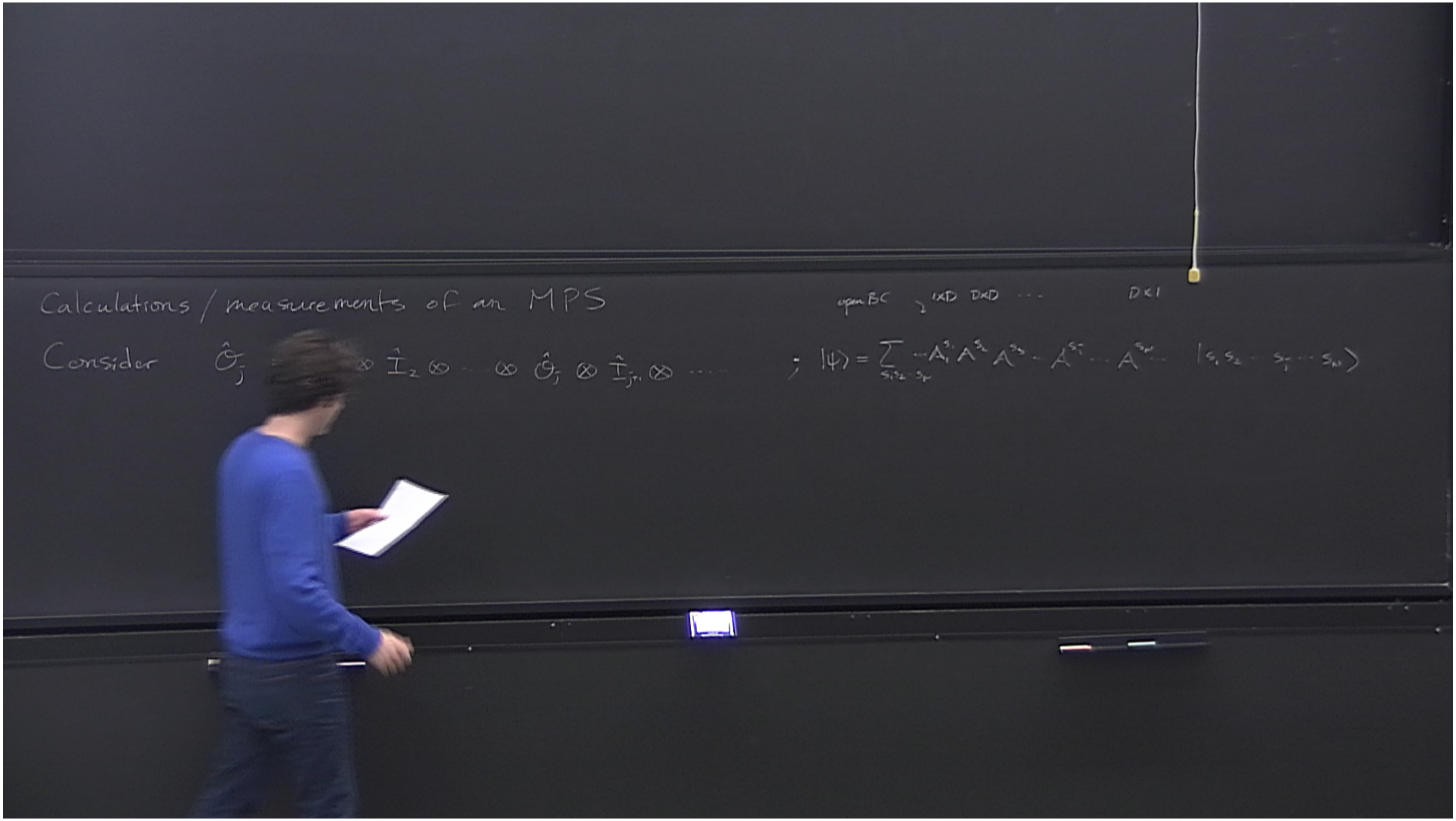
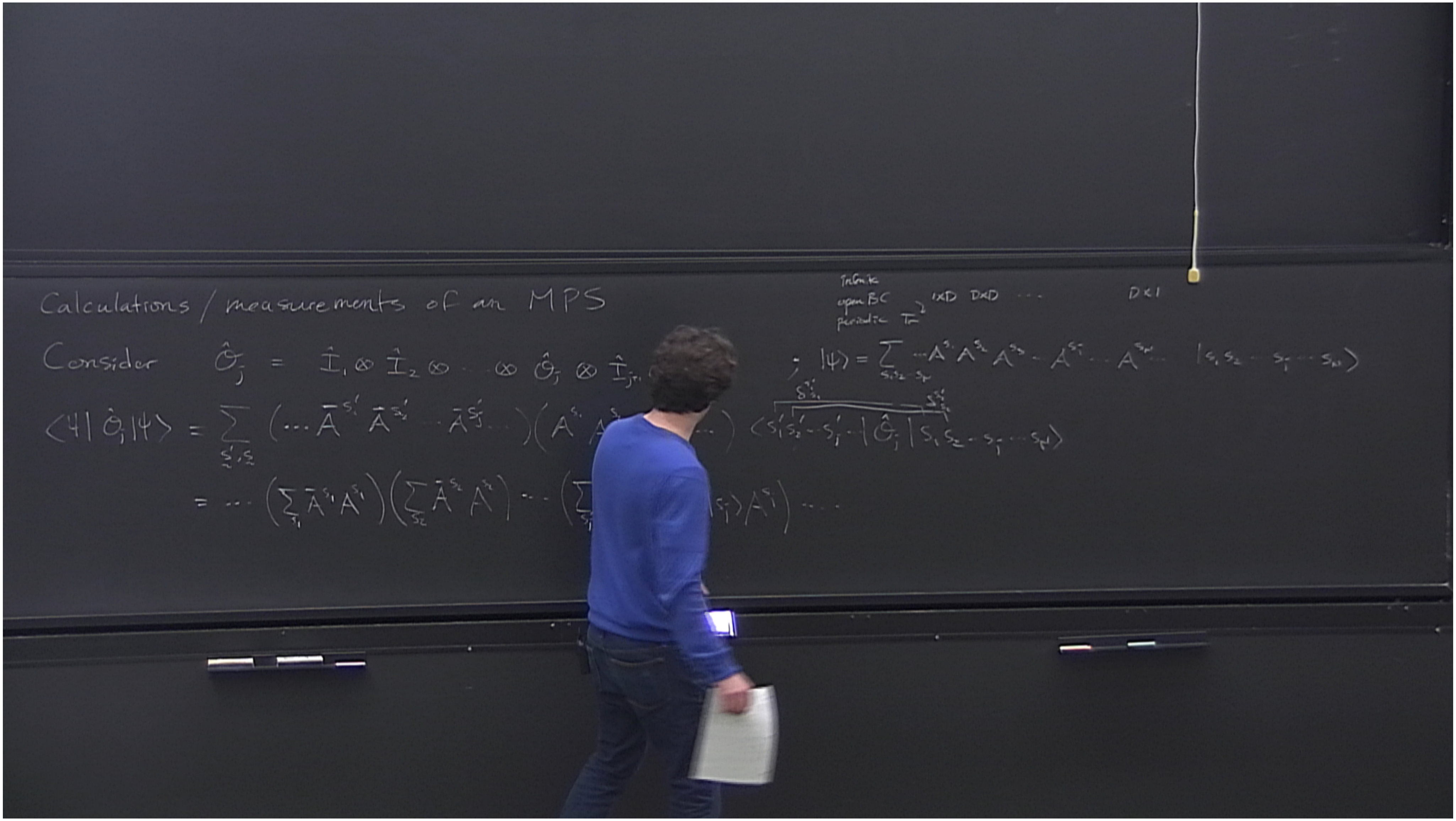
Title: Explorations in Condensed Matter-12

