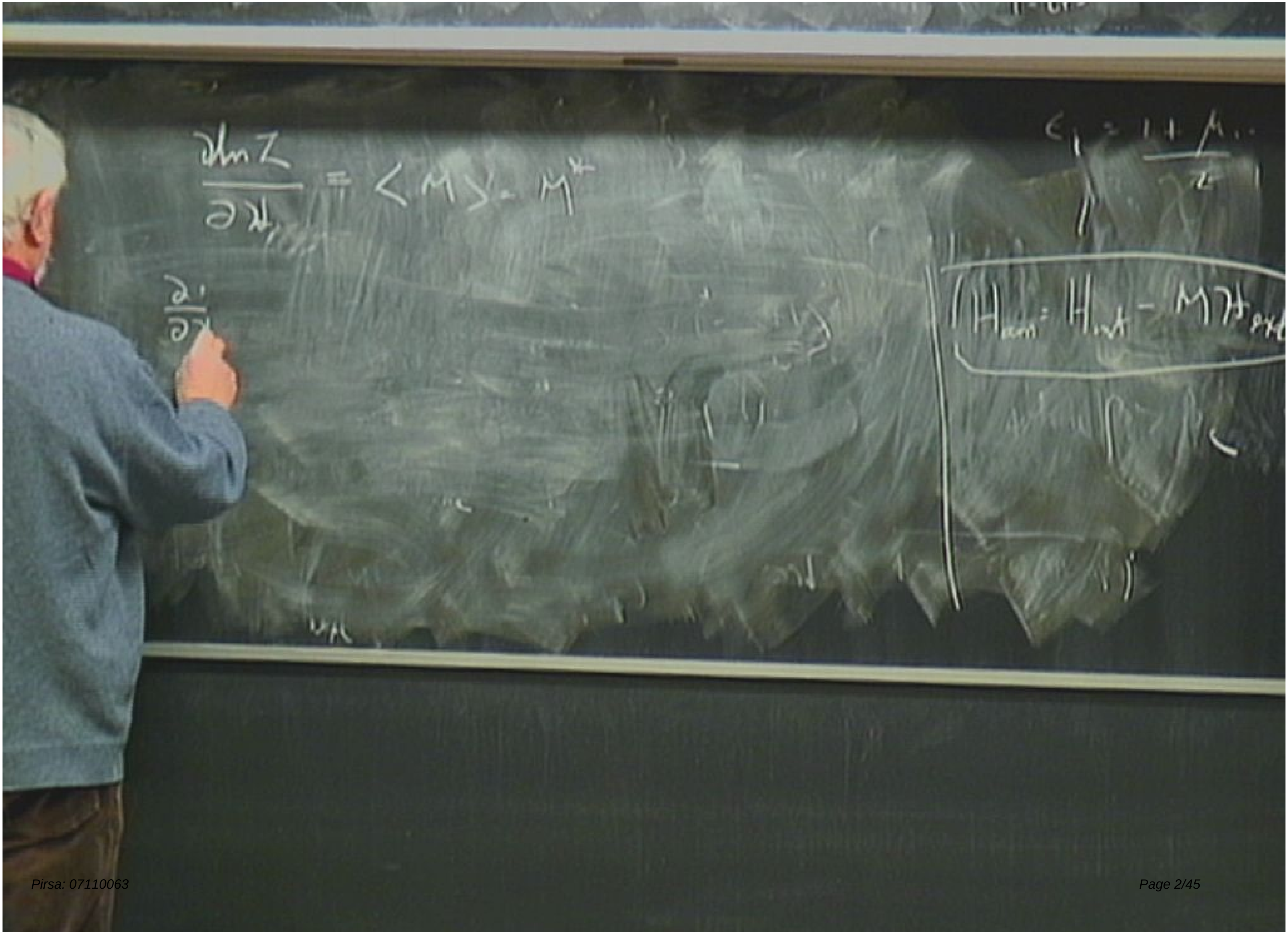
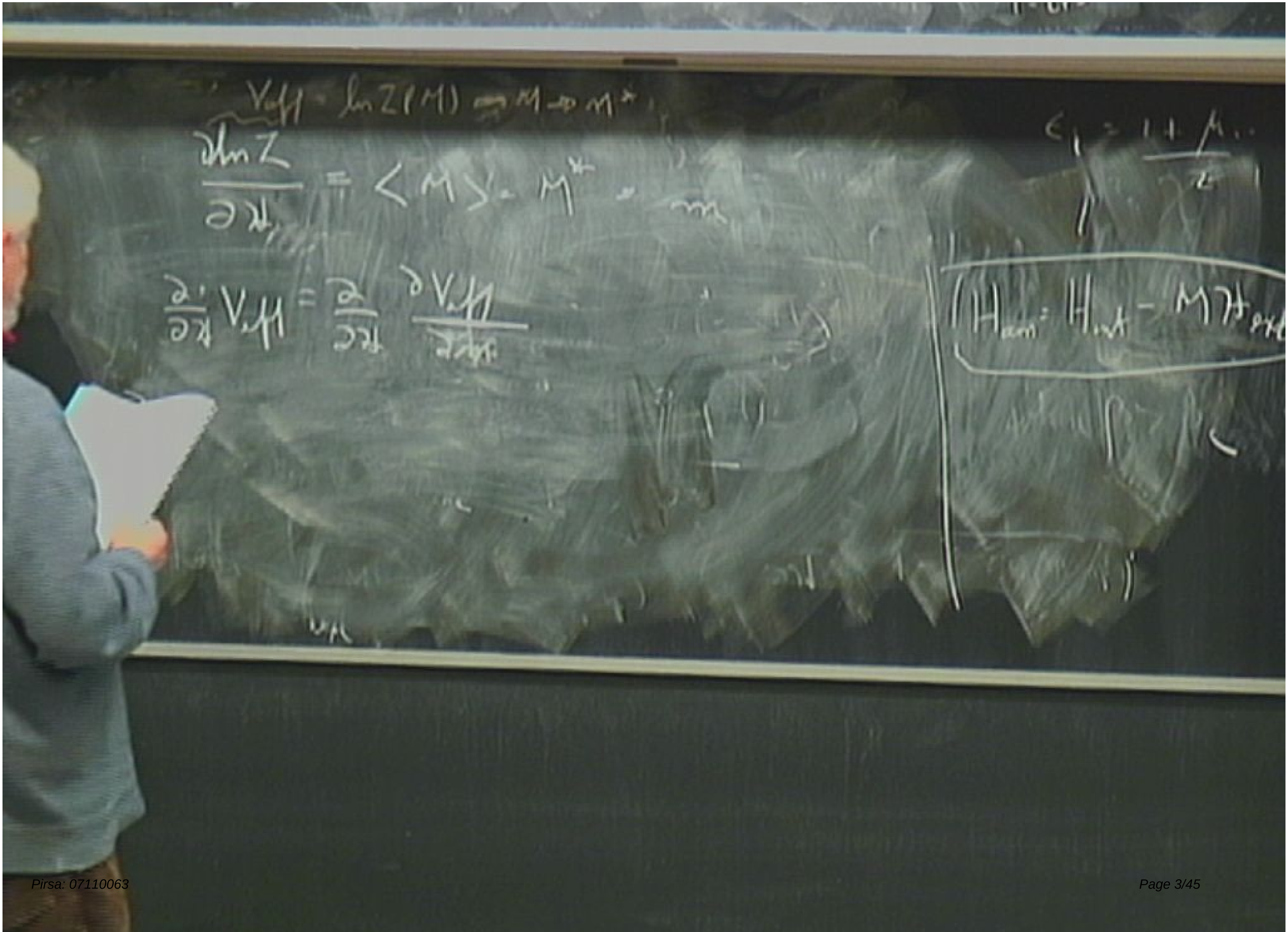
Title: Spontaneous Broken Symmetry 2B

Date: Nov 08, 2007 11:00 AM

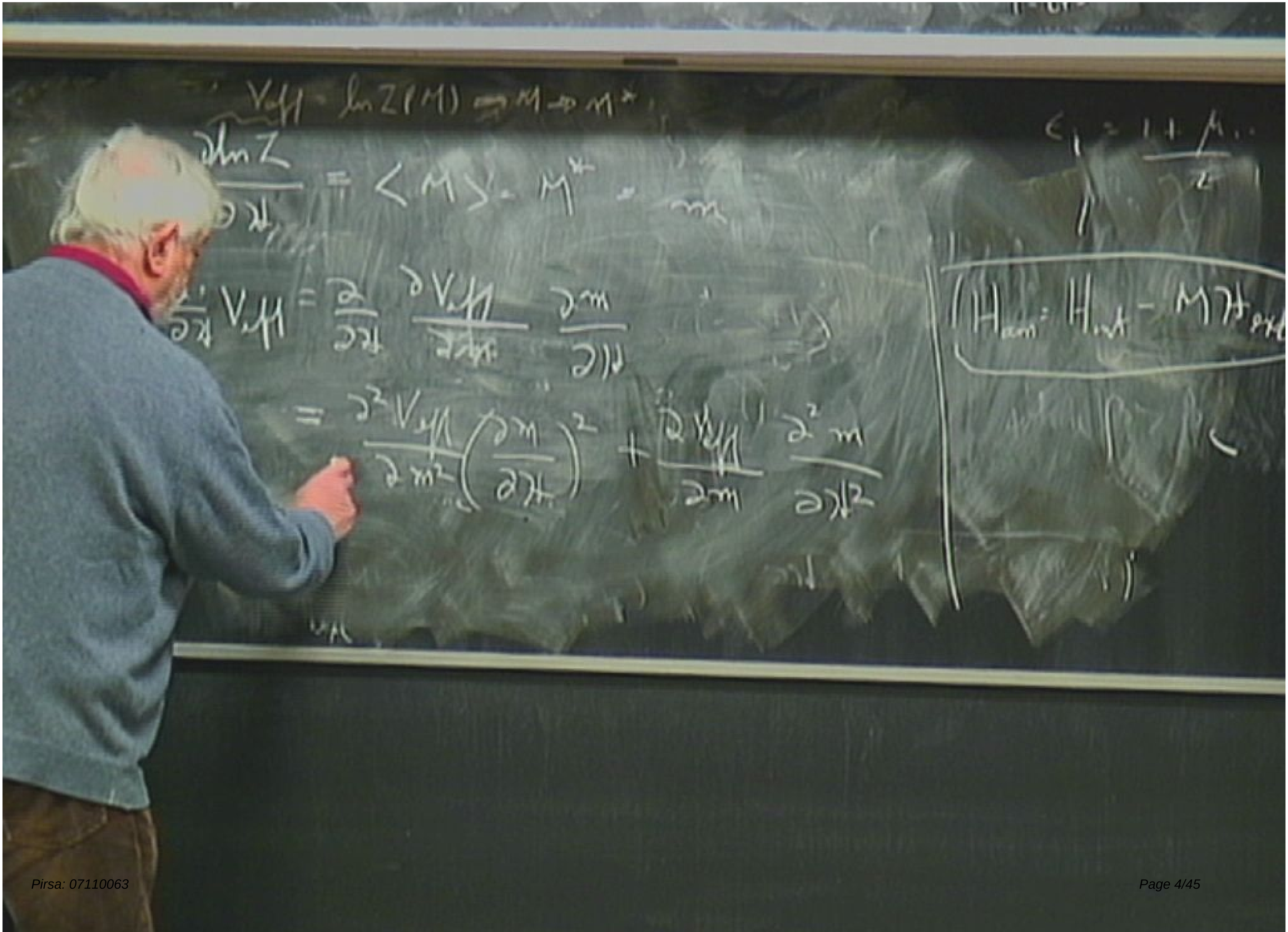
URL: http://pirsa.org/07110063

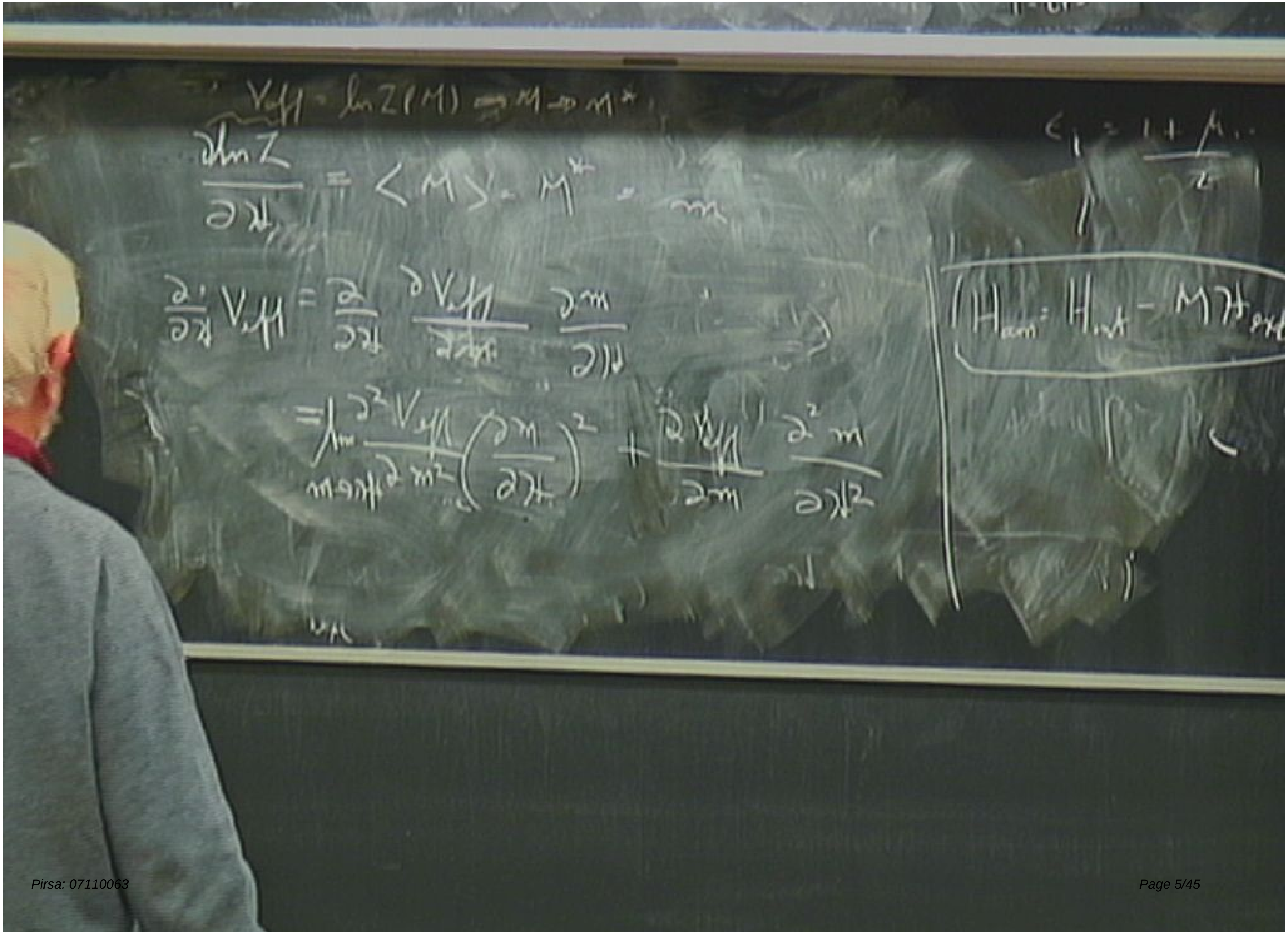
Abstract:


∂ln Z / ∂h = < M > - M*
H = H_int - M h_ext



Veff = ln Z(M) M → M*
∂ln Z / ∂h = <M> = M*
∂/∂h Veff = ∂/∂h ∂Veff/∂h
Ham = Hint − M h ext




