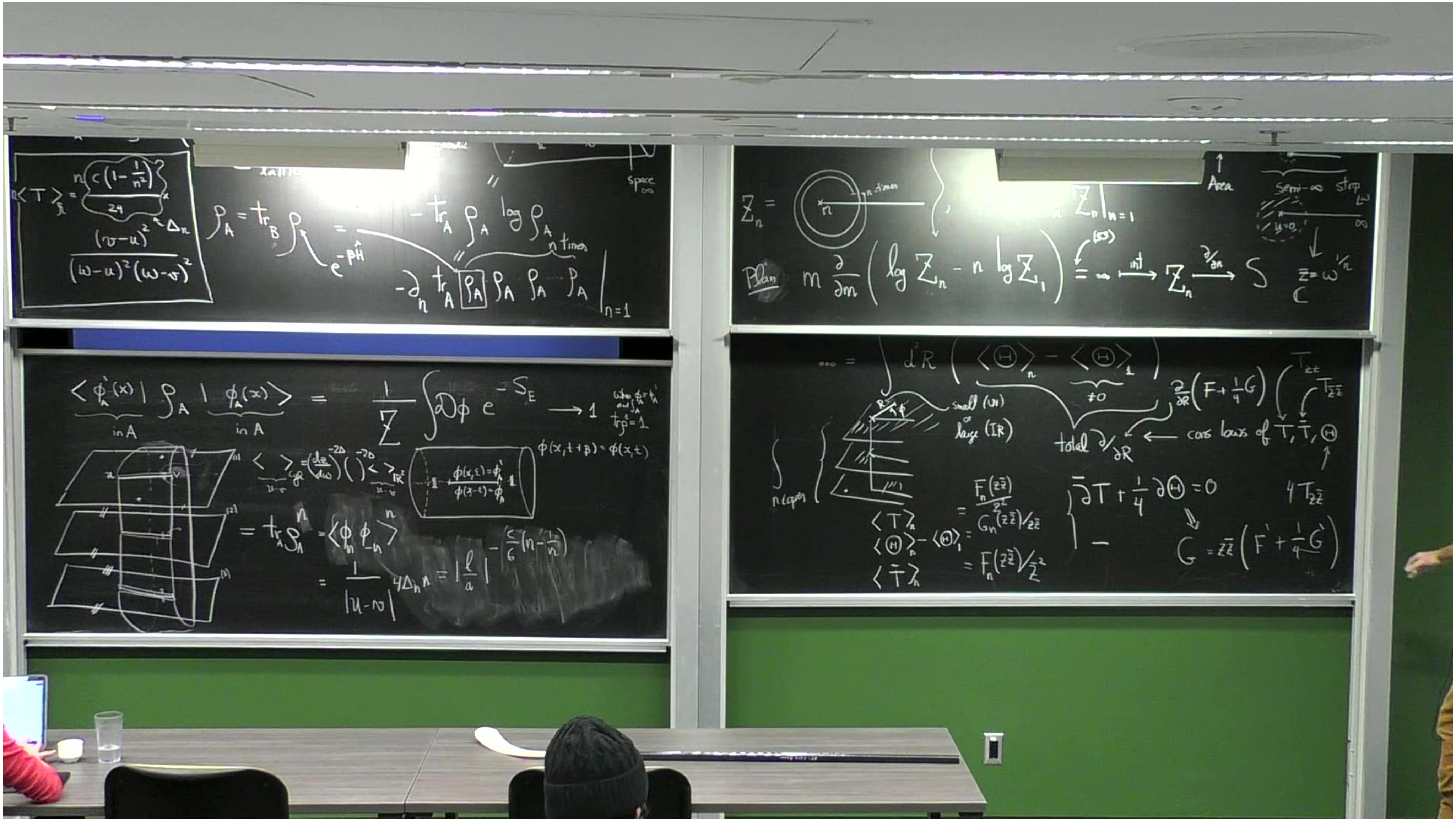

Key object
twist operator ~ put QFT on Riemann surface
Area Law
which sheet we are
n=2
LHS
$\langle T(w) \rangle = \left(\frac{dz}{dw}\right)^2 \langle T(z) \rangle_{\mathbb{C}} + \frac{c}{12}\{z, w\}$
transl inv
Schwartzian
$R_n \to \mathbb{C}$
$w \to z$
$z(w) = \left(\frac{w-u}{w-v}\right)^{1/n}$
n times
CFT
(3)
central charge of CFT
$-\partial_n x^n |_{n=1} = -x \log x$
CFT @ temperature β^{-1}
$S_A = \frac{c}{3} \log\left(\frac{\beta}{\pi a} \sinh \frac{\pi(v-u)}{\beta}\right)$
lattice spacing
time periodic
space ∞
$\rho_A = \mathrm{tr}_B\, \rho$
$e^{-\beta \hat{H}}$
$-\mathrm{tr}_A\, \rho_A \log \rho_A$
n times
$-\partial_n \mathrm{tr}_A\, \rho_A \rho_A \rho_A \cdots \rho_A |_{n=1}$
find f's by studying how they change ← insert T


in CFT
Key object
twist operator ~ put QFT on Riemann surface
Area Law
which sheet we are
LHS
Schwartzian
n times
CFT
central charge of CFT
CFT @ temperature
lattice spacing
time periodic
space
n times
find f's by studying how they change ← insert T


Key object
twist operator ~ put QFT
on Riemann surfaces
in A
in A
n times
space




m > 0
end-points
Area
space
n times
in A
n = 1


space
Area
Semi-∞ strip
Plan
in A
in A
small (UV)
large (IR)
total ∂/∂R
cons laws of T, T̄, Θ
n copies