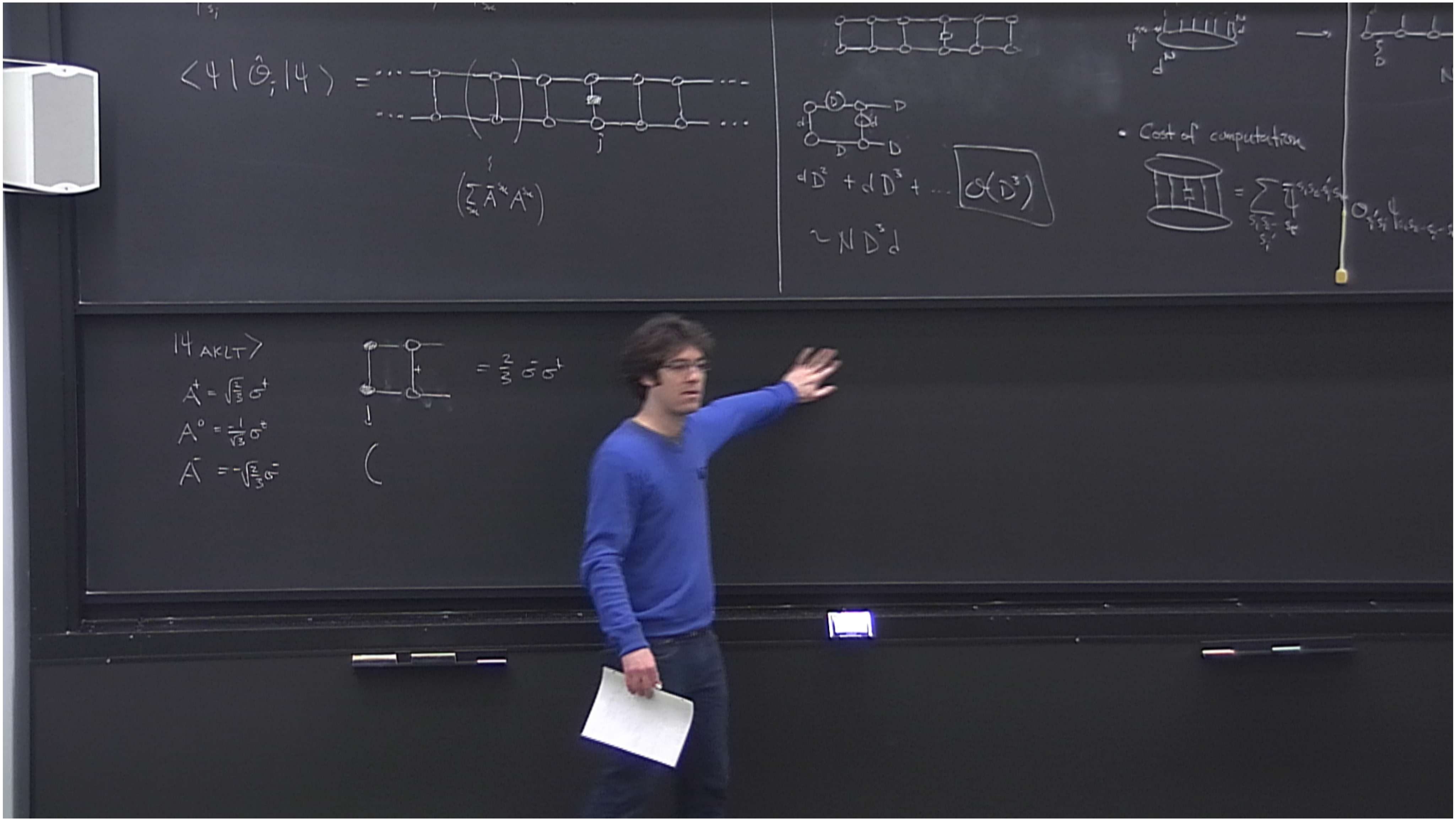
Date: Mar 31, 2015 10:15 AM

URL: http://pirsa.org/15030049

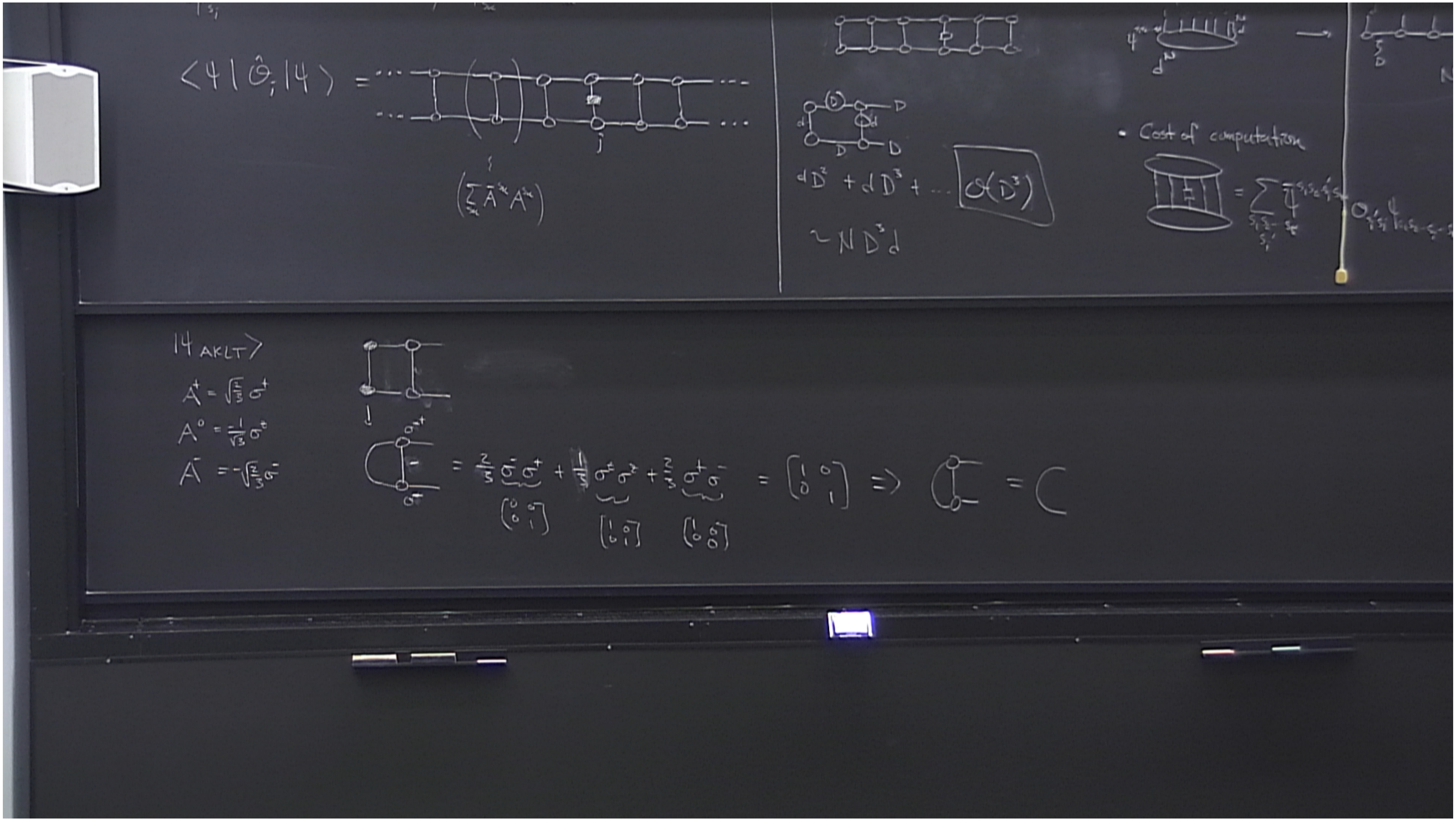
Abstract:

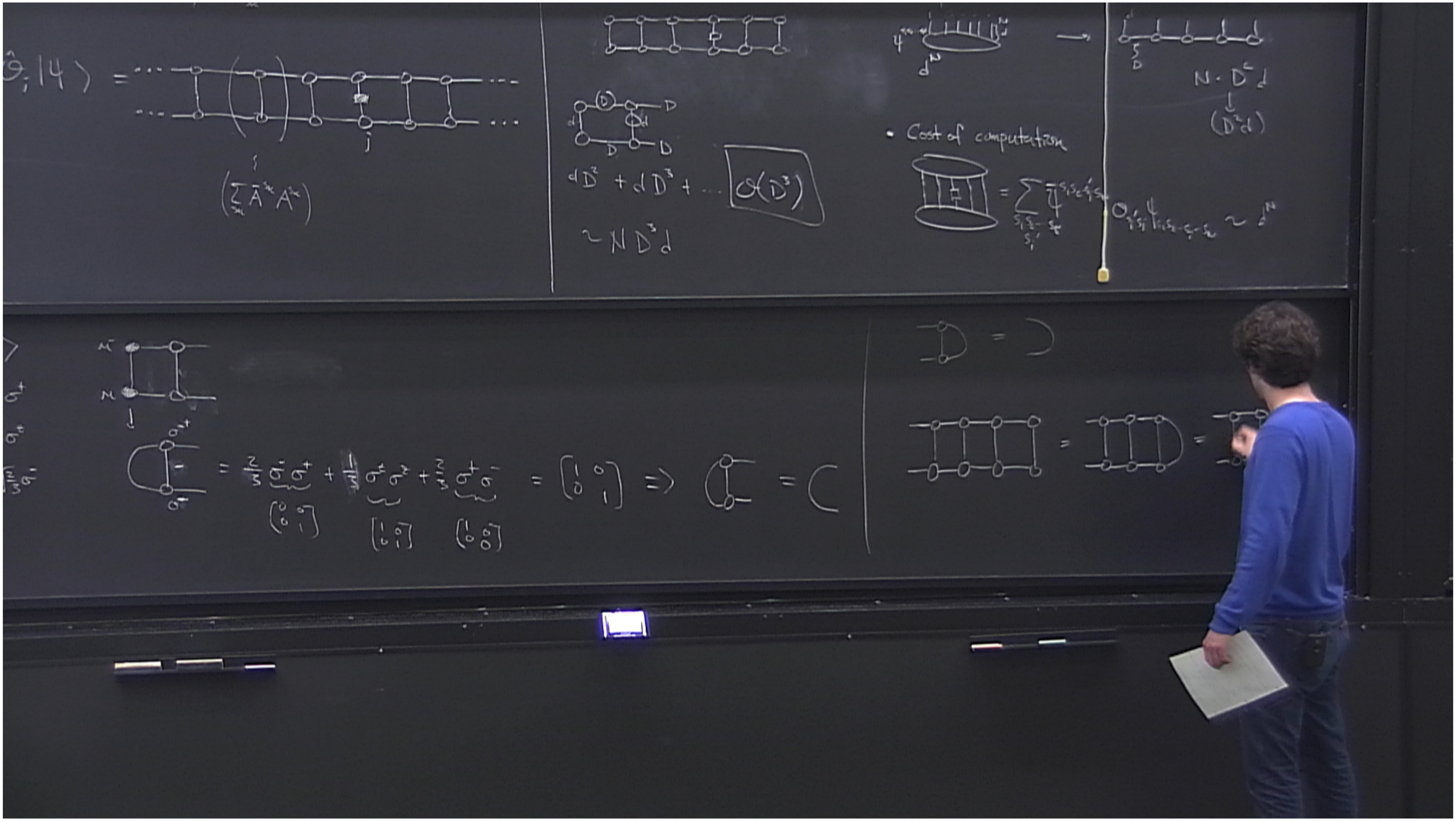

Calculations / measurements of an MPS
open BC
Consider

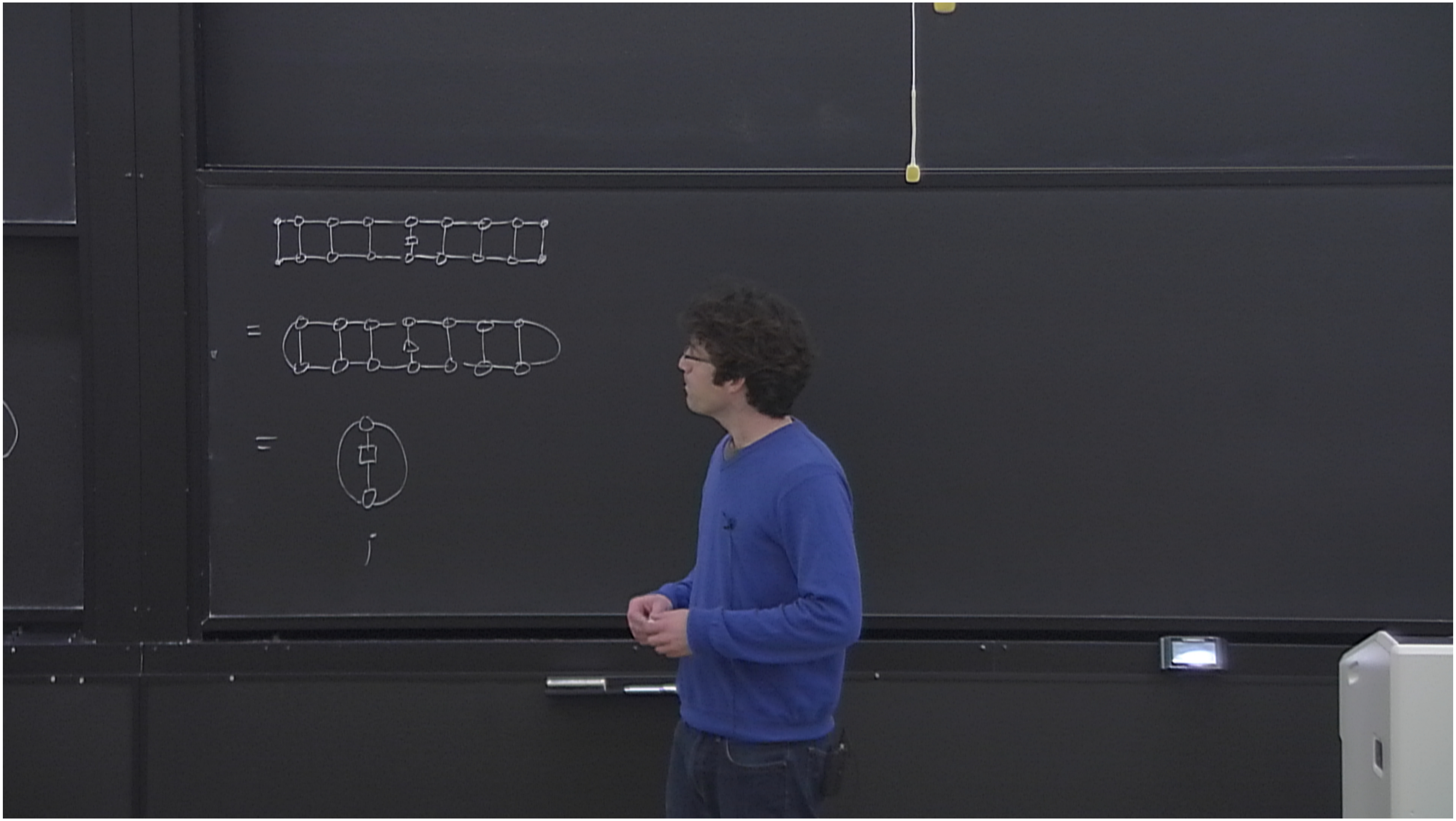

Calculations / measurements of an MPS
Consider
open BC
periodic
1xD DxD ...
Dx1

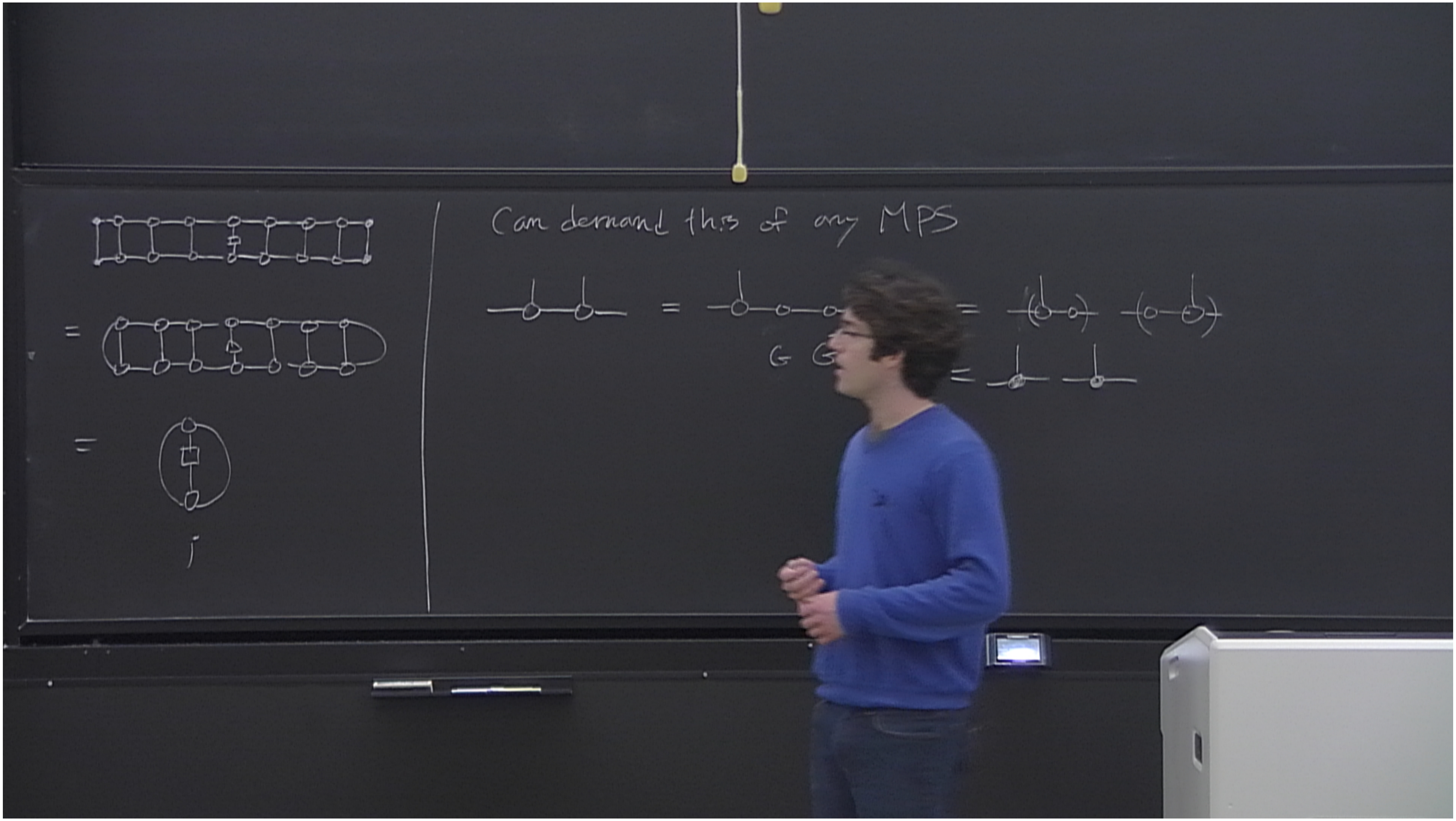


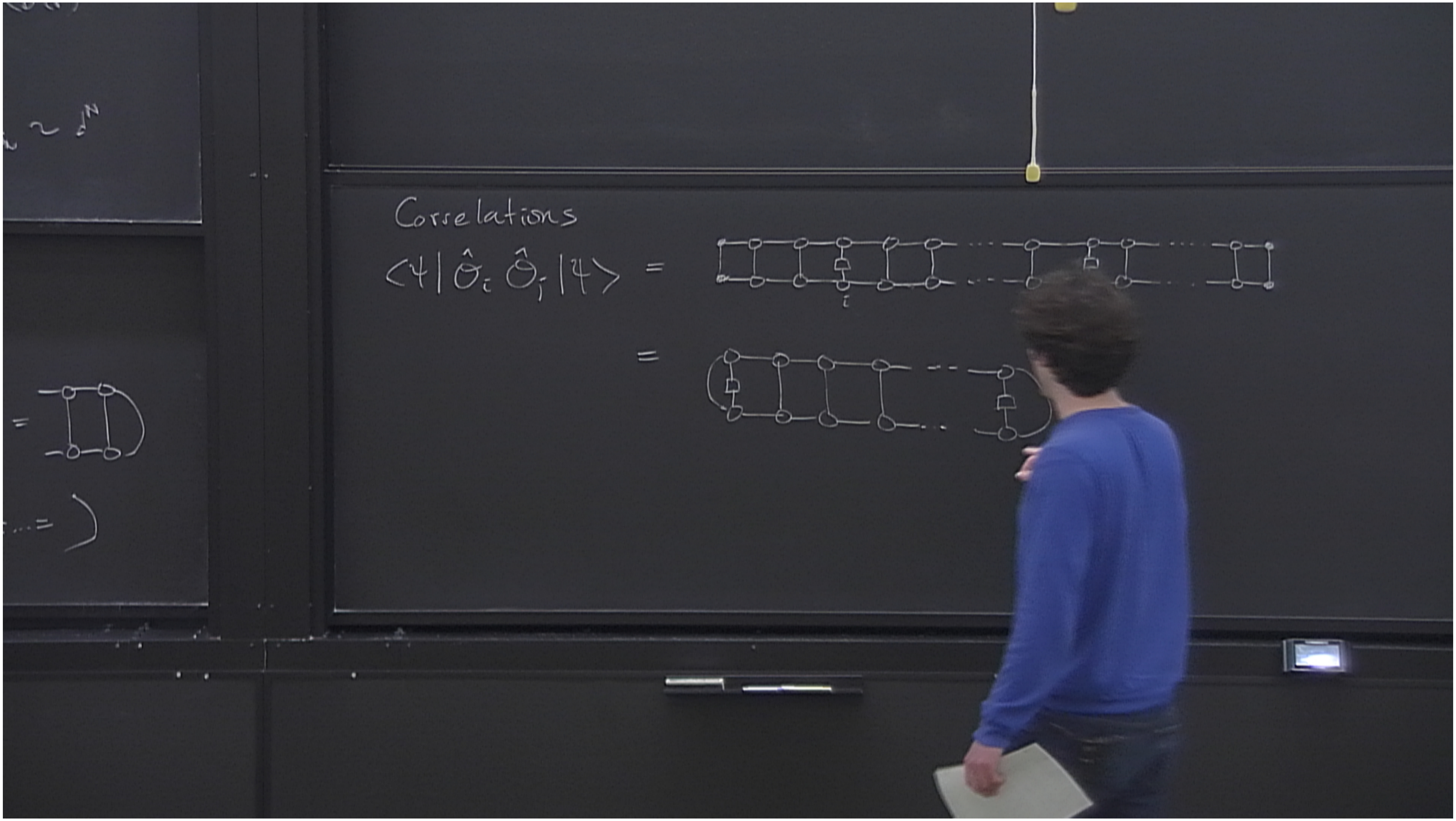