V_eff = ln Z(M) ⇒ M → M*
∂ln Z / ∂H = <M> = M* = m
H_am = H_int − M H_ext

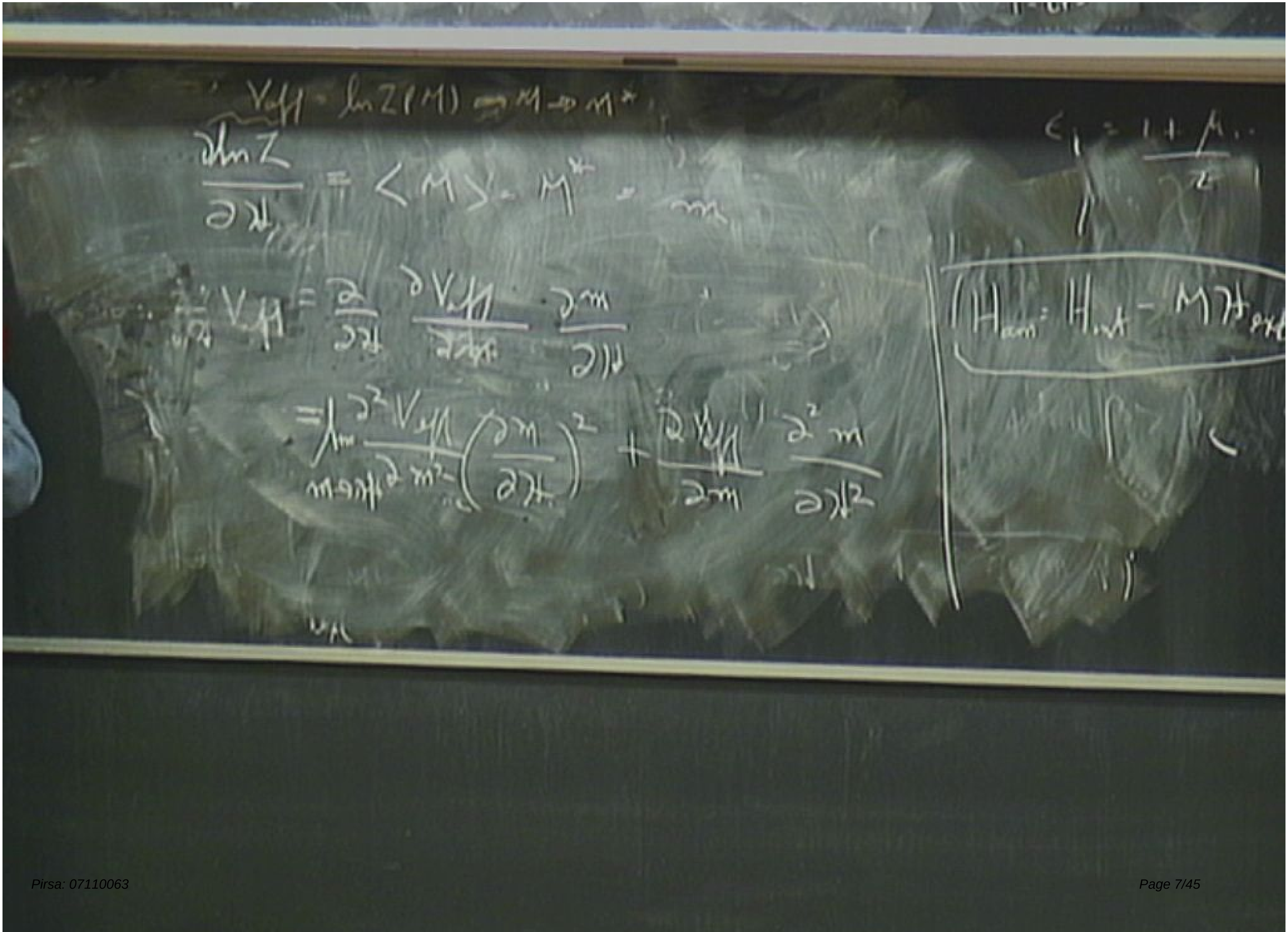
$V_{eff} = \ln Z(M)$, $M \to M^*$

$$\frac{\partial \ln Z}{\partial h} = \langle M \rangle = M^* = m$$

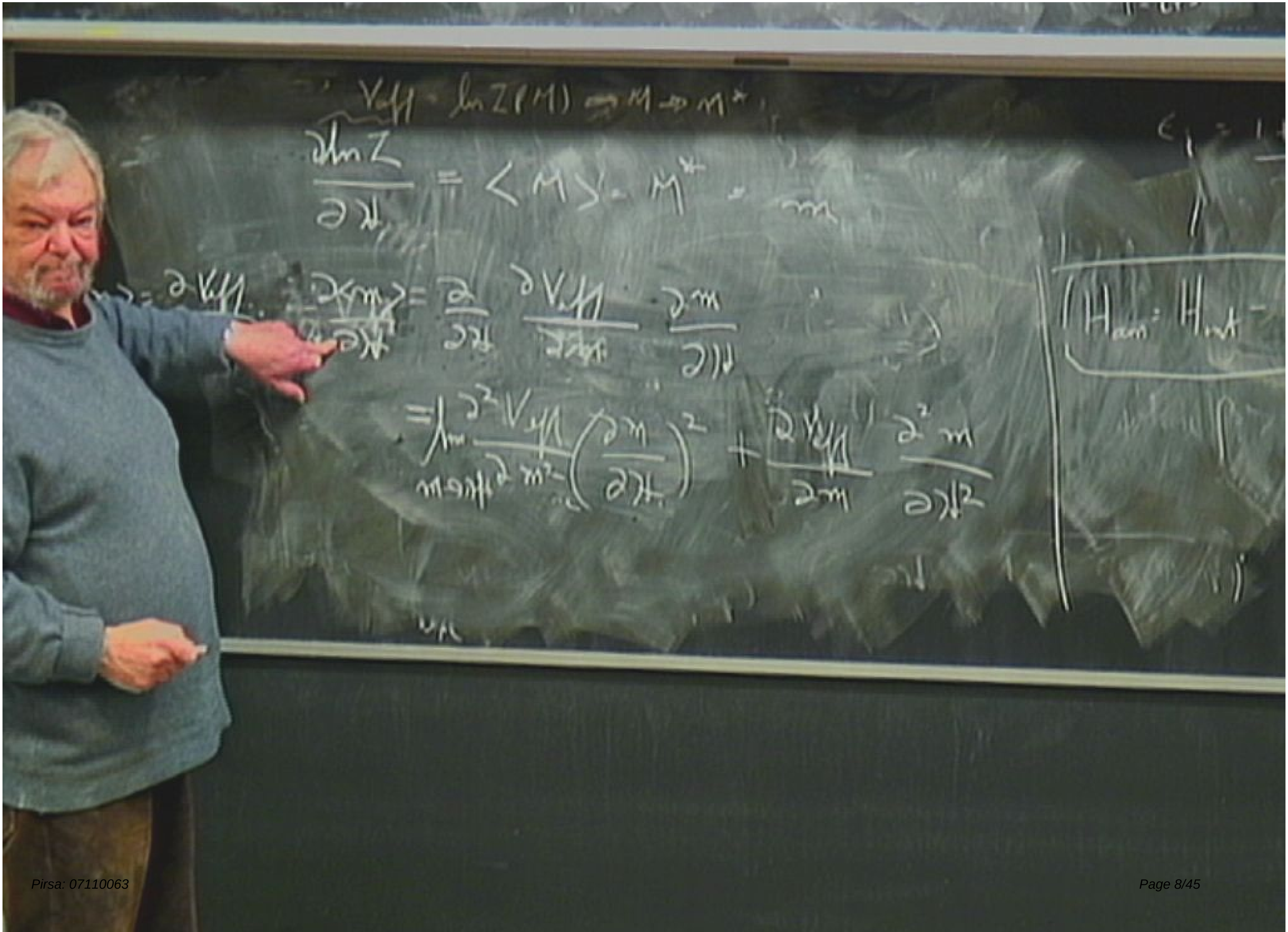
$$\frac{\partial}{\partial h} V_{eff} = \frac{\partial}{\partial h} \frac{\partial V_{eff}}{\partial m} \frac{\partial m}{\partial h}$$

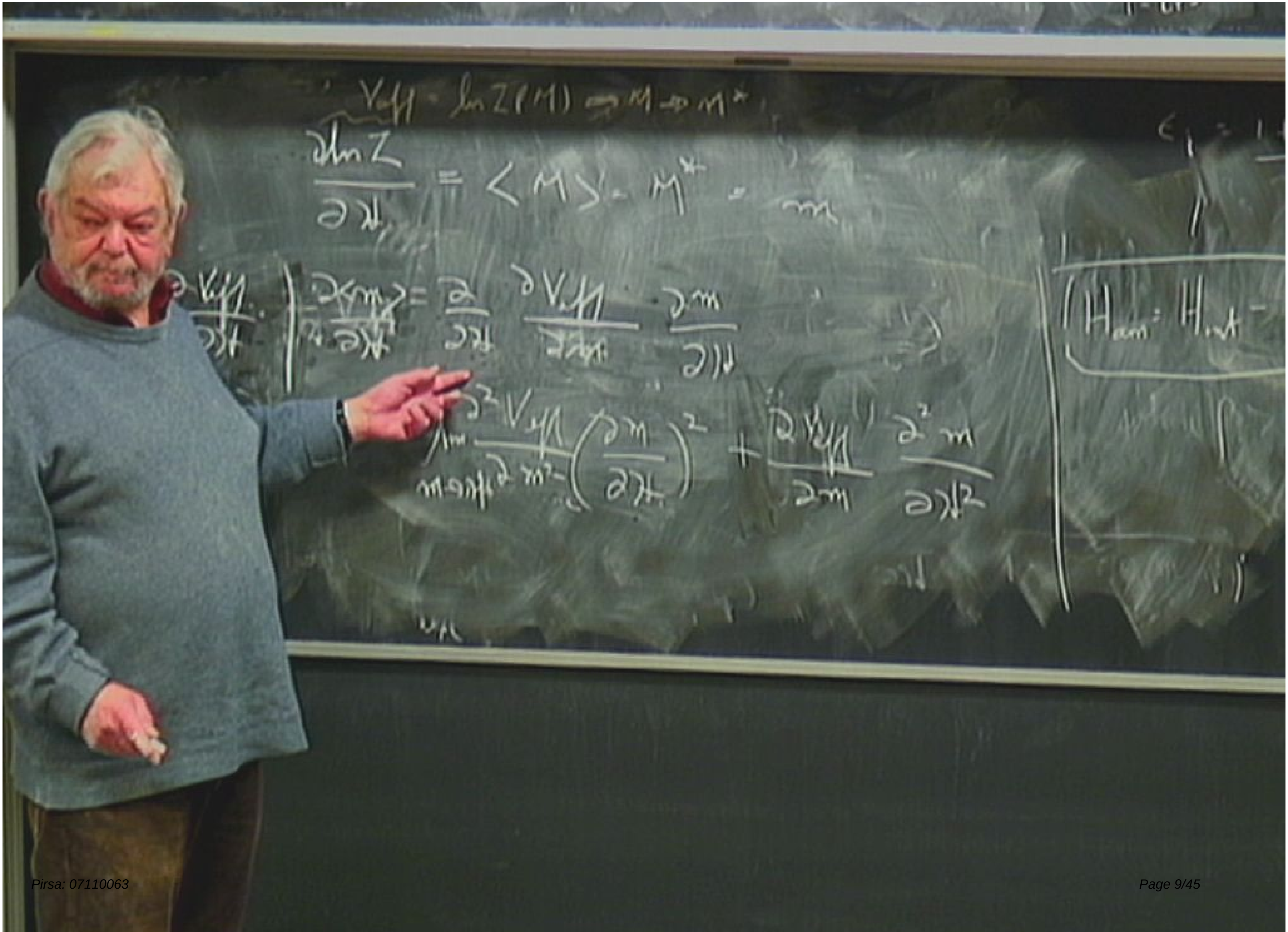
$$= \frac{\partial^2 V_{eff}}{\partial m^2} \left( \frac{\partial m}{\partial h} \right)^2 + \frac{\partial V_{eff}}{\partial m} \frac{\partial^2 m}{\partial h^2}$$

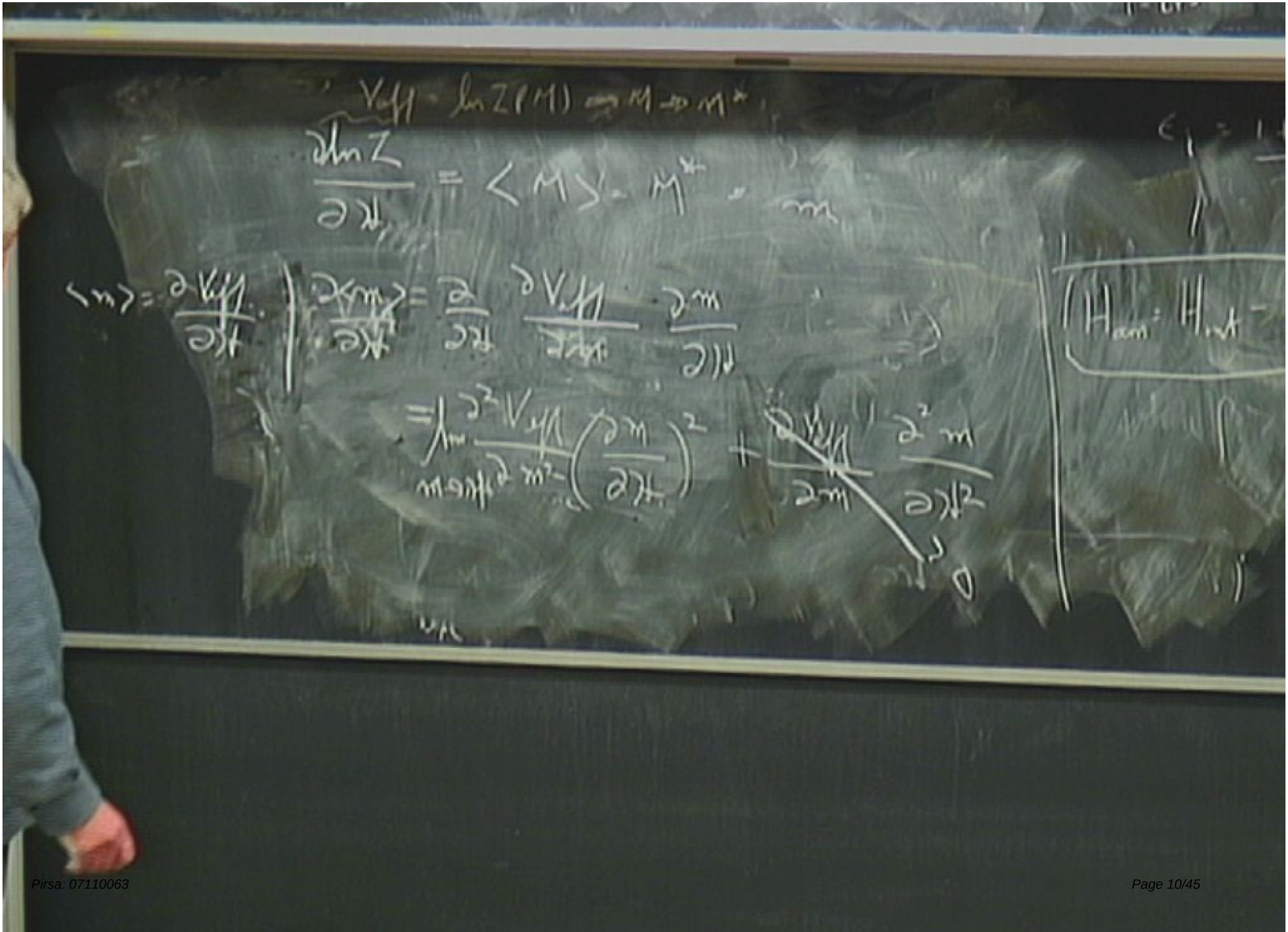
$$H_{new} = H_{old} - M h_{ext}$$



$V_{eff} = \ln Z(M)$ … $m \to m^*$
$\frac{\partial \ln Z}{\partial H} = \langle M \rangle = M^* = m$
$\frac{\partial}{\partial H} V_{eff} = \frac{\partial}{\partial H} \frac{\partial V_{eff}}{\partial m} \cdot \frac{\partial m}{\partial H}$
$= \frac{\partial^2 V_{eff}}{\partial m^2} \left(\frac{\partial m}{\partial H}\right)^2 + \frac{\partial V_{eff}}{\partial m} \frac{\partial^2 m}{\partial H^2}$
$H_{am} = H_{int} - M H_{ext}$