• Cost of computation

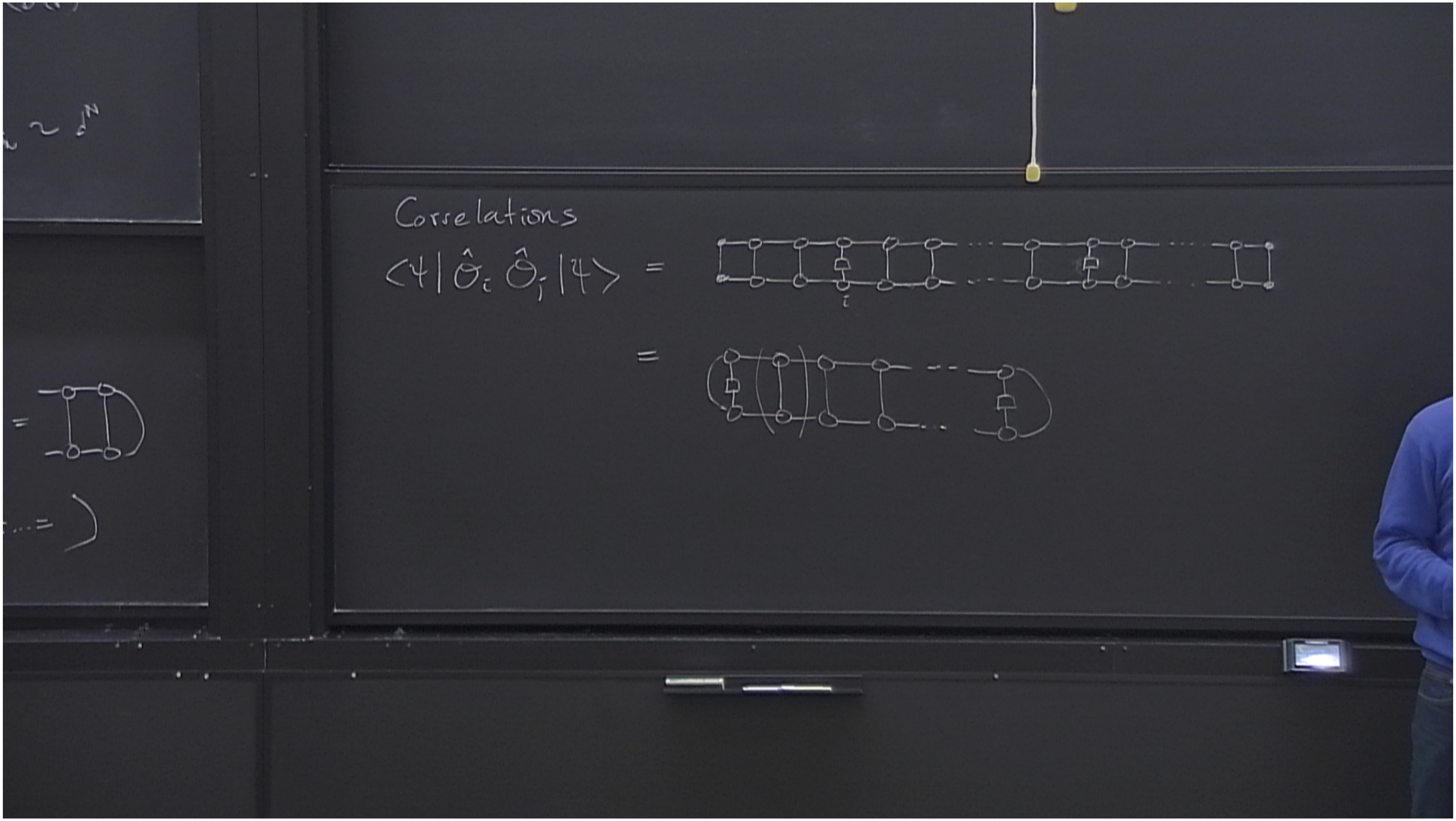

• Cost of computation
|ψ AKLT⟩
dD² + dD³ + ...
O(D³)
~ N D³ d

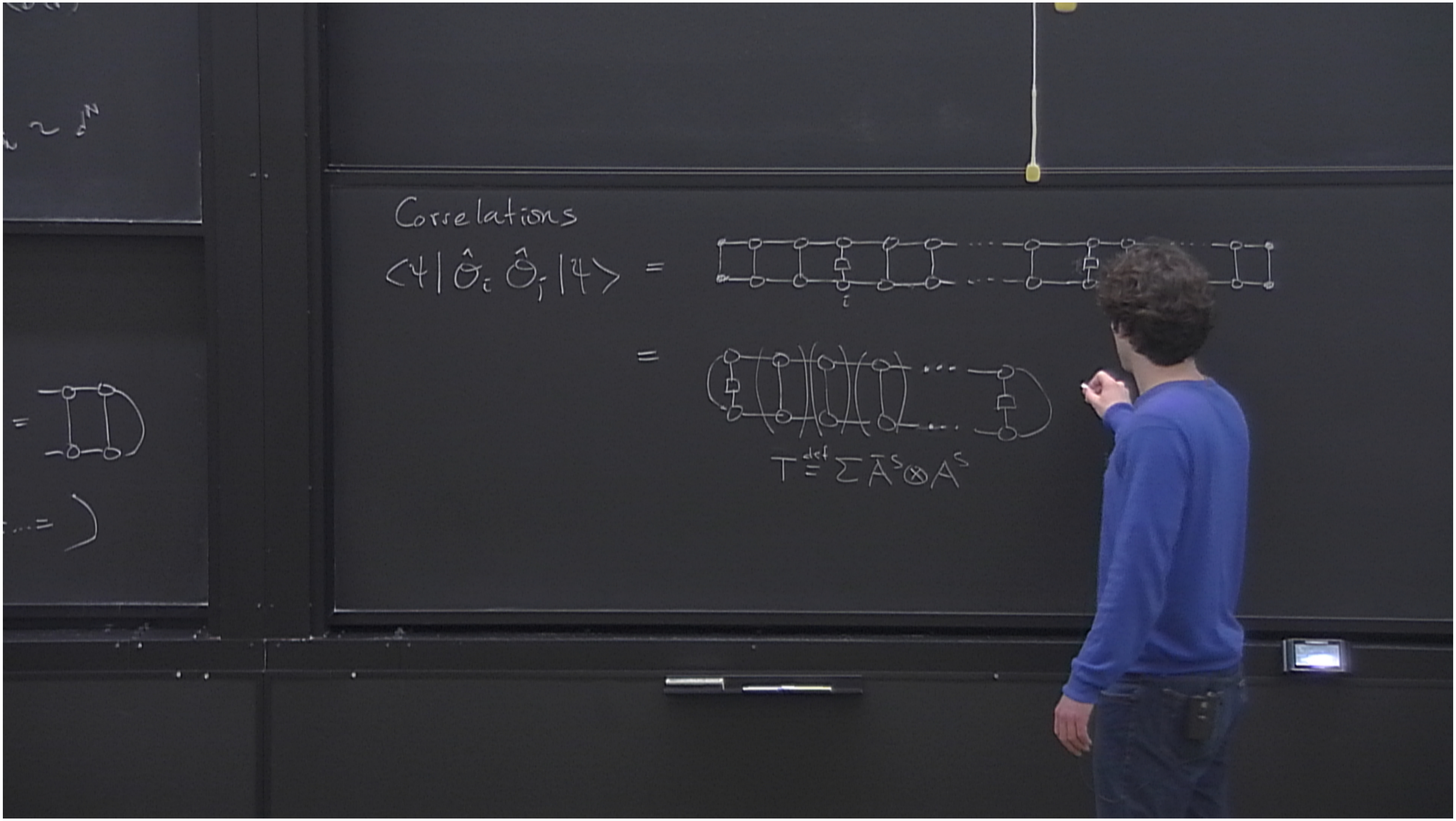

Cost of computation

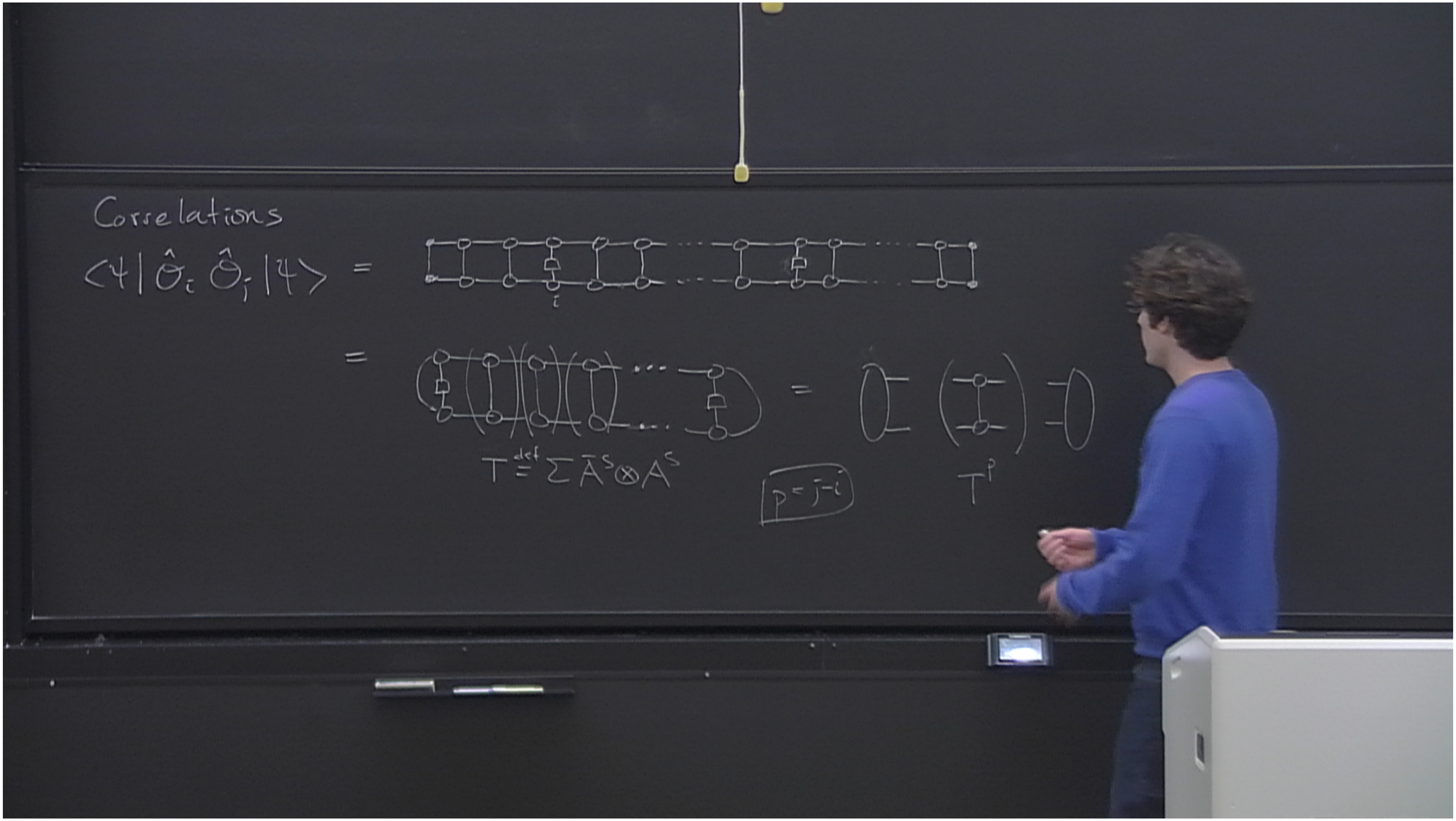


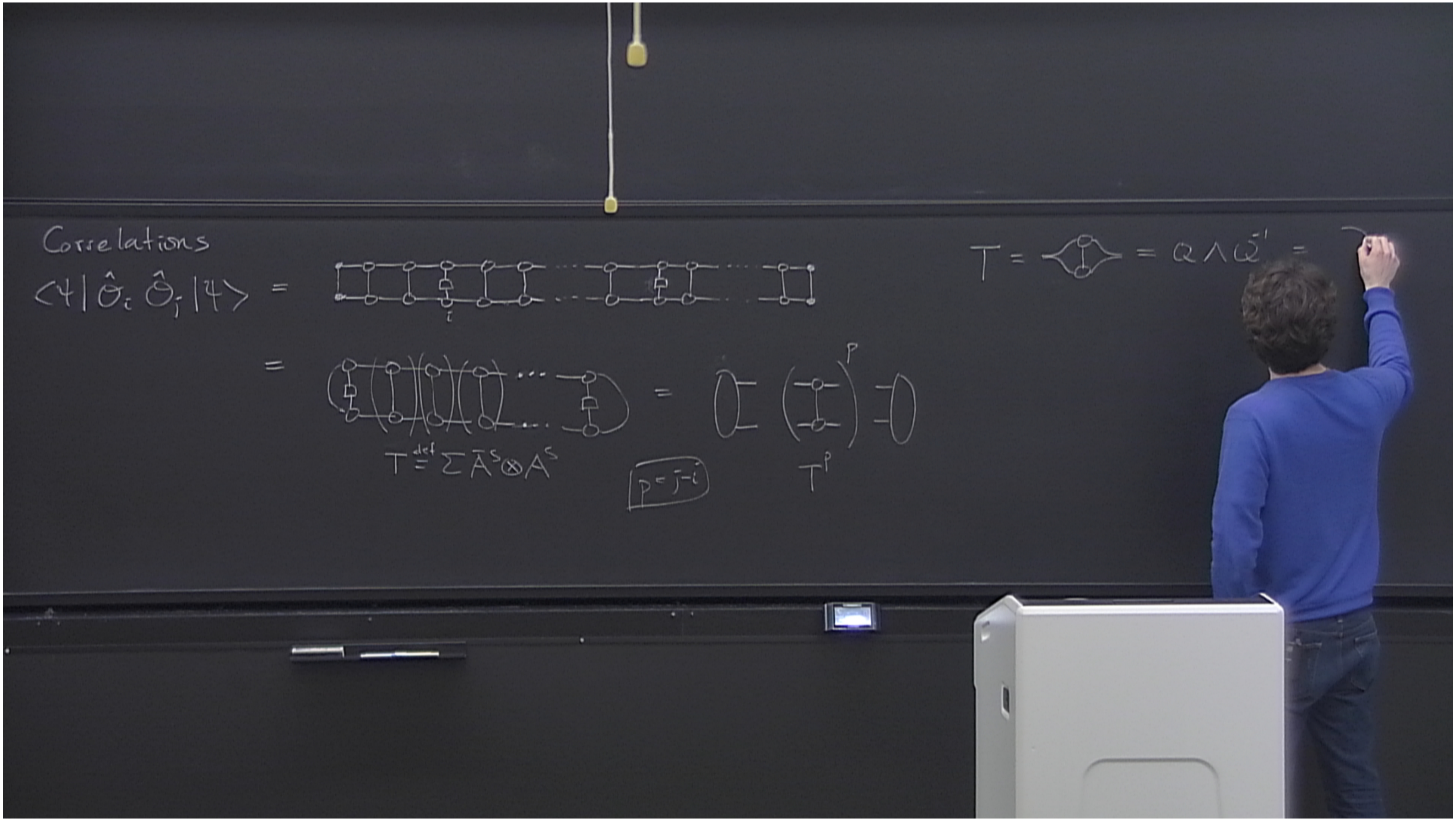

Can demand this of any MPS