Veff = ln Z(M)
= < M > - M*

$$V_{eff} = \ln Z(M) \Rightarrow M \to M^*$$

$$\frac{\partial \ln Z}{\partial H} = \langle M \rangle = M^* = m$$

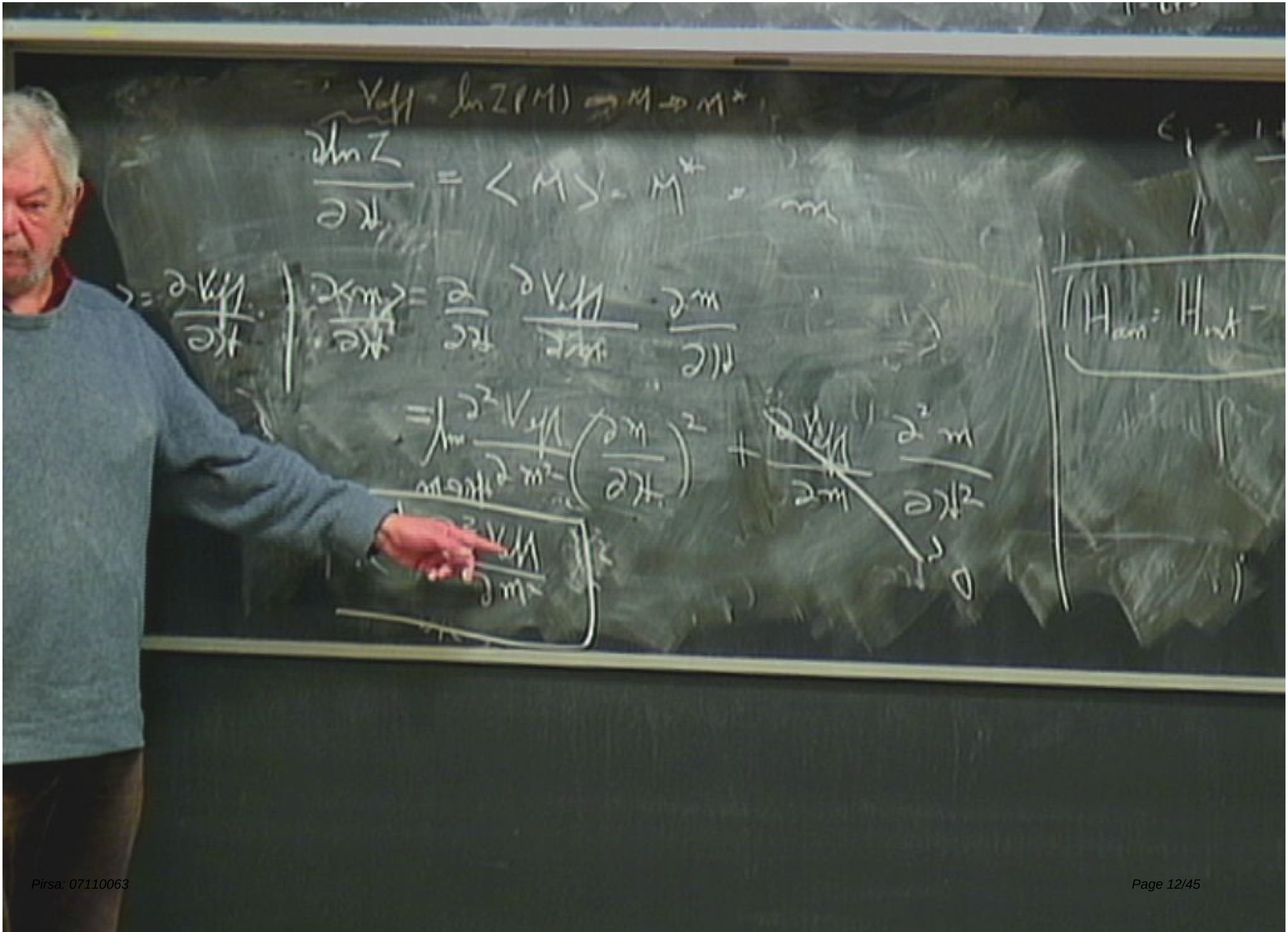
$$\langle m \rangle = \frac{\partial V_{eff}}{\partial H}$$

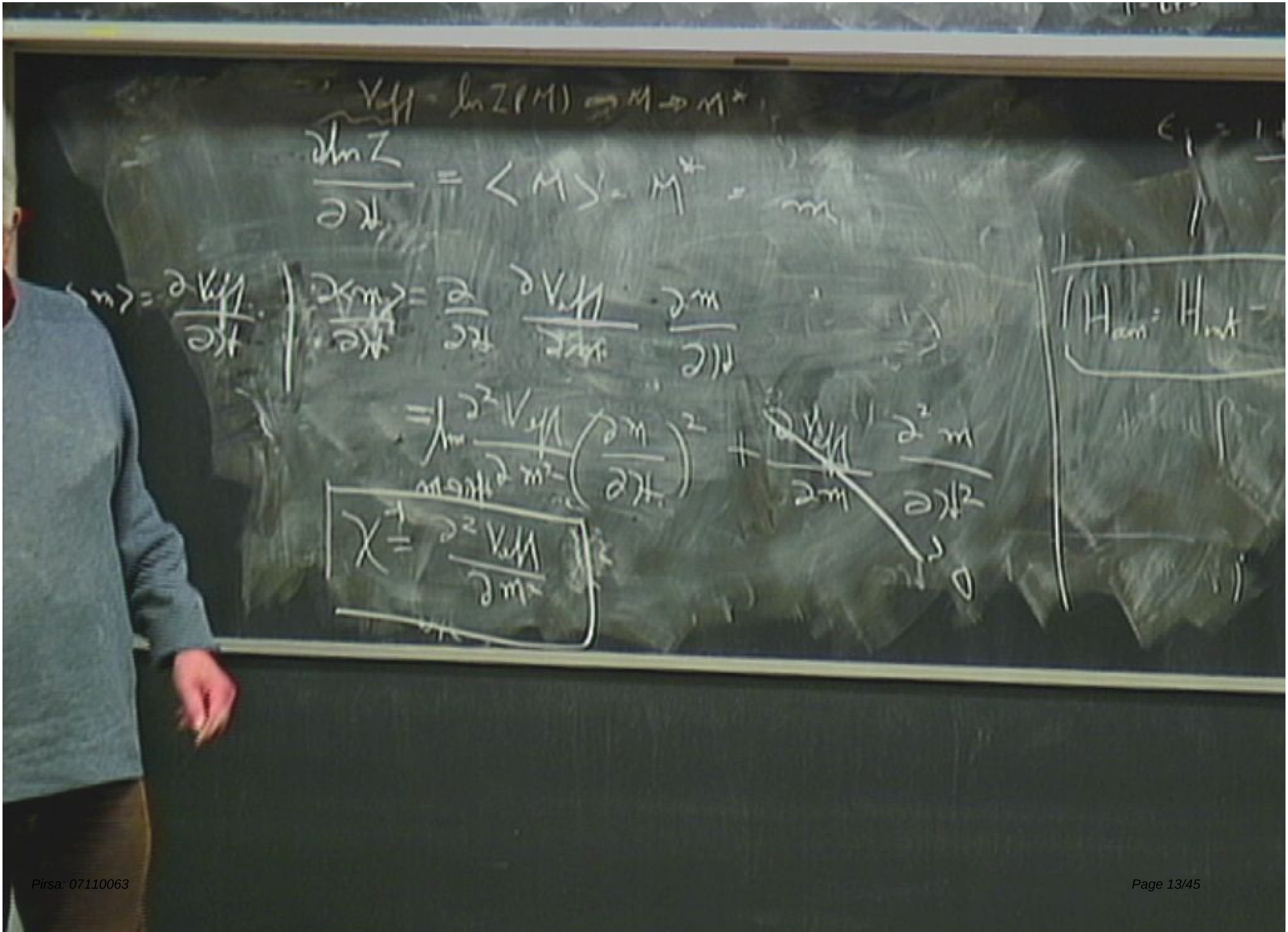
$$\frac{\partial \langle m \rangle}{\partial H} = \frac{\partial}{\partial H} \frac{\partial V_{eff}}{\partial m} \frac{\partial m}{\partial H}$$

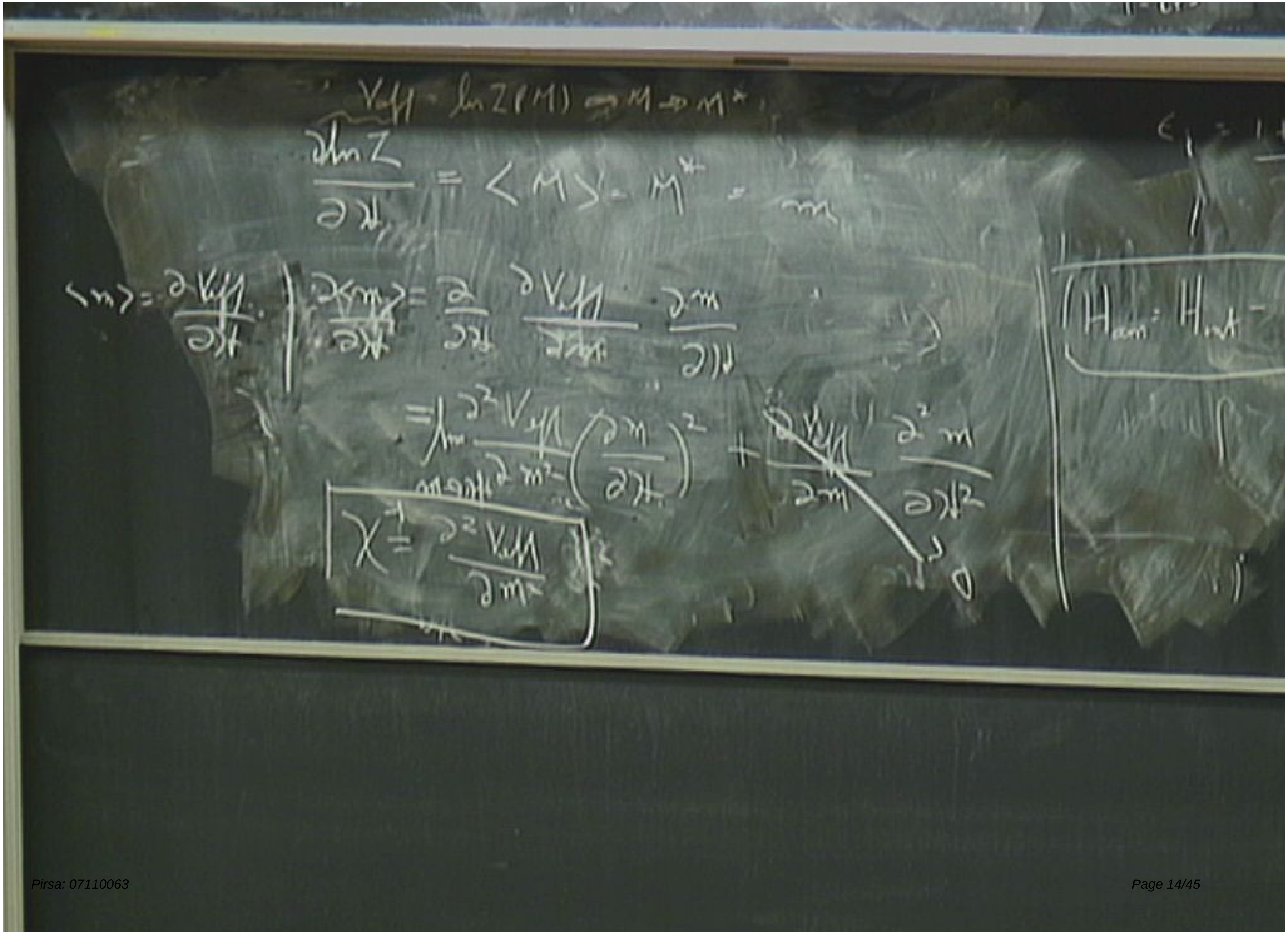
$$= \frac{\partial^2 V_{eff}}{\partial m^2} \left( \frac{\partial m}{\partial H} \right)^2 + \frac{\partial V_{eff}}{\partial m} \frac{\partial^2 m}{\partial H^2} \to 0$$

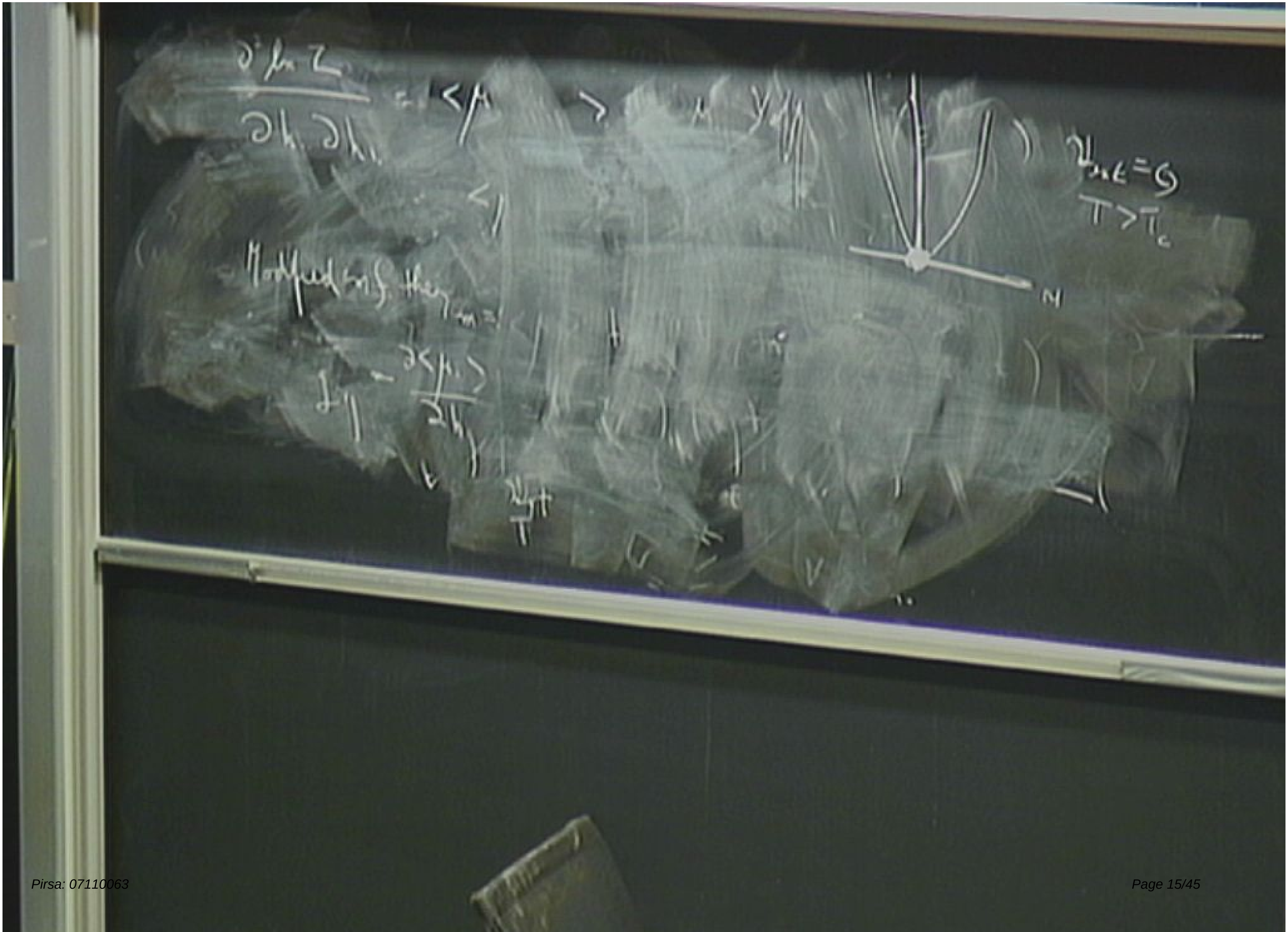
$$\chi = \frac{\partial^2 V_{eff}}{\partial m^2} \chi^2$$

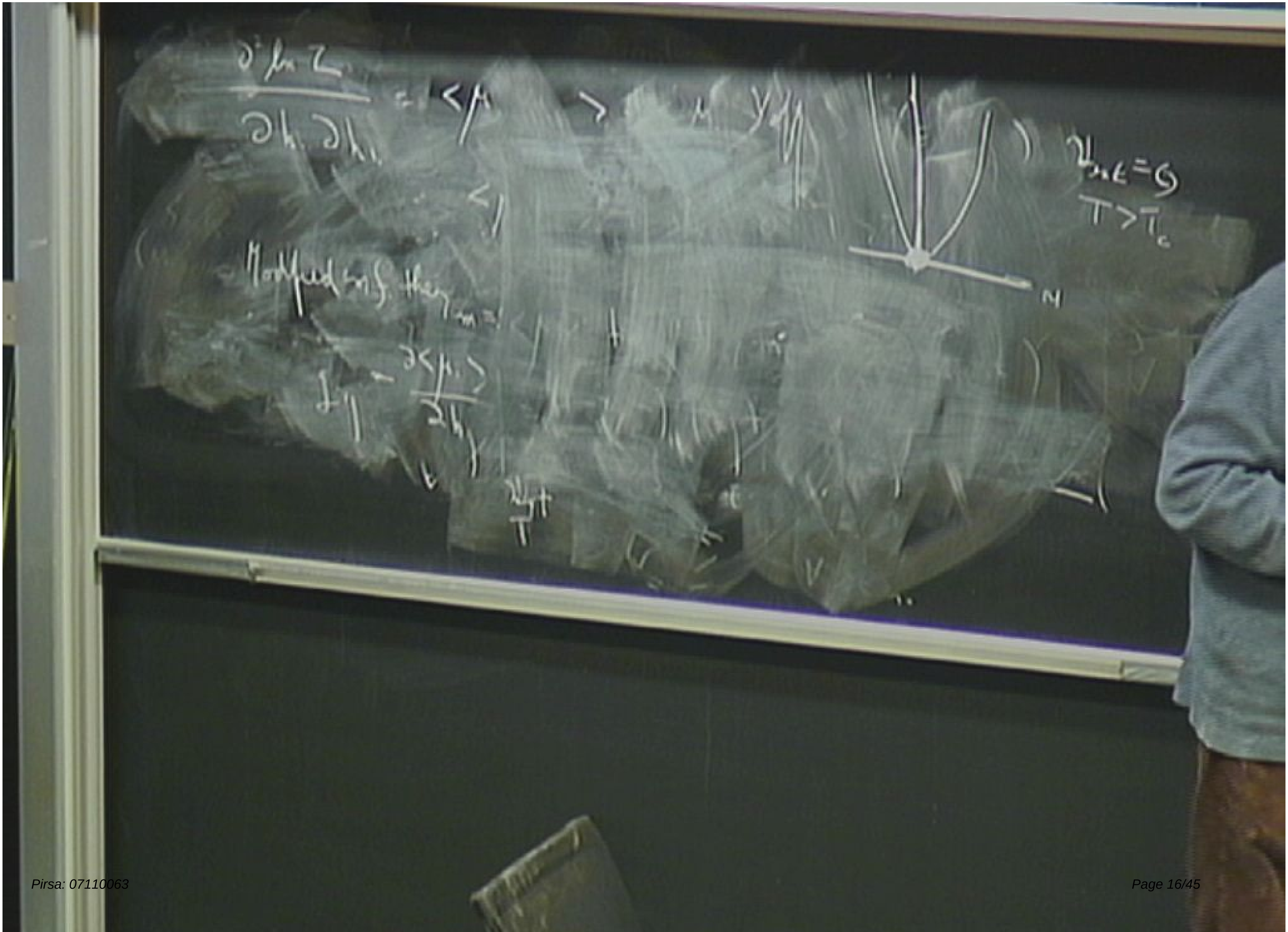
$$H_{am} = H_{int} -$$

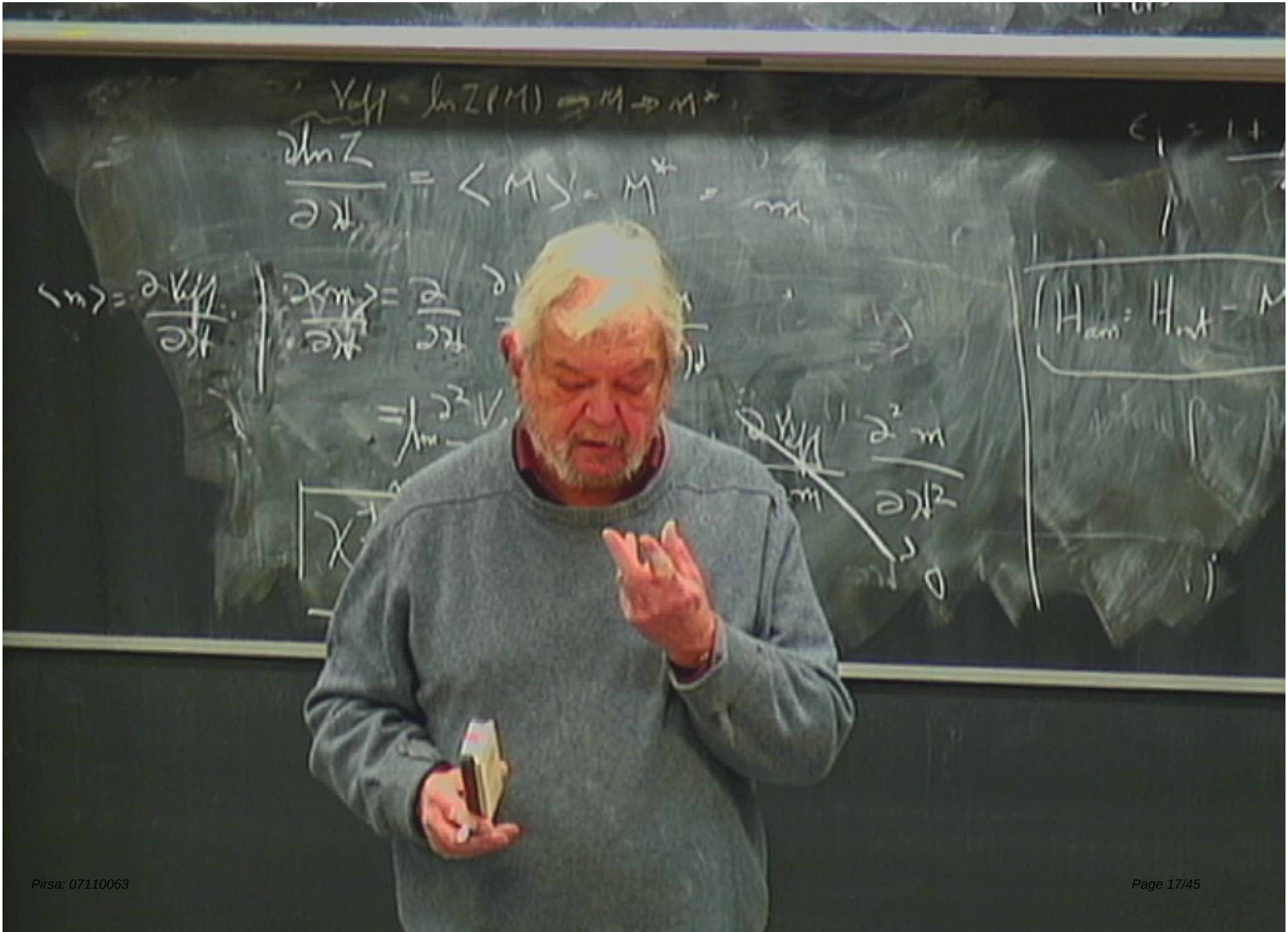


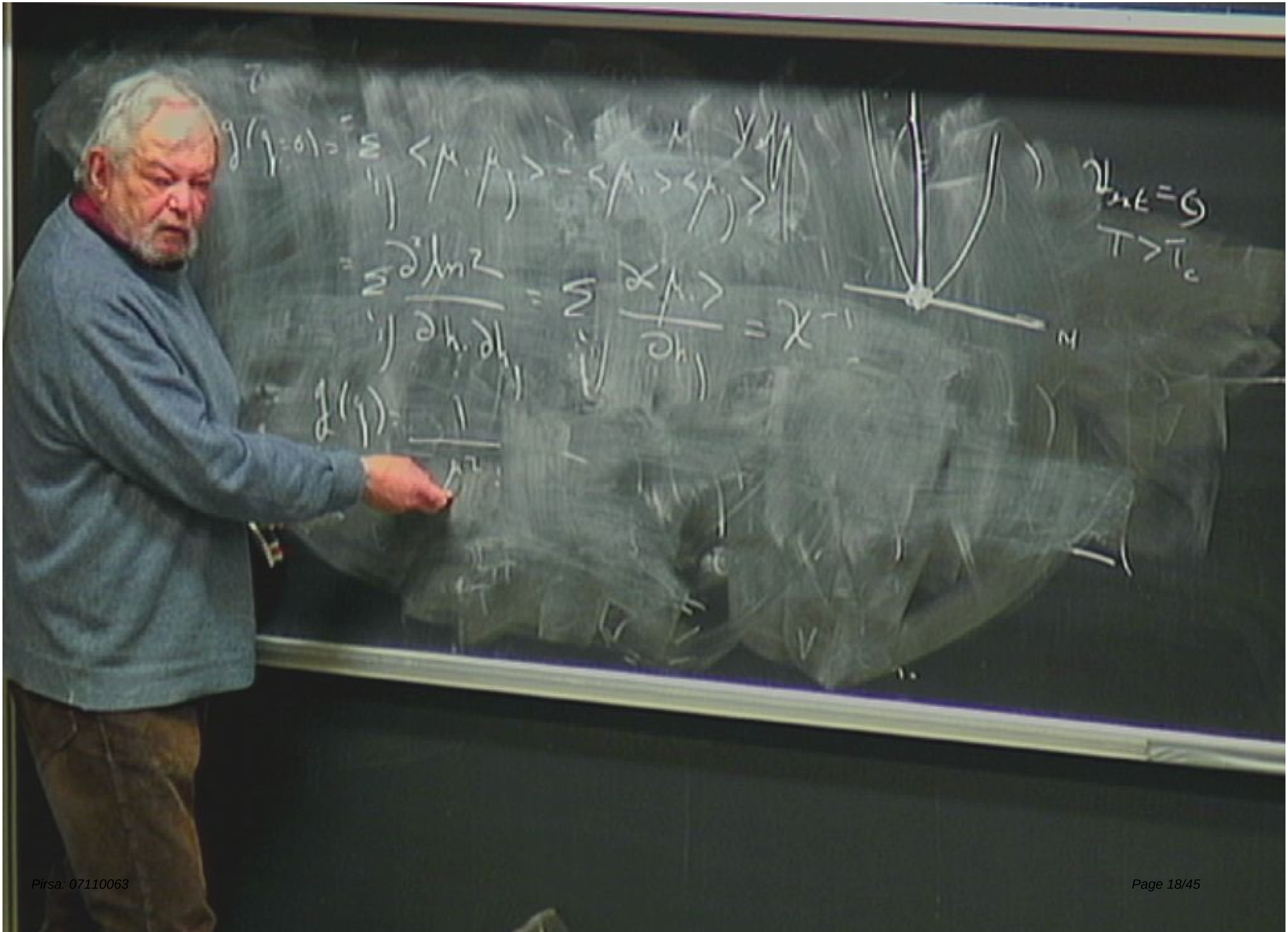

Veff = ln Z(M) M → M*
∂ln Z / ∂H = < M > = M* = m
χ⁻¹ = ∂²Veff / ∂m²

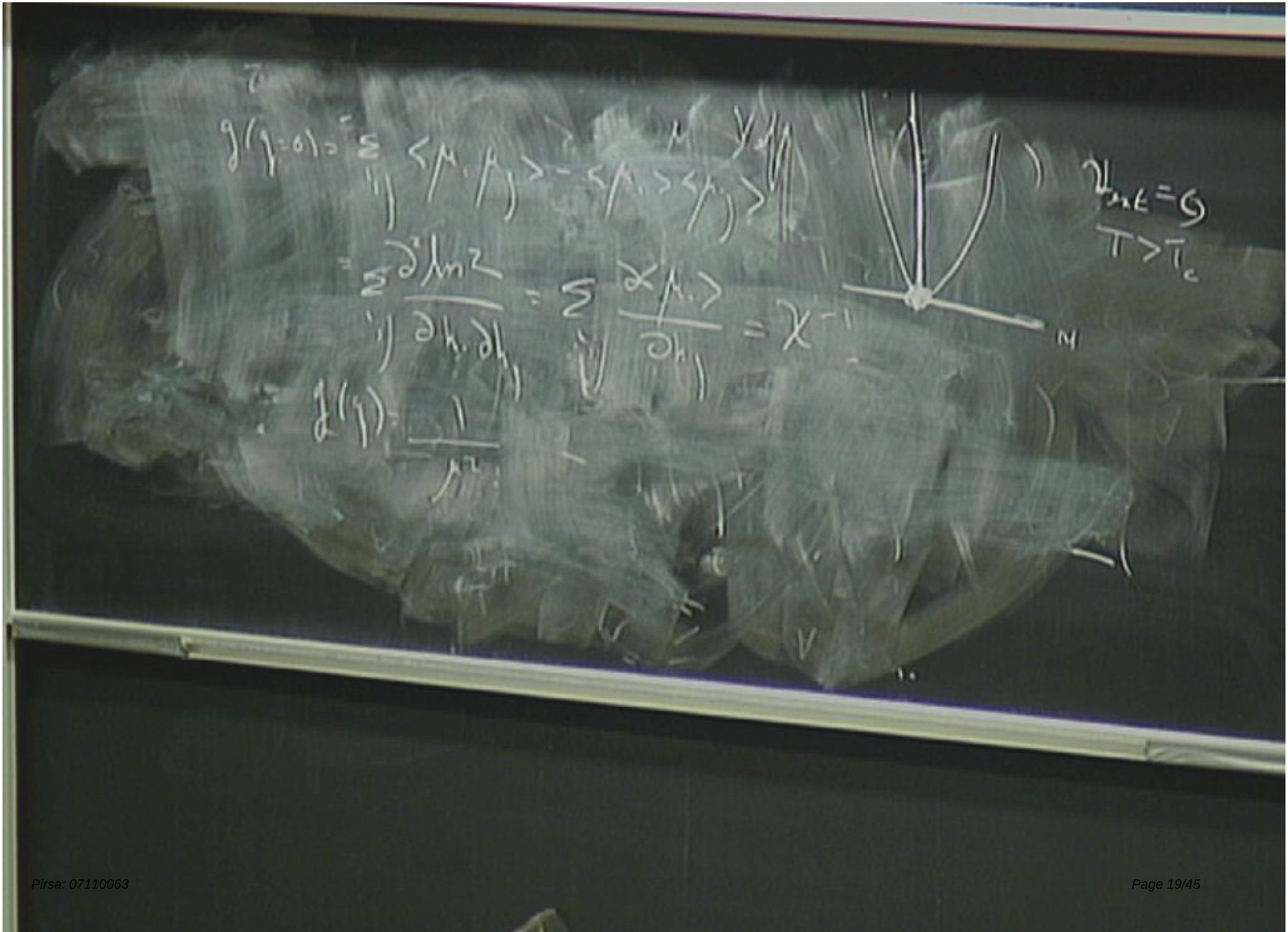

V_eff = ln Z(M) → M → M*
∂ln Z / ∂H = <M> = M* = m
<m> = ∂V_eff / ∂H
∂<m>/∂H = ∂/∂H ∂V_eff/∂m ∂m/∂H
= ∂²V_eff/∂m² (∂m/∂H)² + ∂V_eff/∂m ∂²m/∂H²
→ 0
χ⁻¹ = ∂²V_eff/∂m²
H_eff = H_int