G G

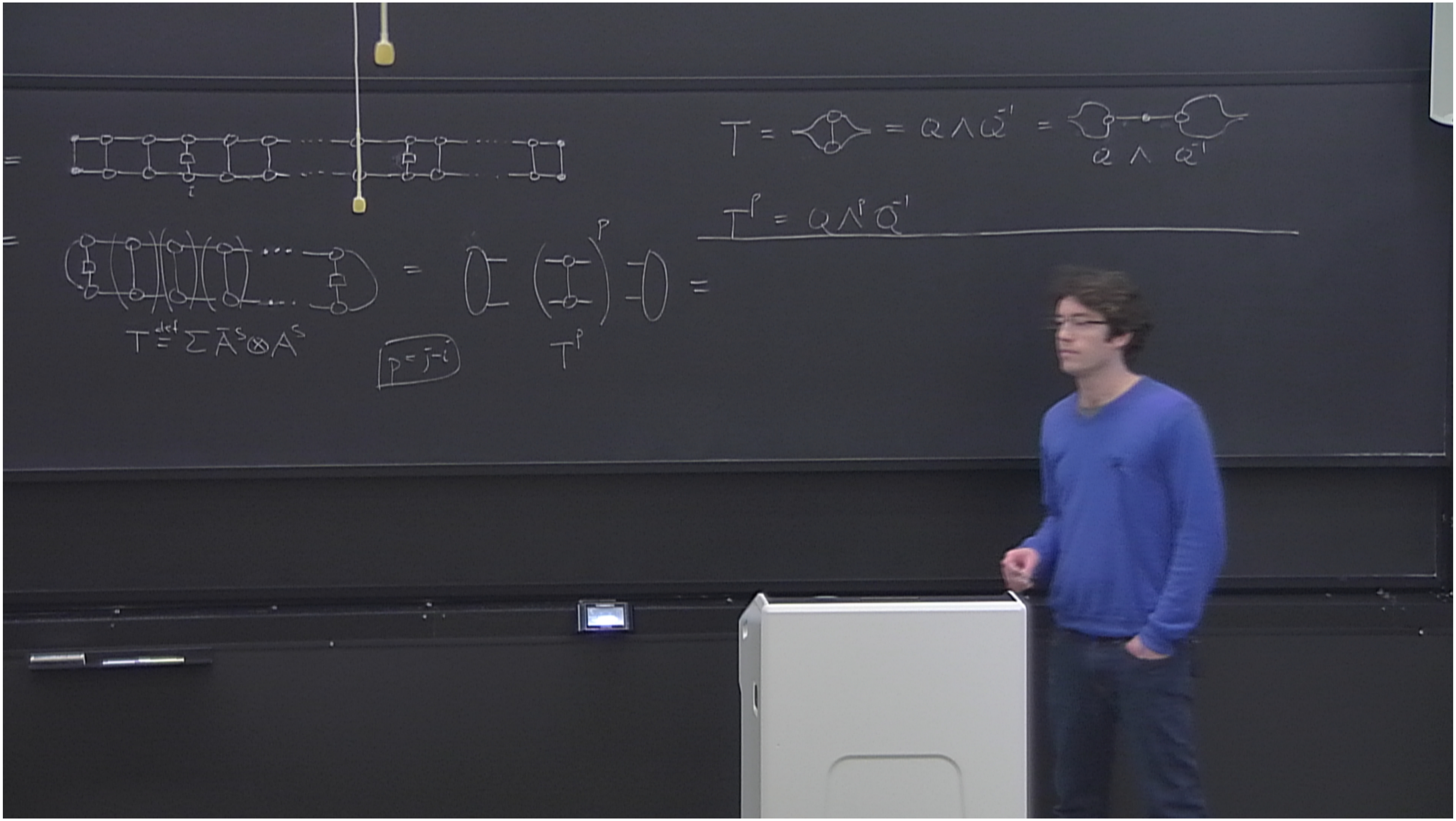

Correlations
⟨ψ| Ô_i Ô_j |ψ⟩ =
=

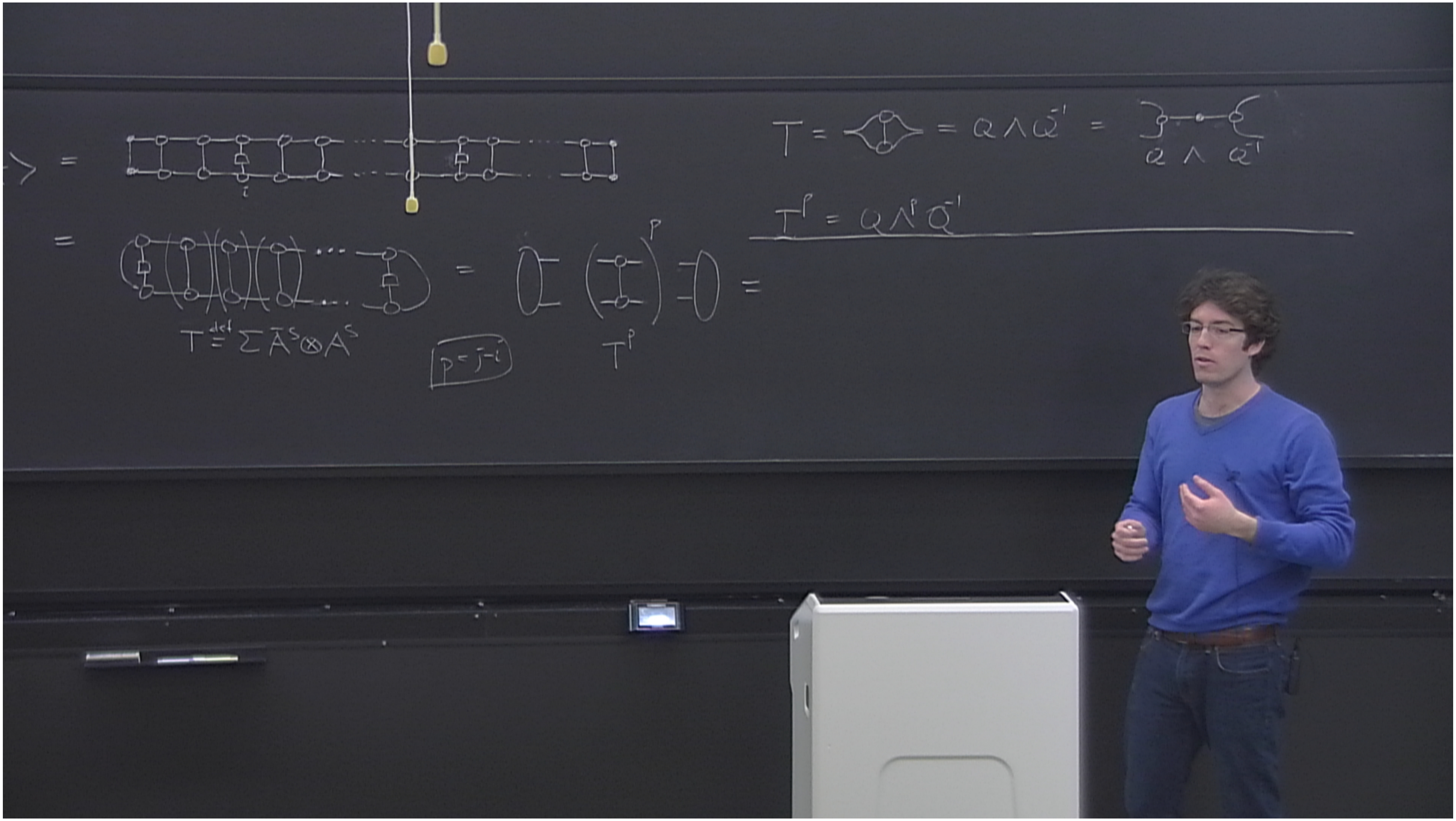

Correlations
$\langle\psi|\hat{O}_i\hat{O}_j|\psi\rangle =$


Correlations
⟨ψ| Ô_i Ô_j |ψ⟩ =
=
T =def Σ Ā^s ⊗ A^s

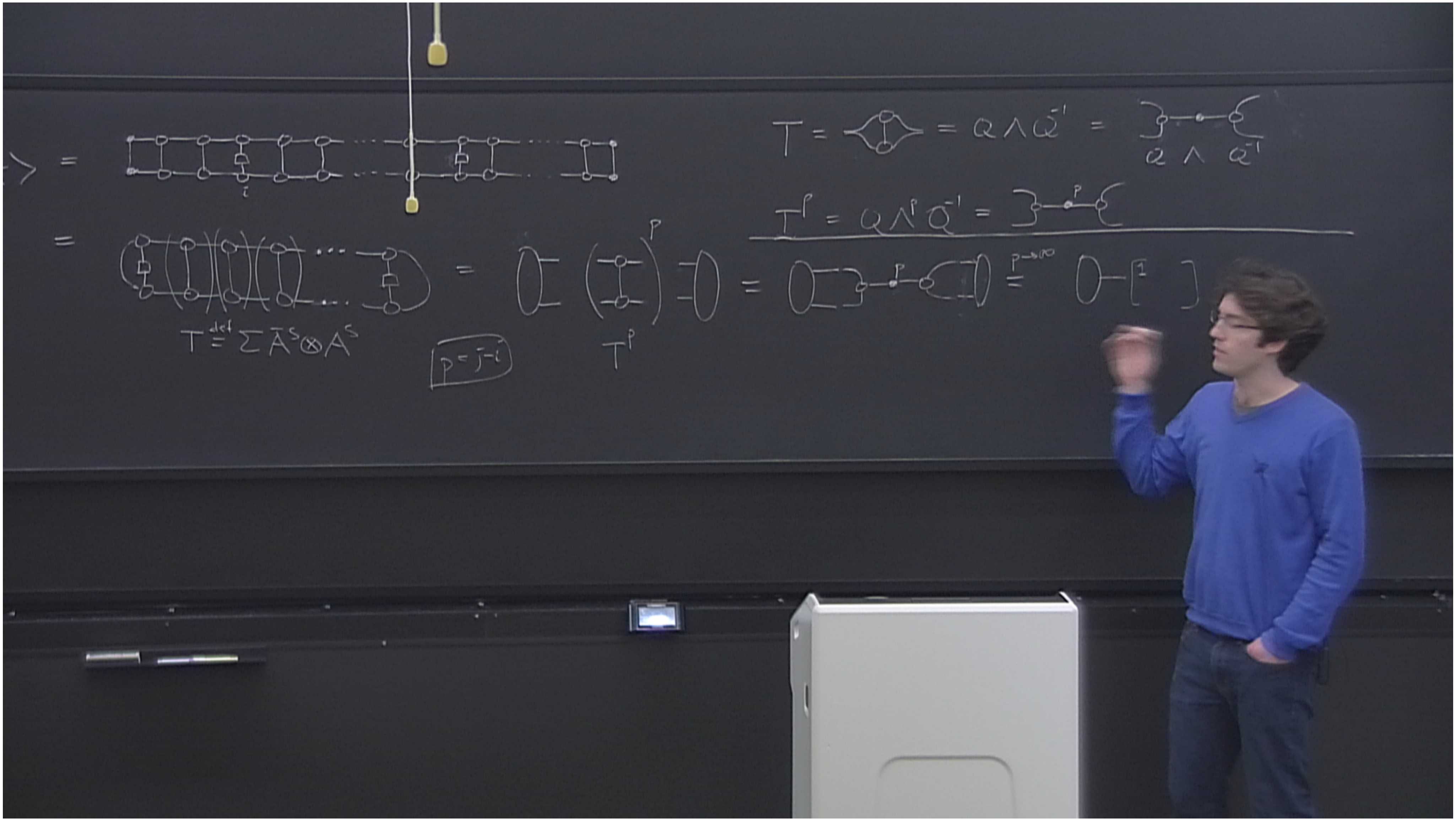

Correlations