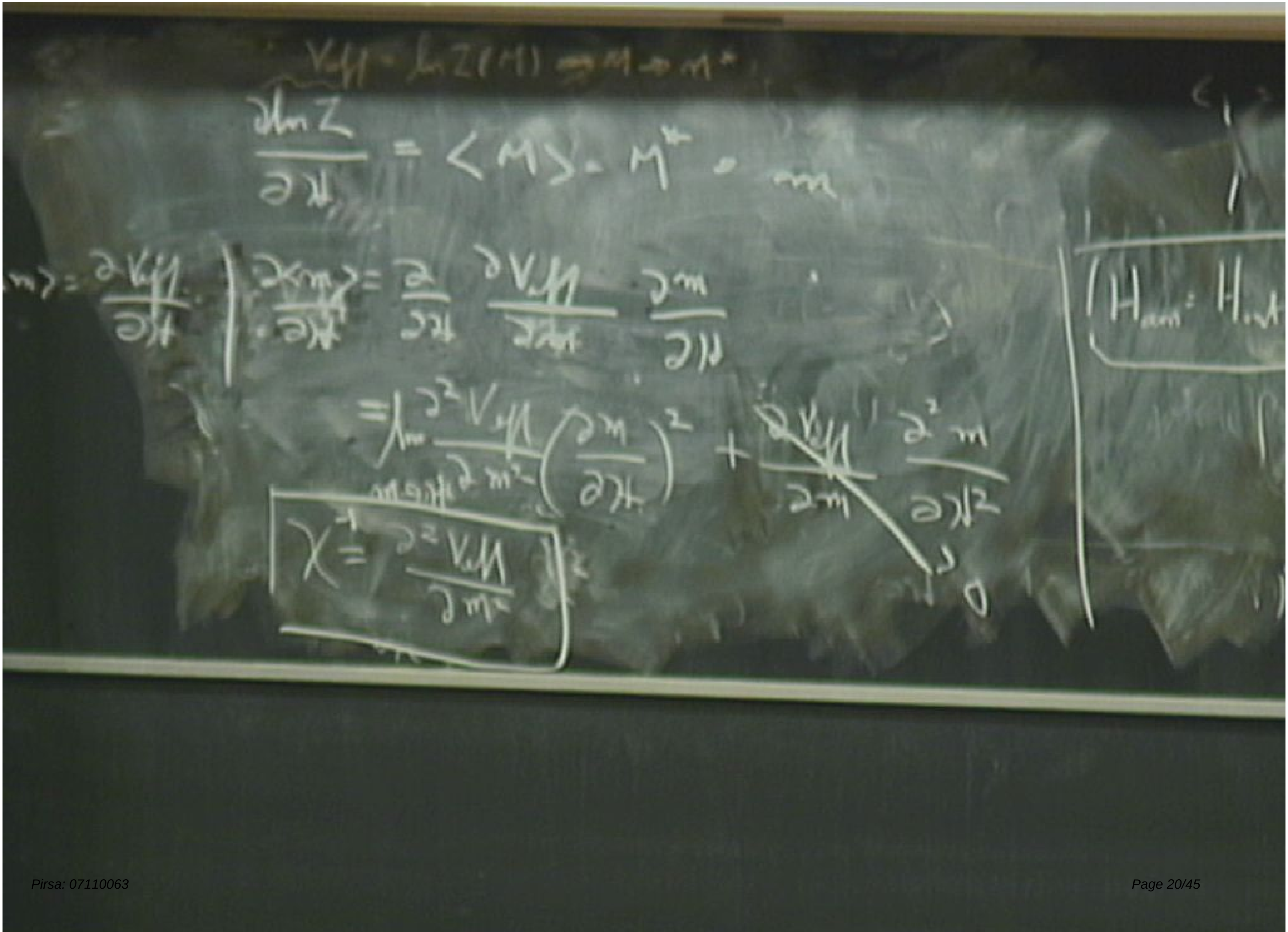


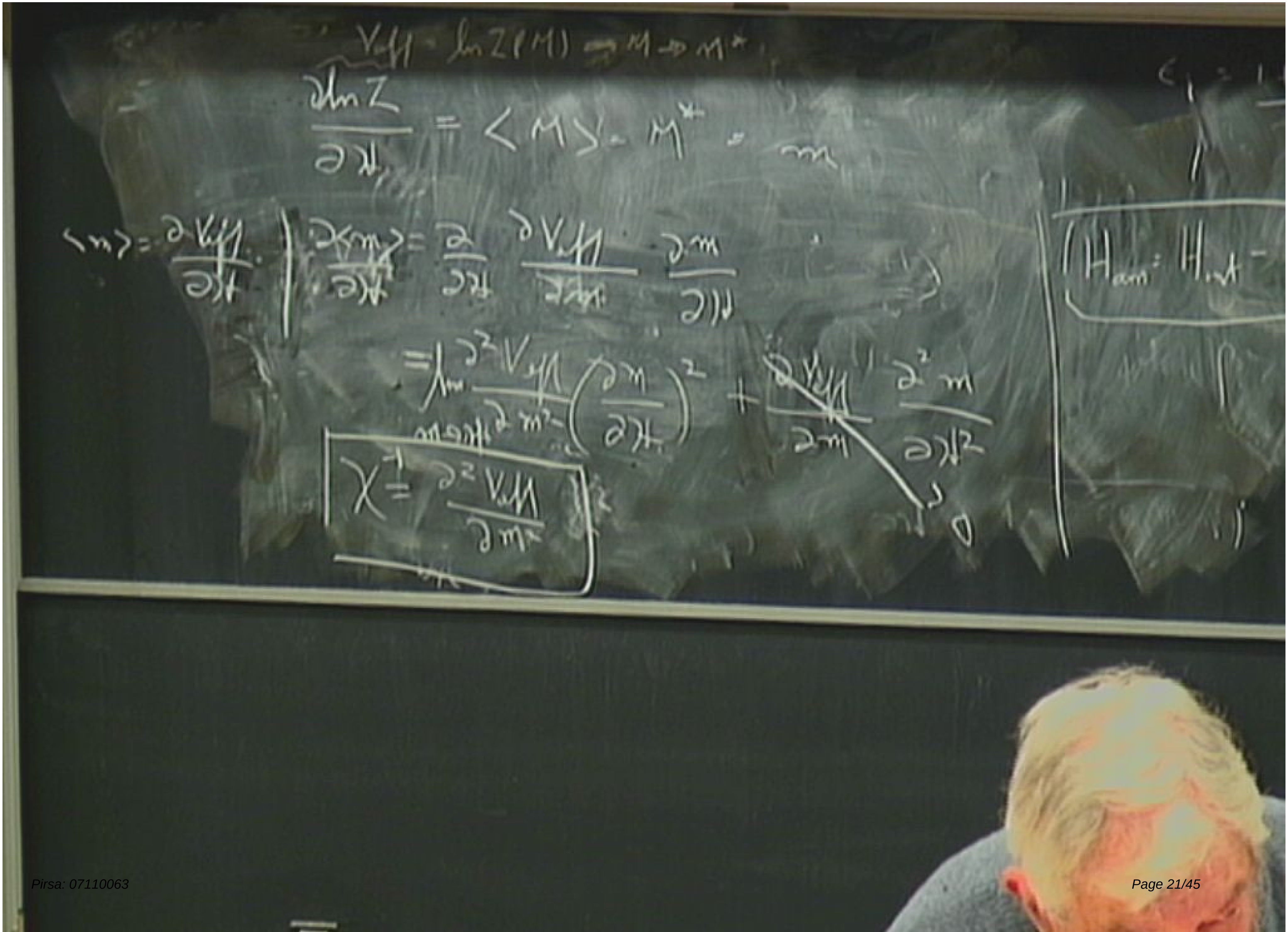

T > T_c

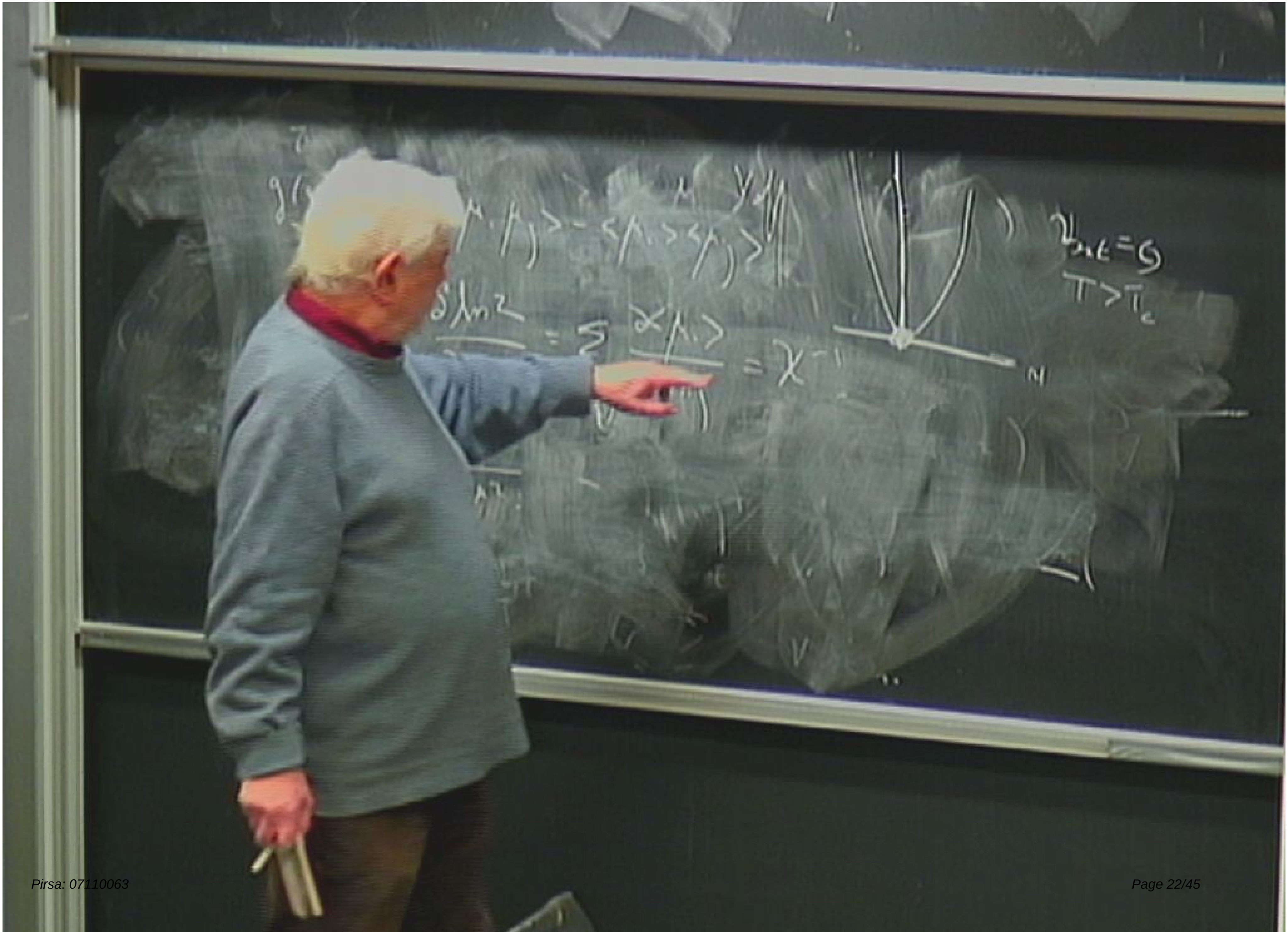





g(q=0) = Σ_ij <μ_i μ_j> − <μ_i><μ_j>
= Σ_ij ∂² ln Z / ∂h_i ∂h_j = Σ_ij ∂<μ_i> / ∂h_j = χ^-1
g(q) = 1 / q²
h_ext = 0
T > T_c
M


V_eff = ln Z(M)
∂ln Z / ∂h = ⟨M⟩ = M* = m
⟨m⟩ = ∂V_eff / ∂h
∂⟨m⟩/∂h = ∂/∂h ∂V_eff/∂m ∂m/∂h
= ∂²V_eff/∂m² (∂m/∂h)² + ∂V_eff/∂m ∂²m/∂h²
χ⁻¹ = ∂²V_eff/∂m²
H_ann = H_int


V_eff = ln Z(M) → M → M*
∂ln Z / ∂H = < M > − M* = m
< m > = ∂V_eff / ∂H
χ⁻¹ = ∂²V_eff / ∂m²



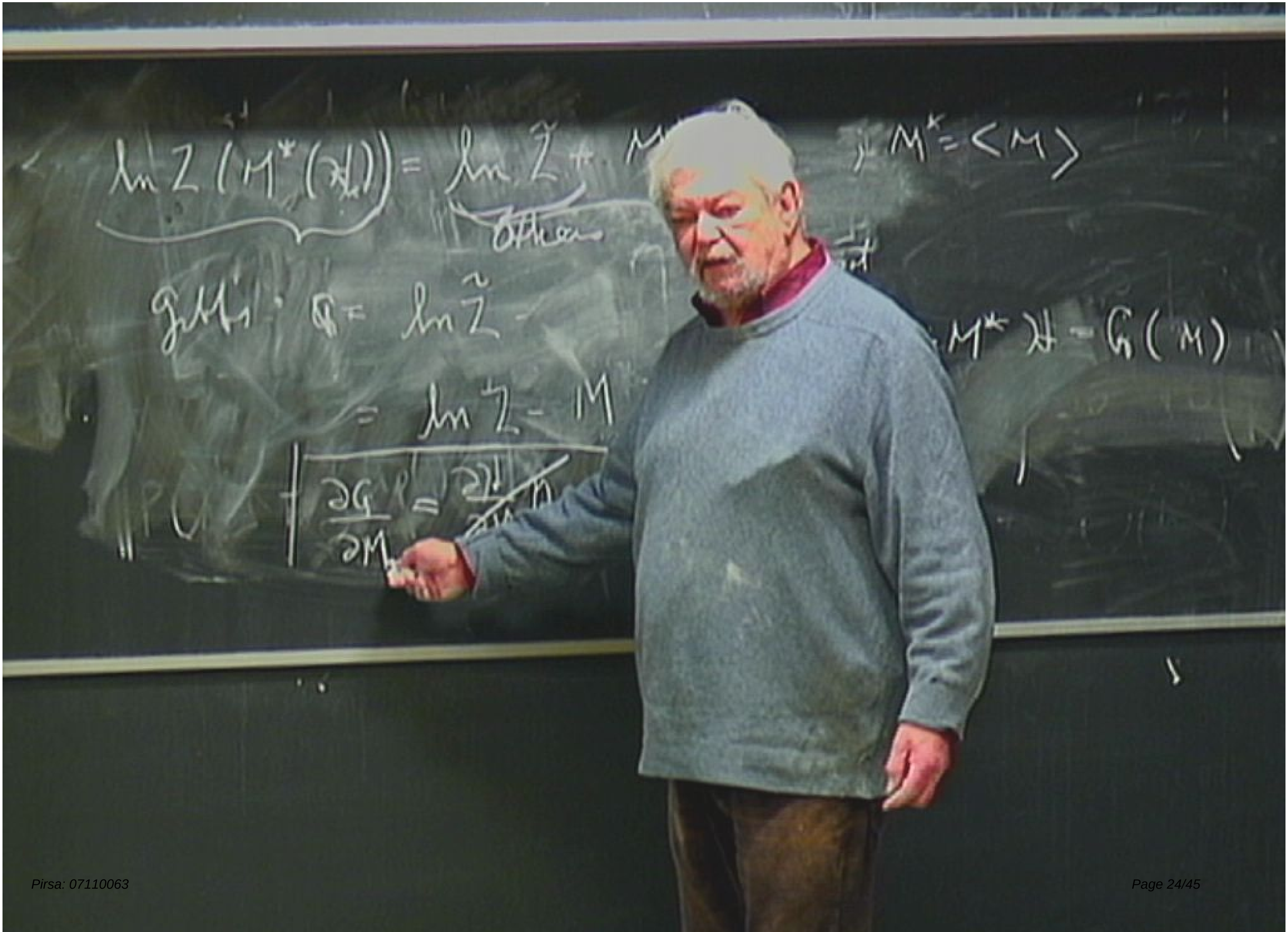
$\ln Z(M^*(\mathcal{H}_{ext})) = \ln \tilde{Z} + M^* \mathcal{H}_{ext}$ ; $M^* = \langle M \rangle$

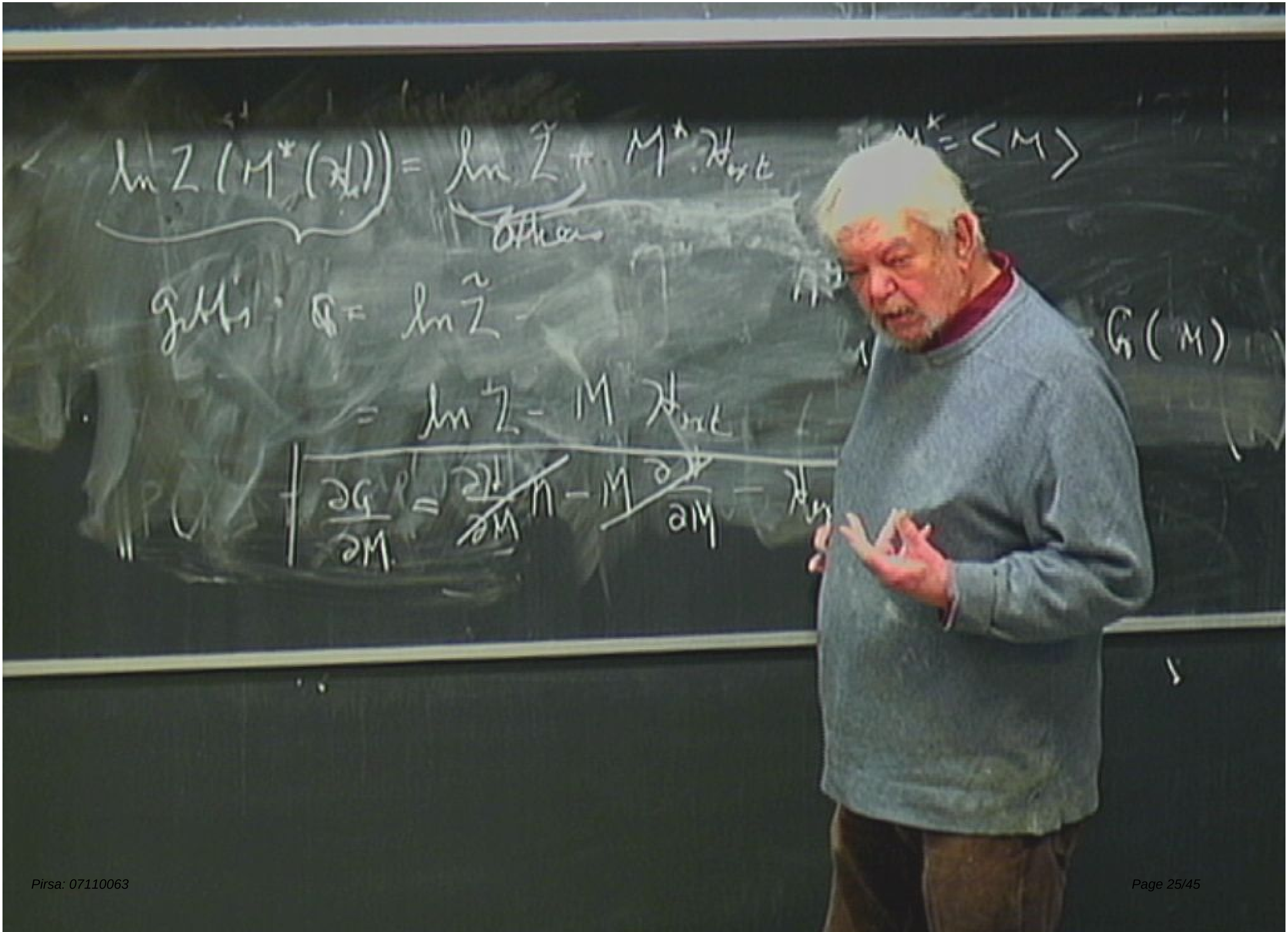
Others

Gibbs: $G = \ln \tilde{Z}$

$\ln Z = M^* \mathcal{H} - G(M)$

$= \ln Z - M \mathcal{H}_{ext}$

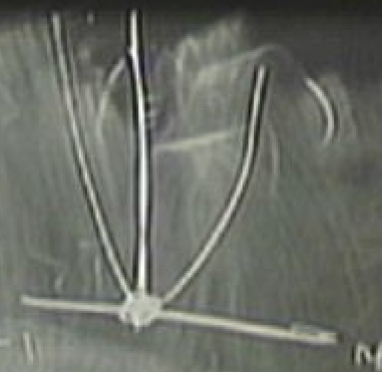




$$g(q=0) = \sum_{ij} \langle \mu_i \mu_j \rangle - \langle \mu_i \rangle \langle \mu_j \rangle$$

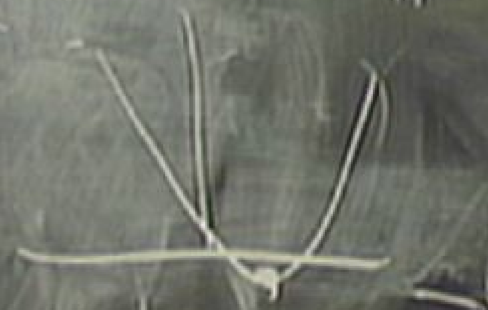
$$= \sum_{ij} \frac{\partial^2 \ln Z}{\partial h_i \partial h_j} = \sum_{ij} \frac{\partial \langle \mu_i \rangle}{\partial h_j} = \chi^{-1}$$