⟨ψ| Ô_i Ô_j |ψ⟩ =
T =def Σ Ā^s ⊗ A^s
p = j − i
T^p

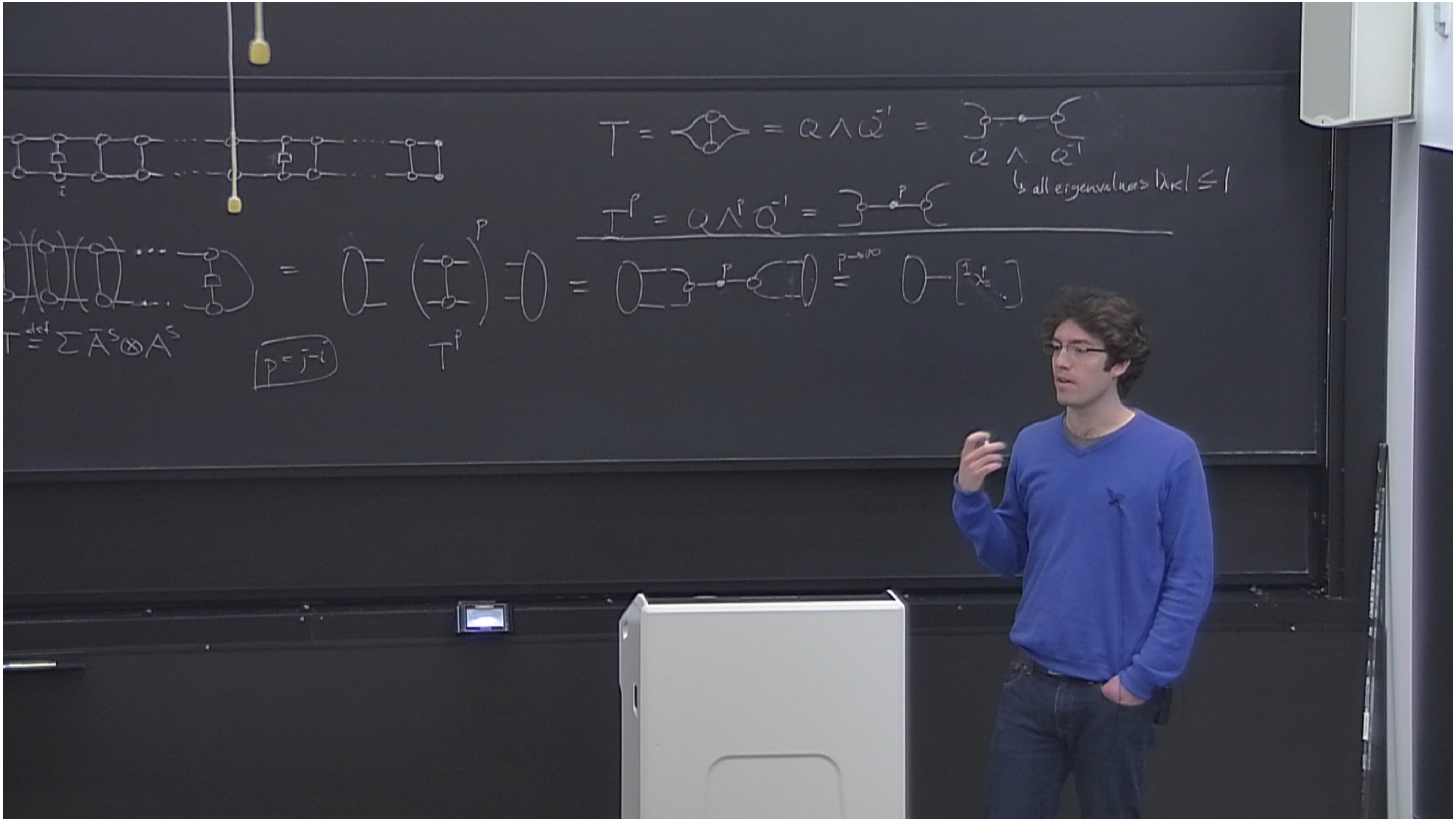

Correlations
⟨ψ| Ô_i Ô_j |ψ⟩ =
T =def Σ Ā^s ⊗ A^s
p = j − i
T^p
T = = Q Λ Q^-1 =

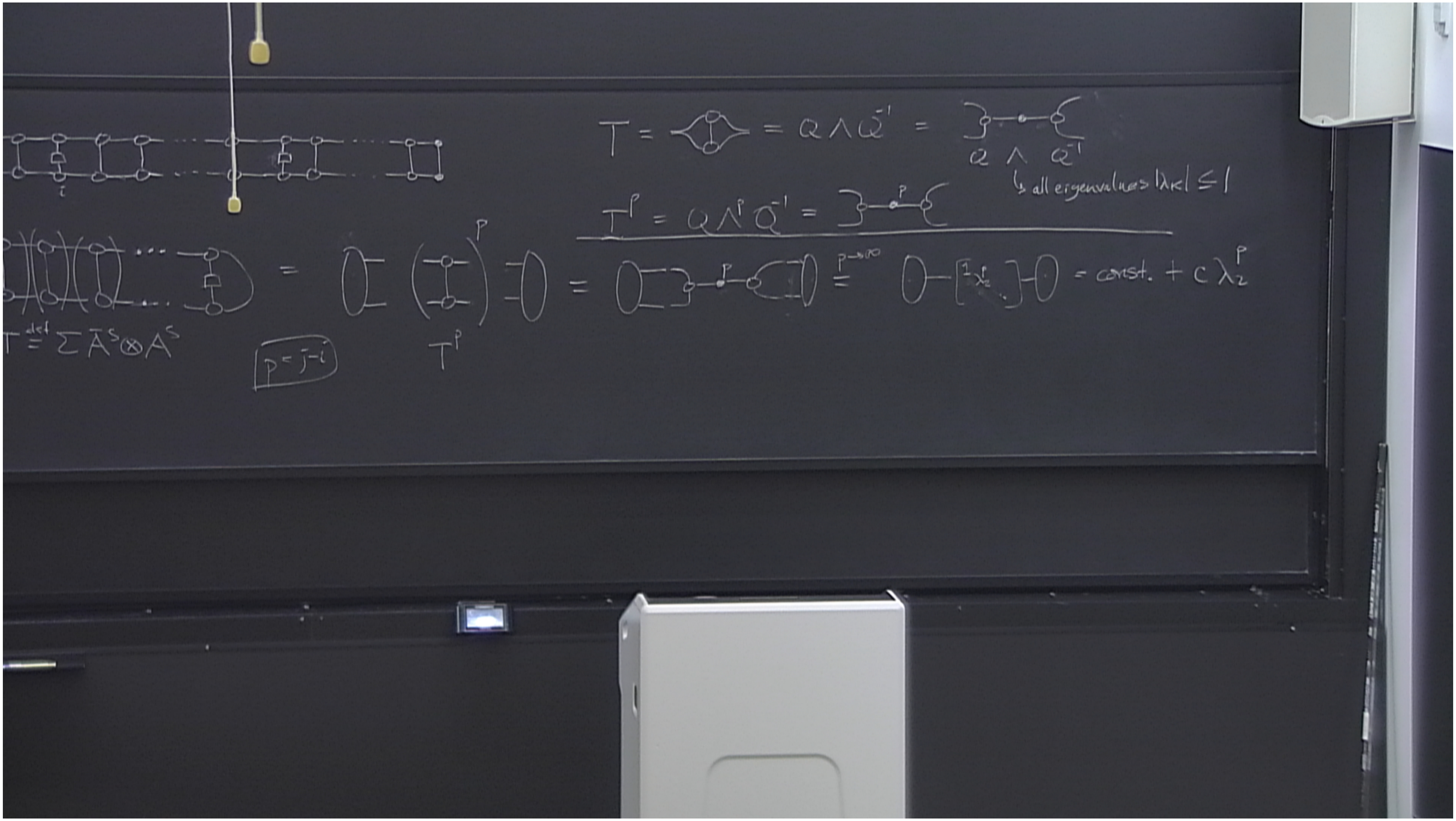

T = = QΛQ⁻¹ =
Q Λ Q⁻¹
Tᵖ = QΛᵖQ⁻¹
T =def Σ Āˢ⊗Aˢ
p = j−i
Tᵖ

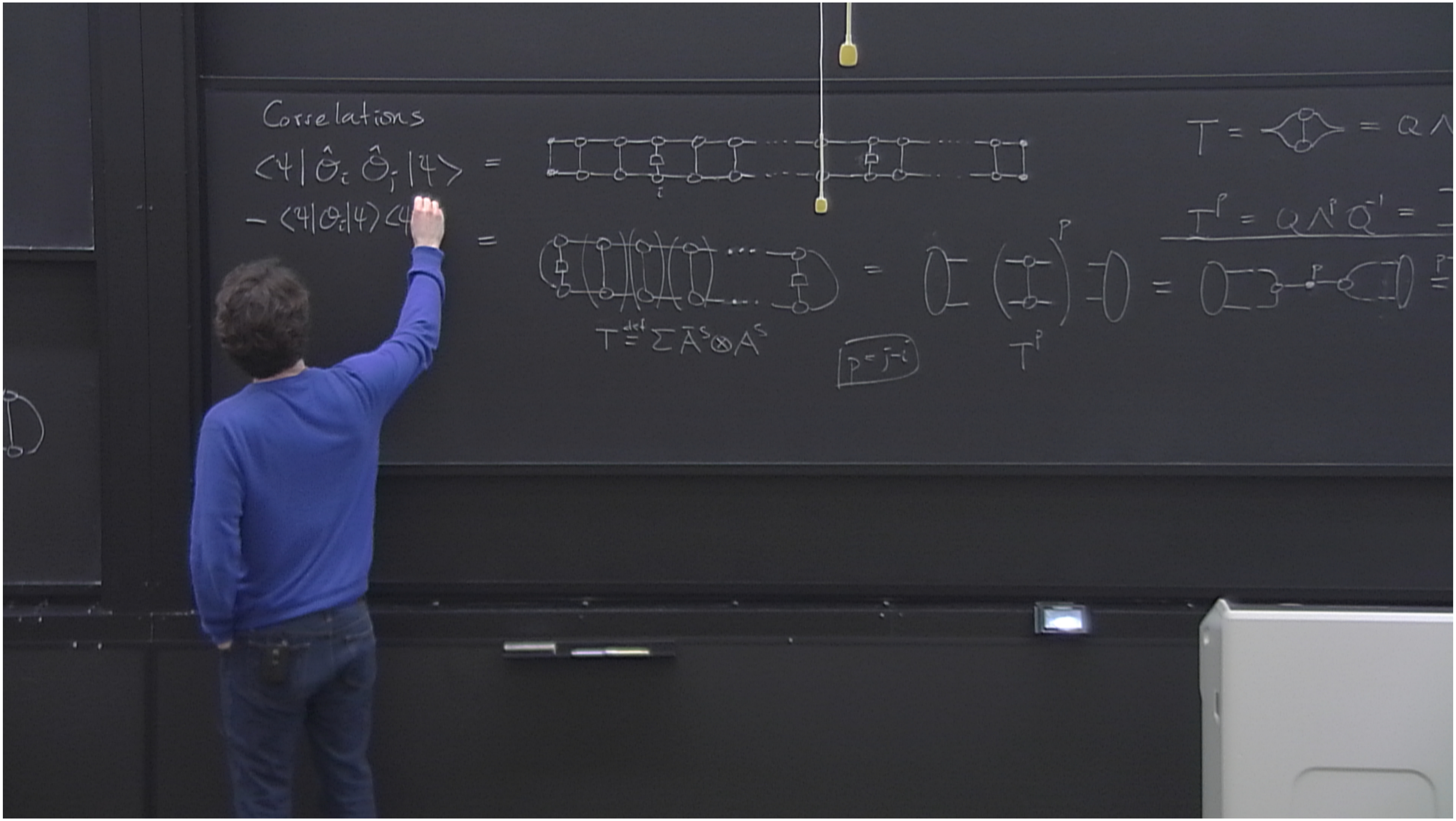


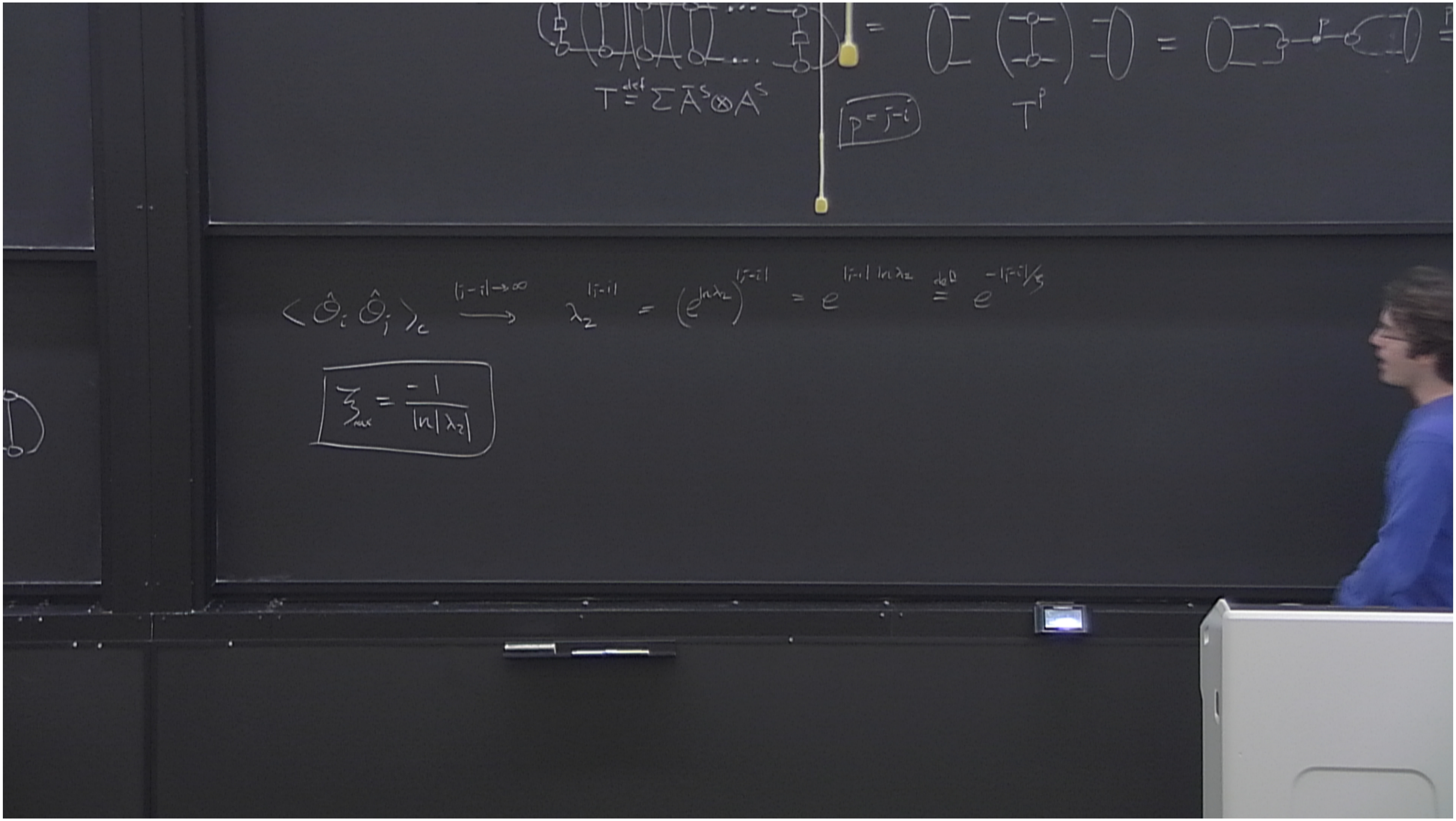
T = Q Λ Q̄⁻¹
Q Λ Q̄⁻¹
T^p = Q Λ^p Q̄⁻¹
T =def Σ Ā^s ⊗ A^s
p = j−i
T^p

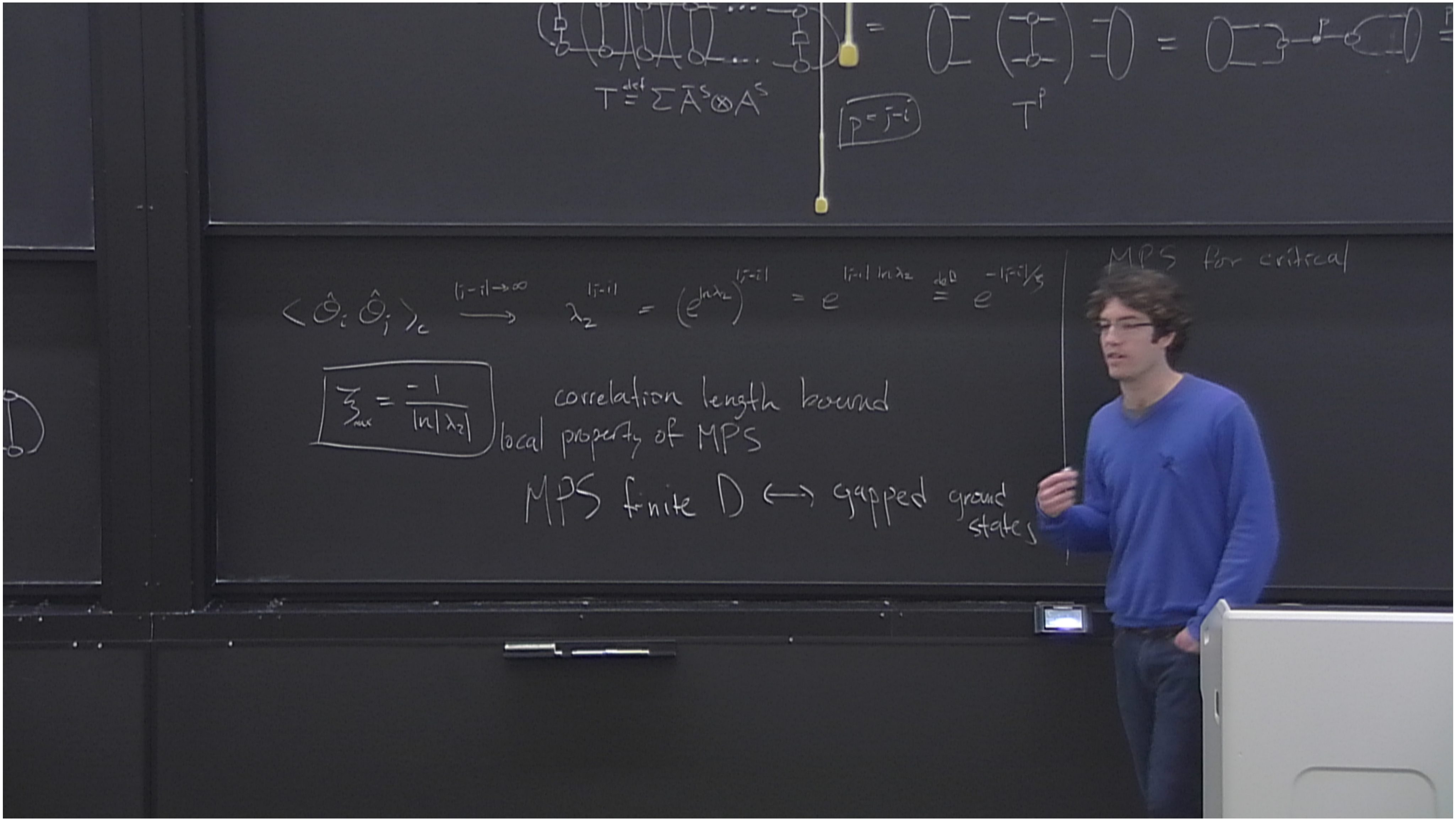


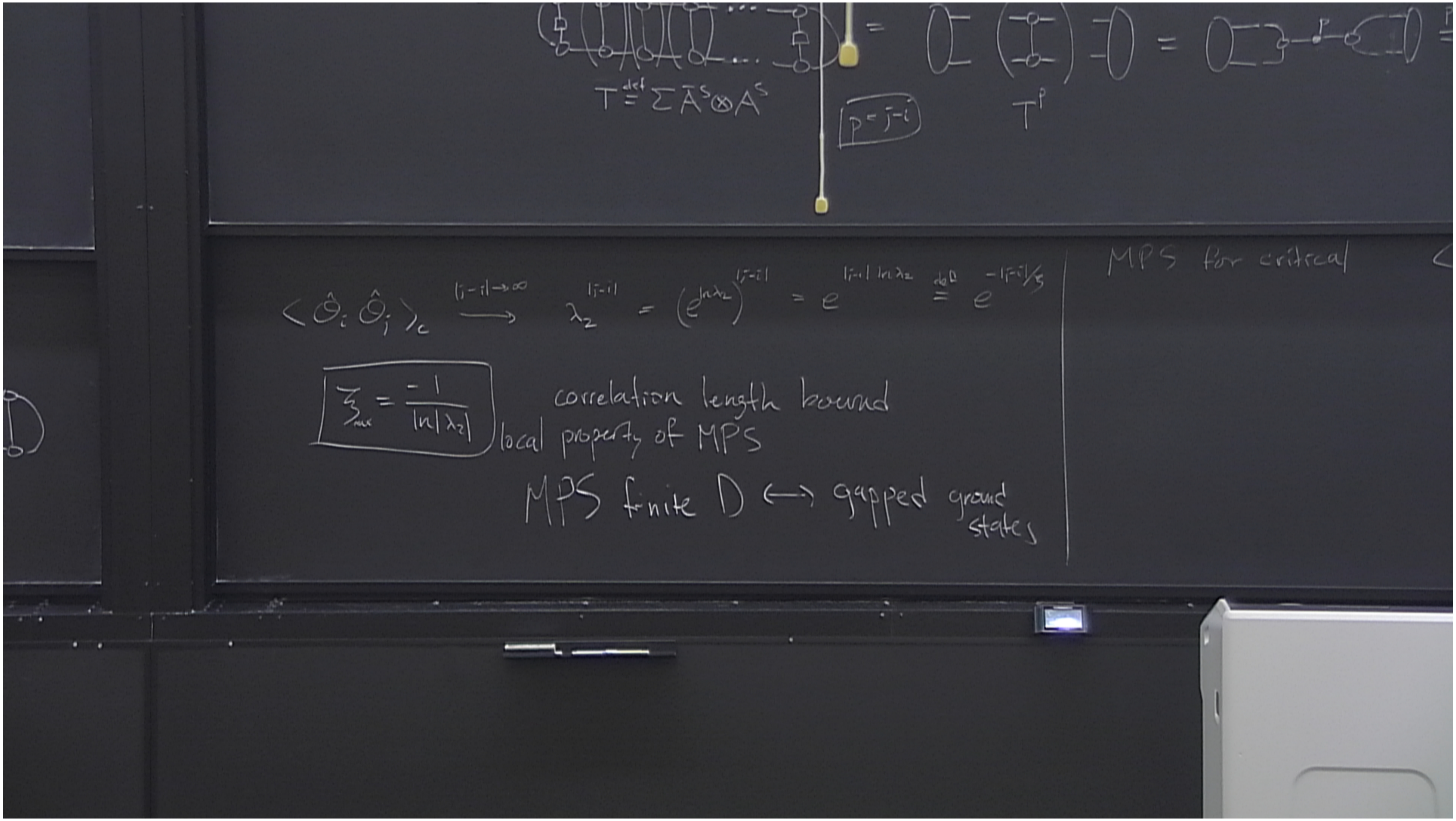

T = = Q Λ Q⁻¹ =
Q Λ Q⁻¹
all eigenvalues |λk| ≤ 1
Tᵖ = Q Λᵖ Q⁻¹ =
T ≝ Σ Āˢ⊗Aˢ
p = j−i
Tᵖ
p→∞