$$g(q) = \frac{1}{q^2}$$

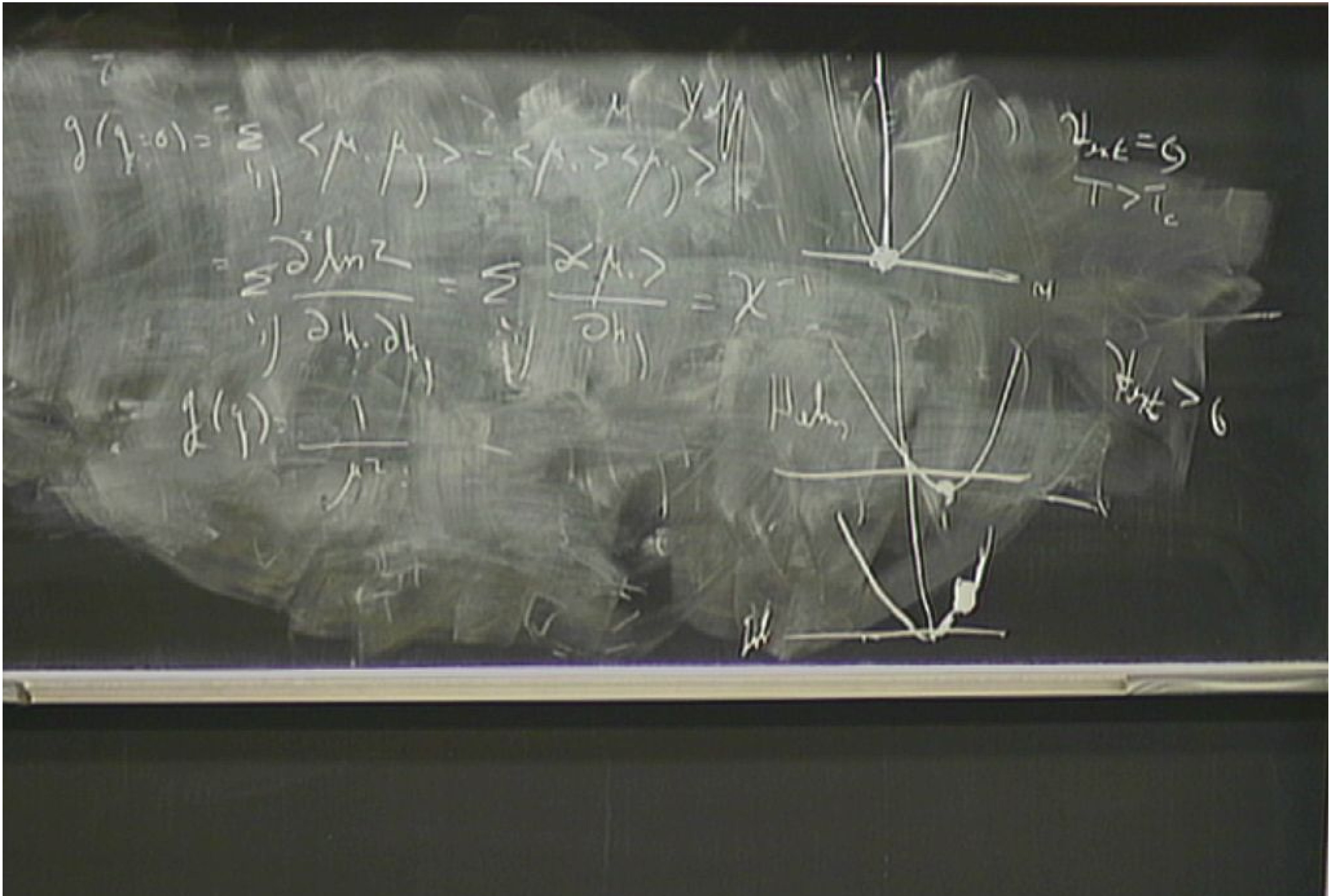


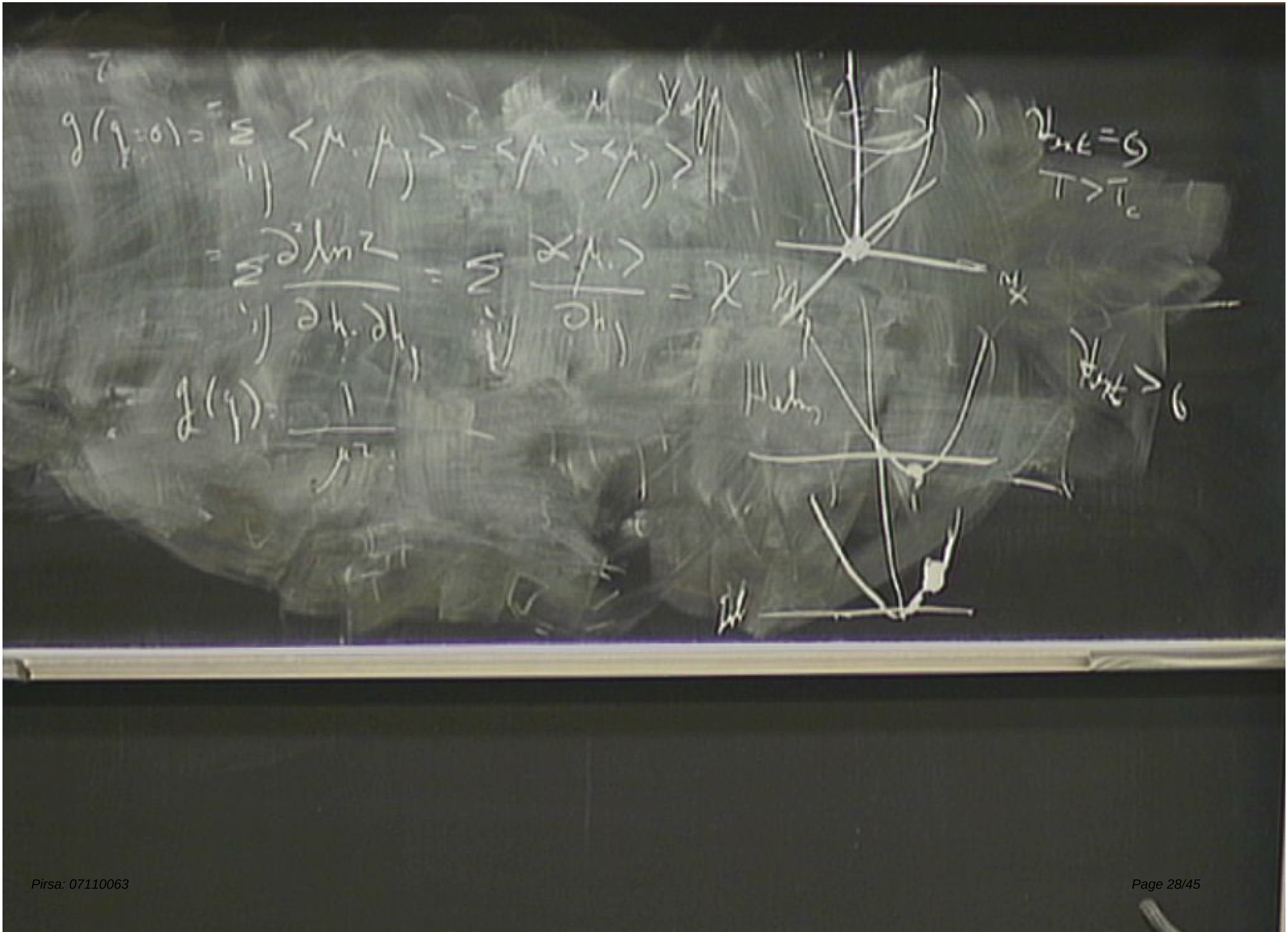

$\lambda_{ext} = 0$

$T > T_c$

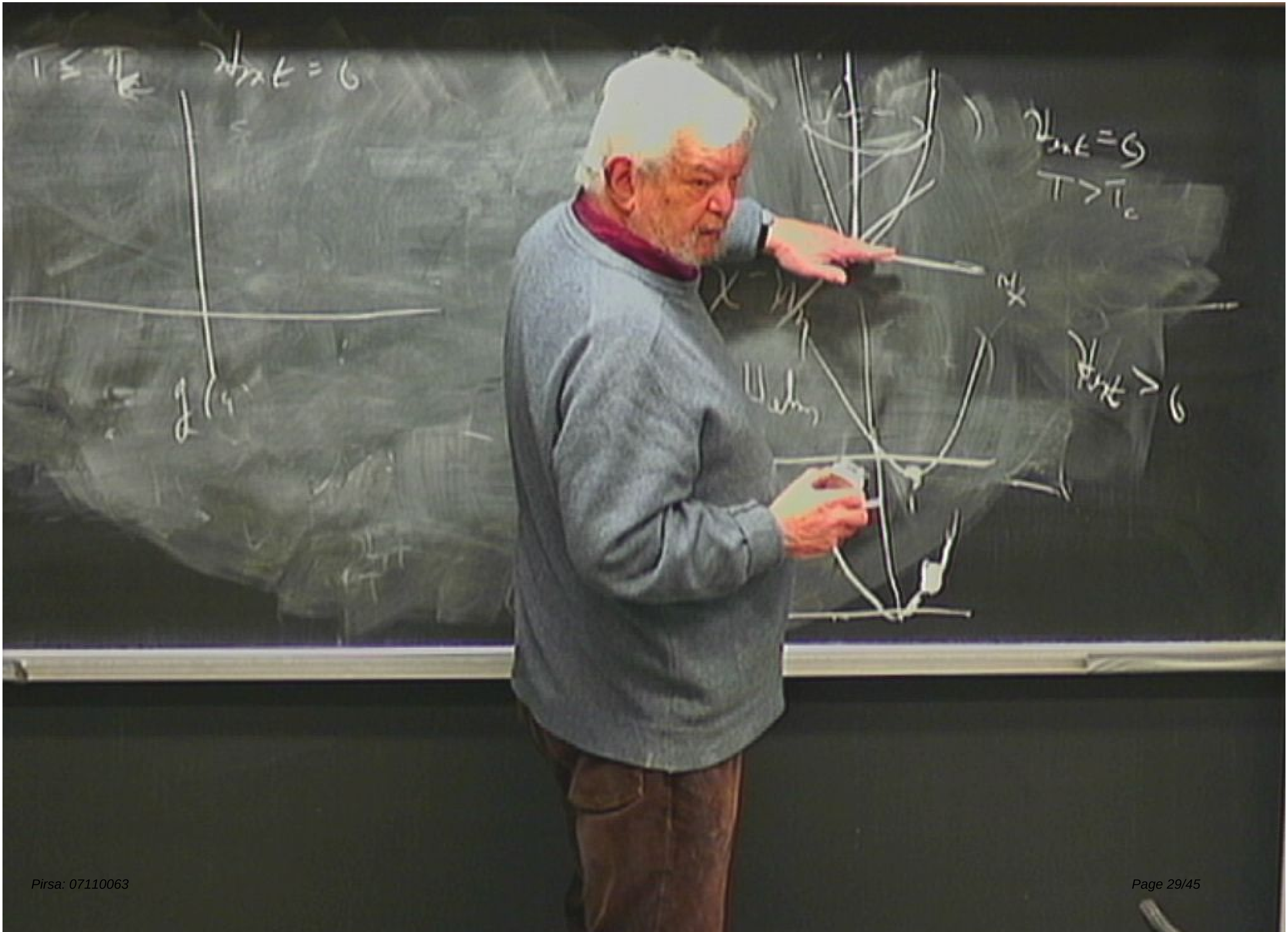


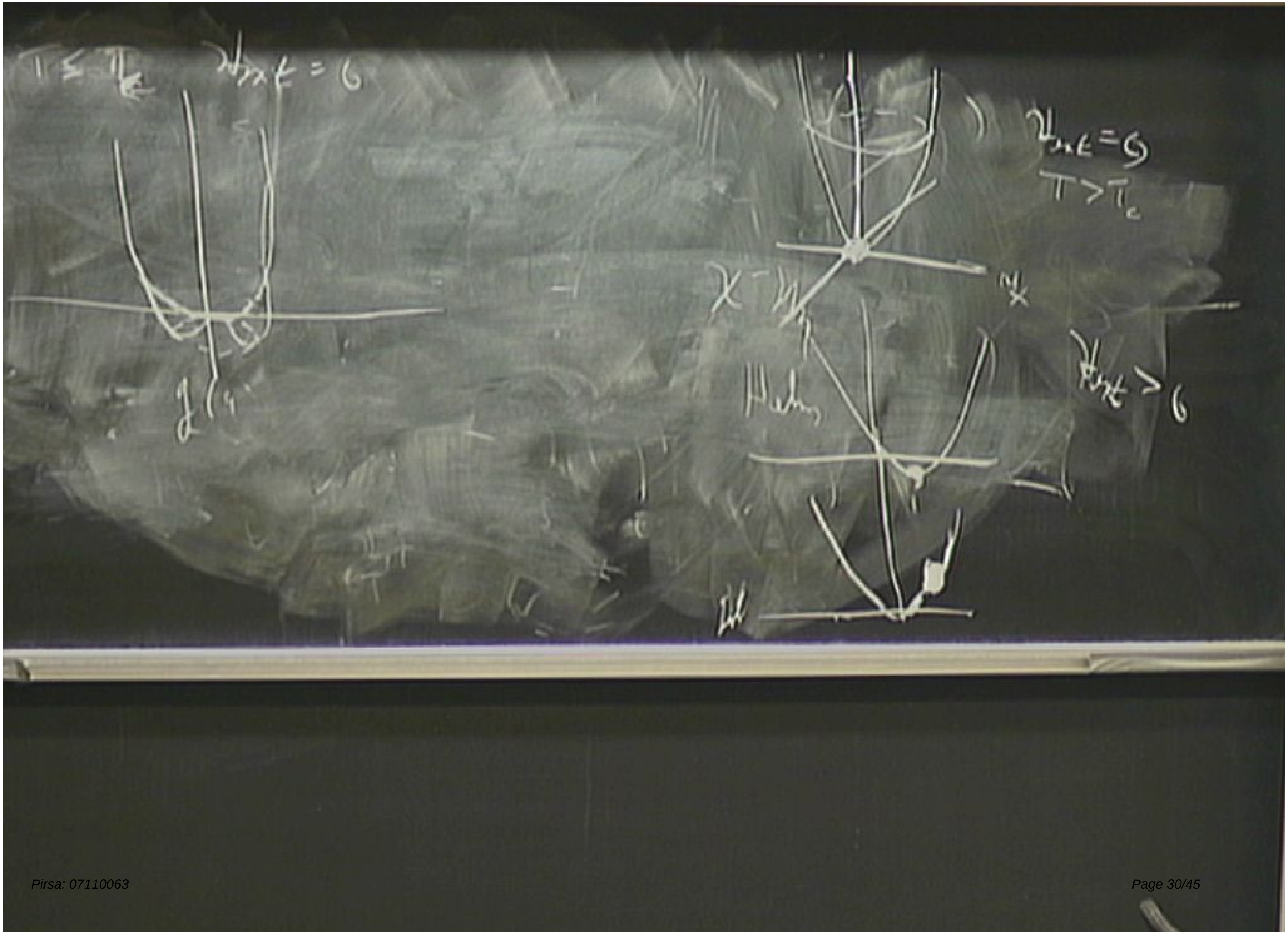
$\lambda_{ext} > 0$

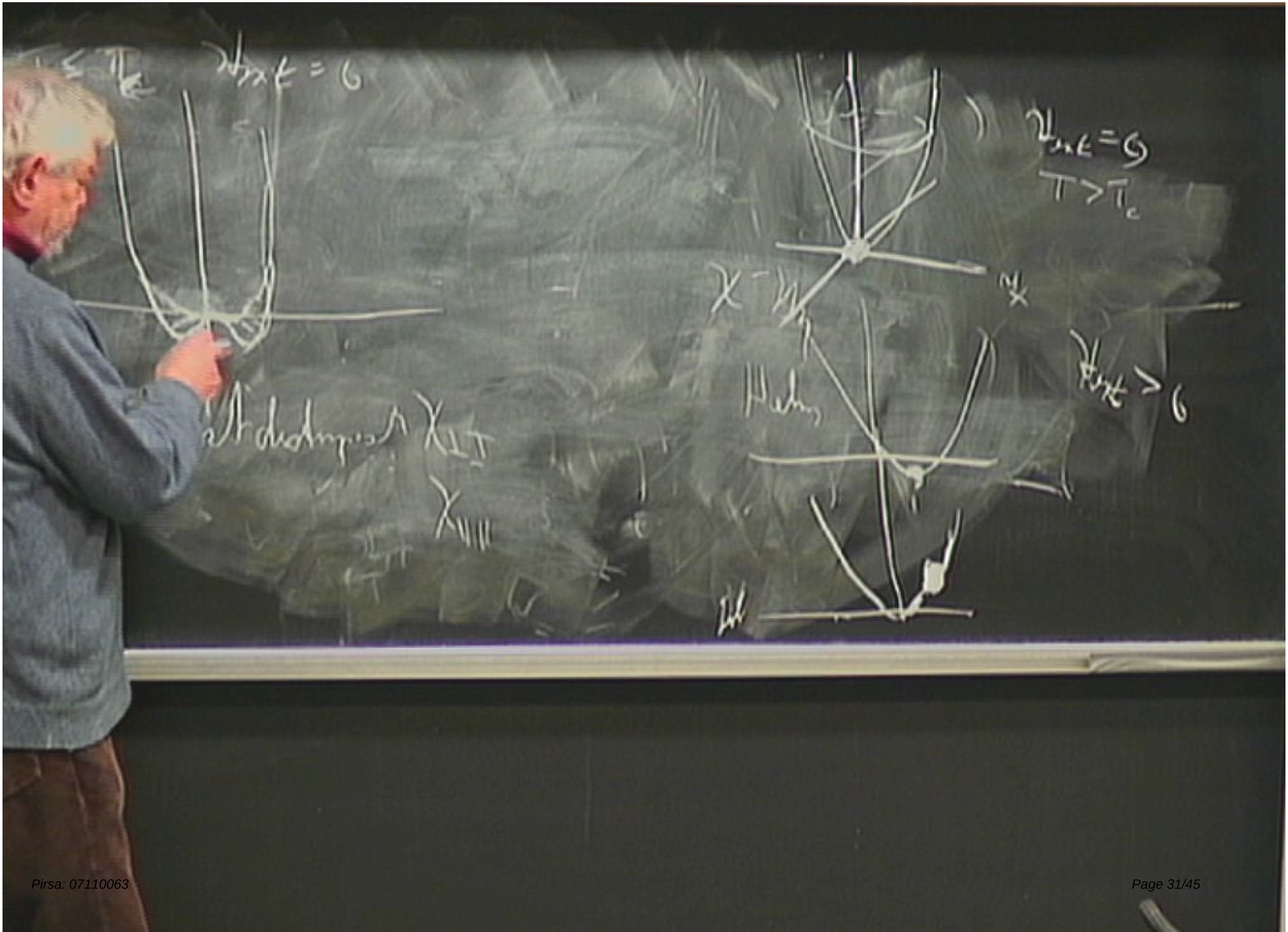

g(r_ij=0) = Σ_ij <μ_i μ_j> - <μ_i><μ_j>
= Σ_ij ∂²ln Z / ∂h_i ∂h_j = Σ_ij ∂<μ_i> / ∂h_j = χ^-1
g(r) = 1 / r²
h_ext = 0
T > T_c
h_ext > 0