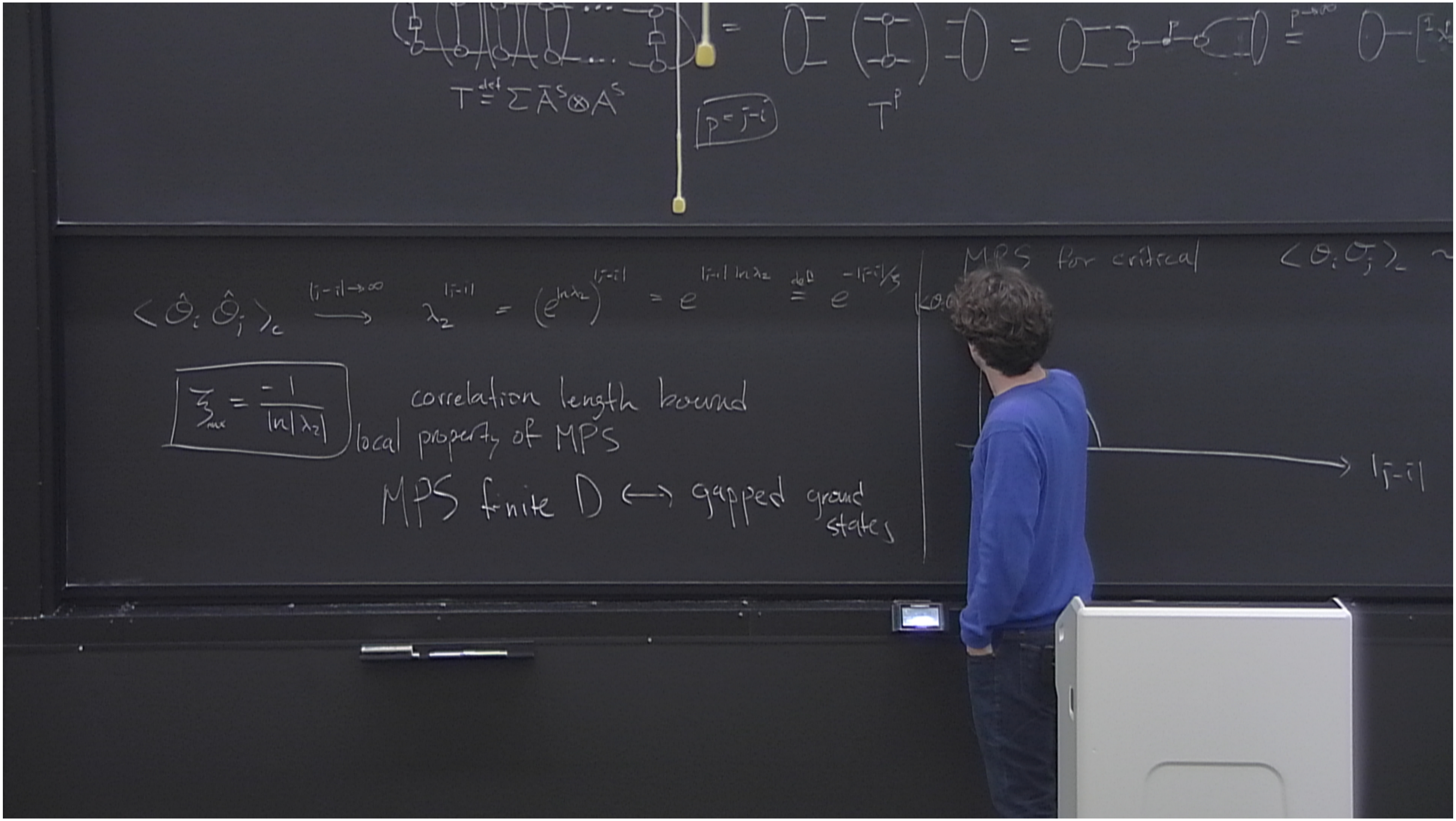

T = = Q Λ Q⁻¹ =
Q Λ Q⁻¹
↳ all eigenvalues |λk| ≤ 1
Tᵖ = Q Λᵖ Q⁻¹ =
p→∞
= const. + c λ₂ᵖ
T ≝ Σ Āˢ ⊗ Aˢ
p = j−i
Tᵖ


Correlations
⟨ψ| Ô_i Ô_j |ψ⟩ =
− ⟨ψ|O_i|ψ⟩⟨ψ
T =def Σ Ā^s ⊗ A^s
p = j−i
T^p
T = = QΛ
T^p = QΛ^p Q^{-1} =

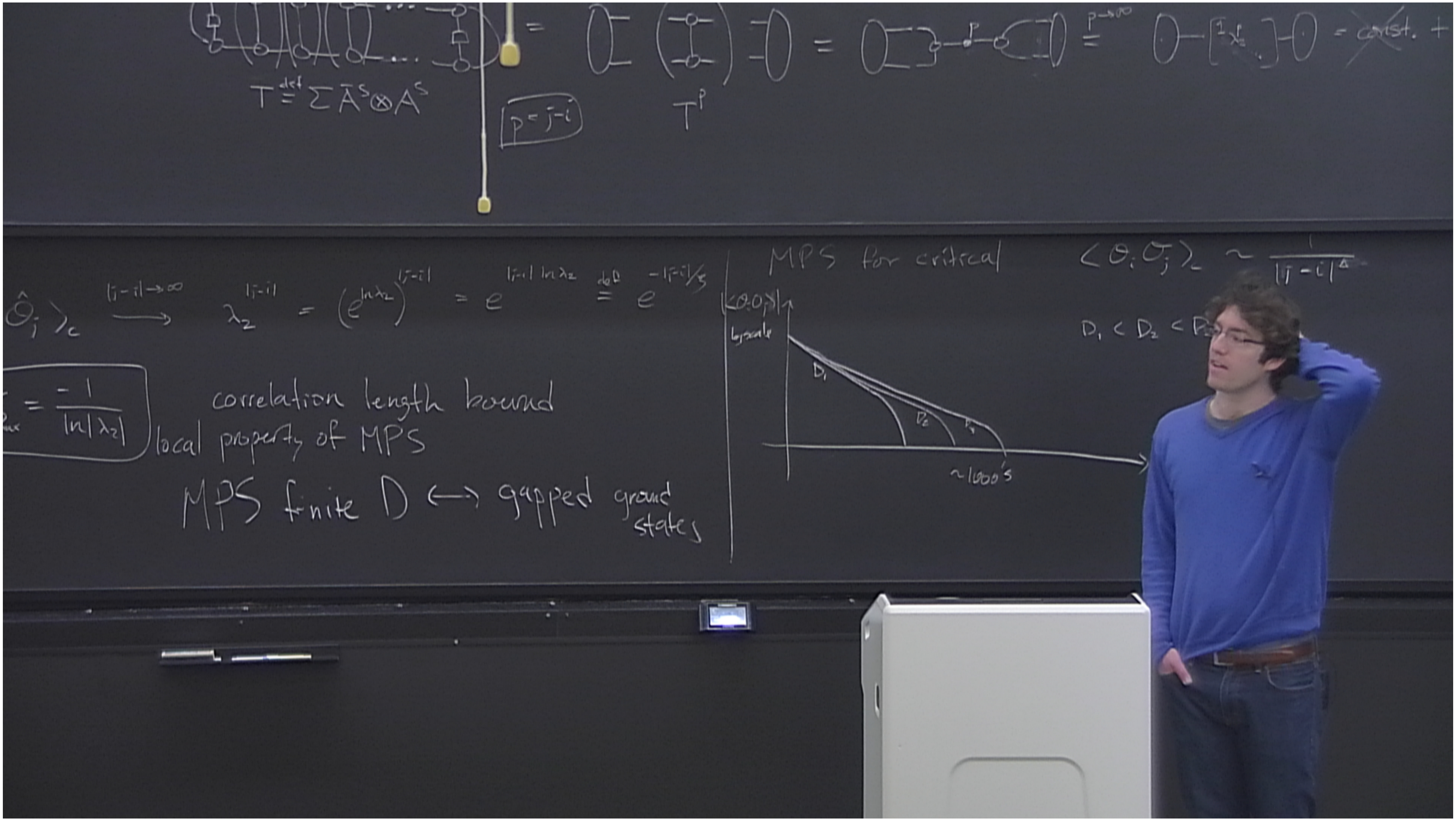

T =def Σ Ā^s ⊗ A^s
p = j − i
T^p
⟨Ô_i Ô_j⟩_c —(|j−i| → ∞)→ λ_2^{|j−i|} = (e^{ln λ_2})^{|j−i|} = e^{|j−i| ln λ_2} =def e^{−|j−i|/ξ}
ξ_max = −1 / ln|λ_2|


correlation length bound
local property of MPS
MPS finite D ⟷ gapped ground states
MPS for critical


T =def Σ Ā^s ⊗ A^s
p = j − i
T^p
⟨Ô_i Ô_j⟩_c → (|j − i| → ∞) λ_2^{|j−i|} = (e^{ln λ_2})^{|j−i|} = e^{|j−i| ln λ_2} =def e^{−|j−i|/ξ}
ξ_max = −1 / ln|λ_2|
correlation length bound
local property of MPS
MPS finite D ⟷ gapped ground states
MPS for critical



$T \stackrel{def}{=} \sum \bar{A}^s \otimes A^s$
$p = j - i$
T^p
$\langle \hat{O}_i \hat{O}_j \rangle_c \xrightarrow{|j-i| \to \infty} \lambda_2^{|j-i|} = (e^{\ln \lambda_2})^{|j-i|} = e^{|j-i| \ln \lambda_2} \stackrel{def}{=} e^{-|j-i|/\xi}$
$\xi_{max} = \frac{-1}{\ln|\lambda_2|}$
correlation length bound
local property of MPS
MPS finite D ⟷ gapped ground states
MPS for critical
$|j-i|$


T def= Σ Ā^s ⊗ A^s
p = j−i
T^p
= const. +
MPS for critical
⟨O_i O_j⟩_c ~ 1/|j−i|^Δ
D_1 < D_2 <
D_1
~1000's
correlation length bound
local property of MPS
MPS finite D ⟷ gapped ground states