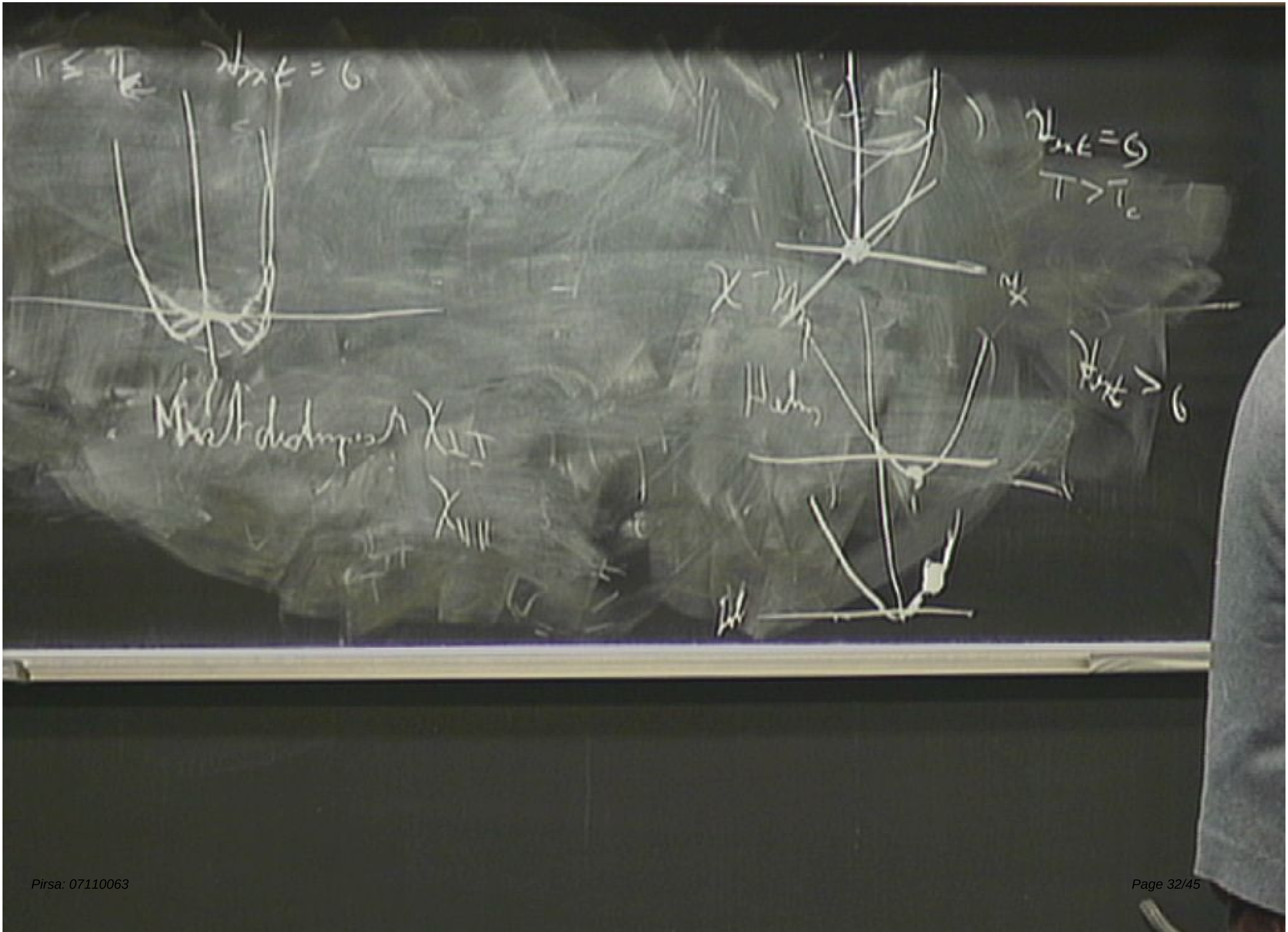


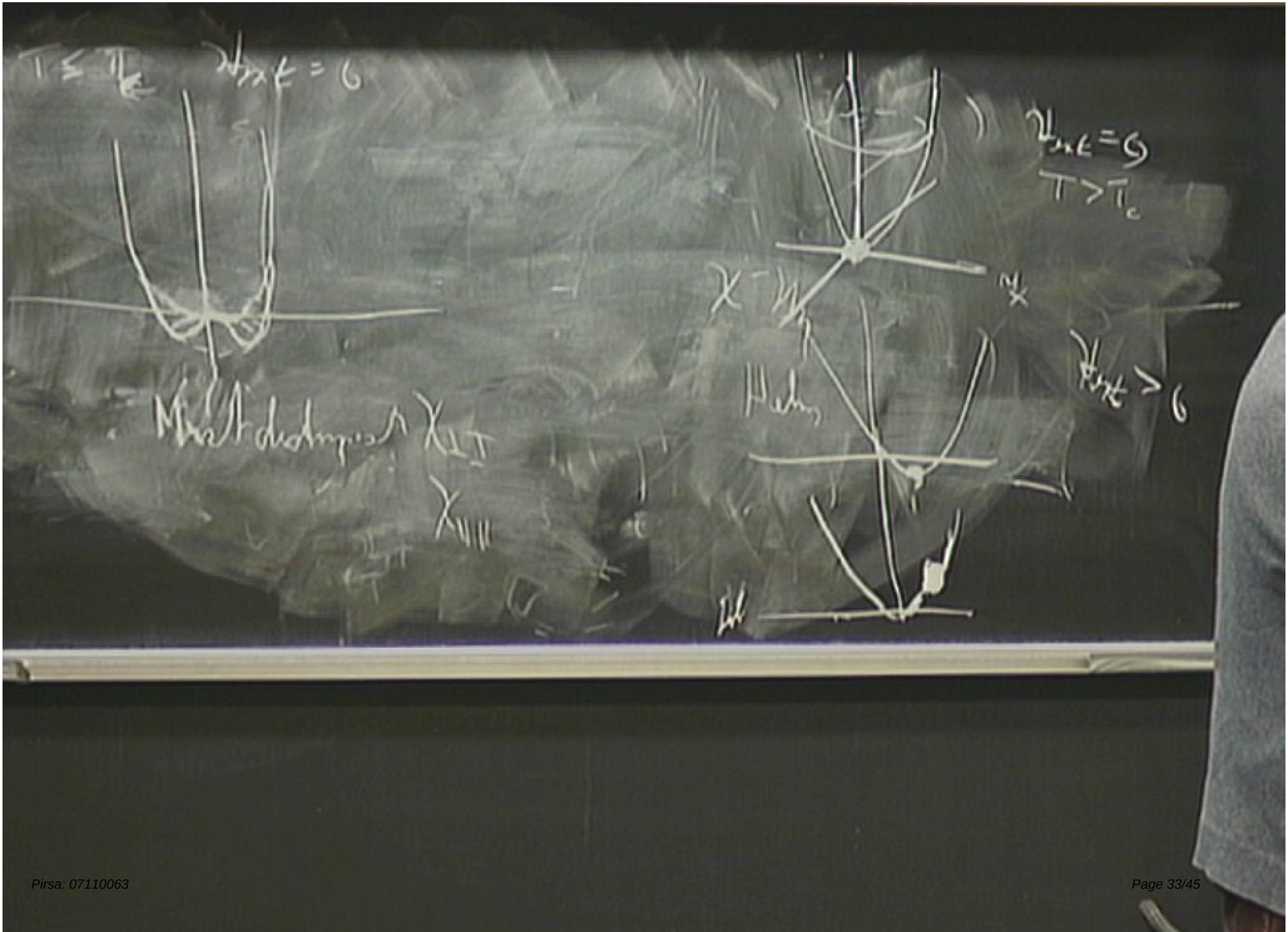
T > T_c

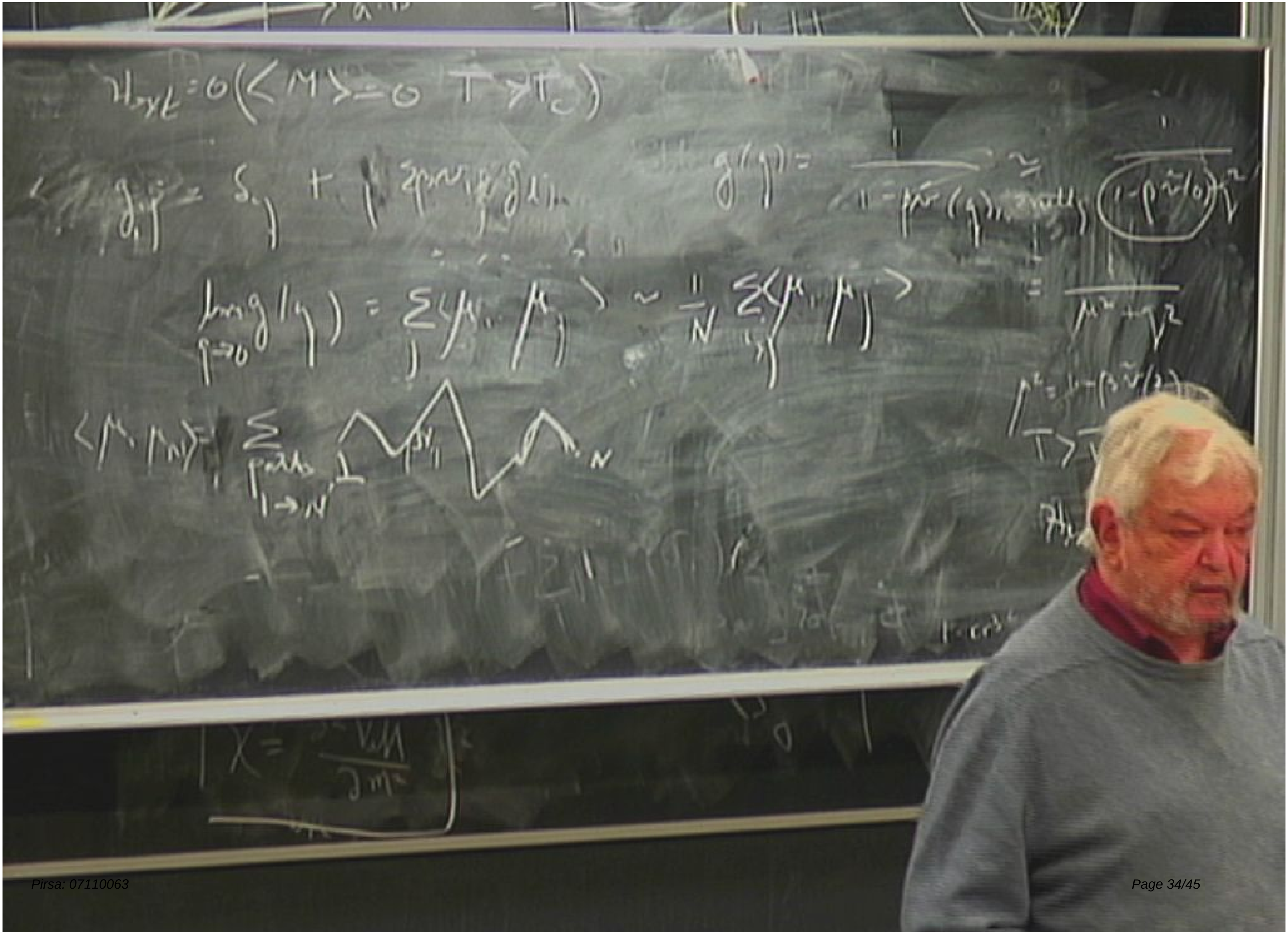

T ≤ T_c
T > T_c

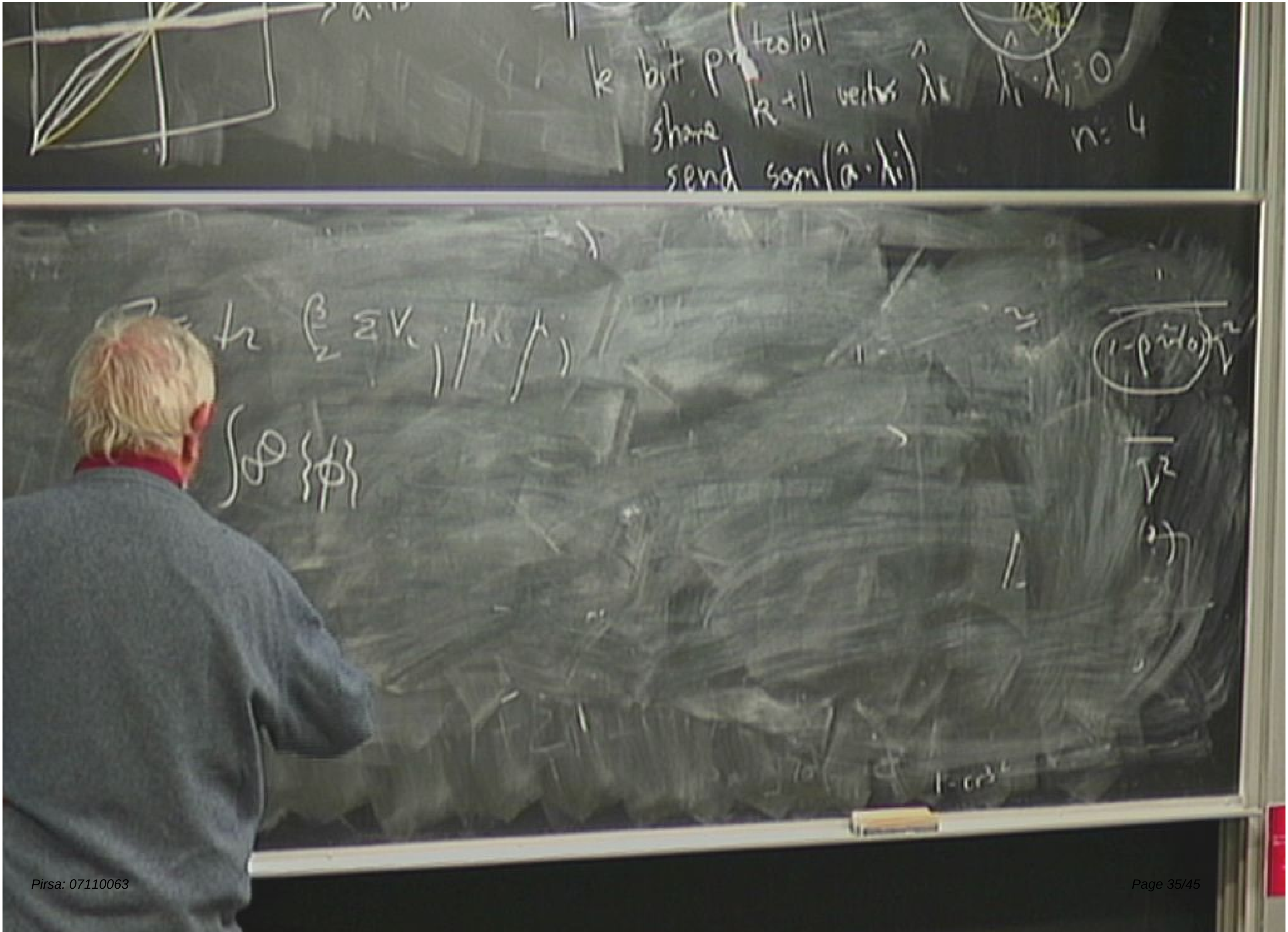







T > T_c




k bit protocol
k+1 vectors
share
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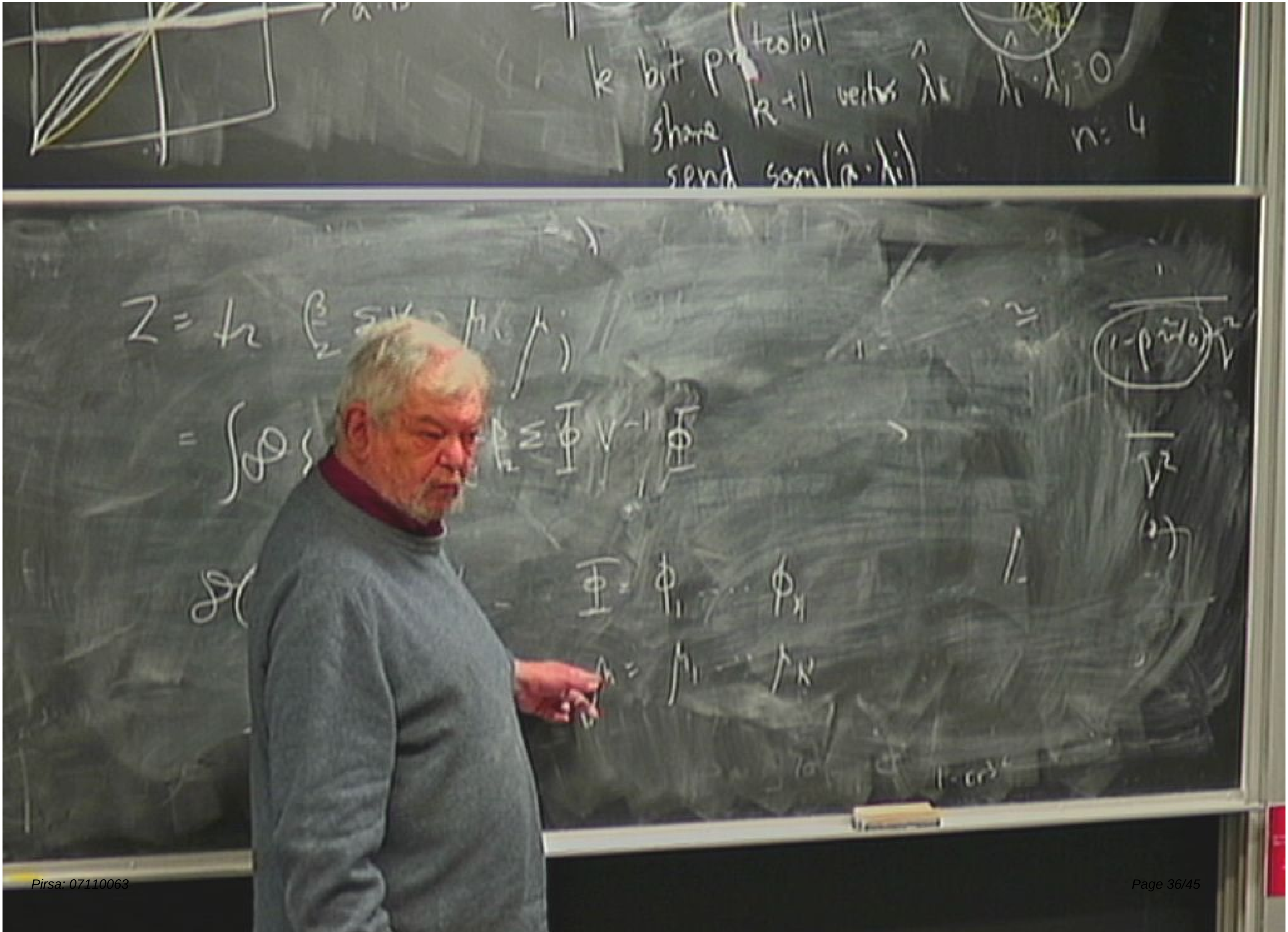
n: 4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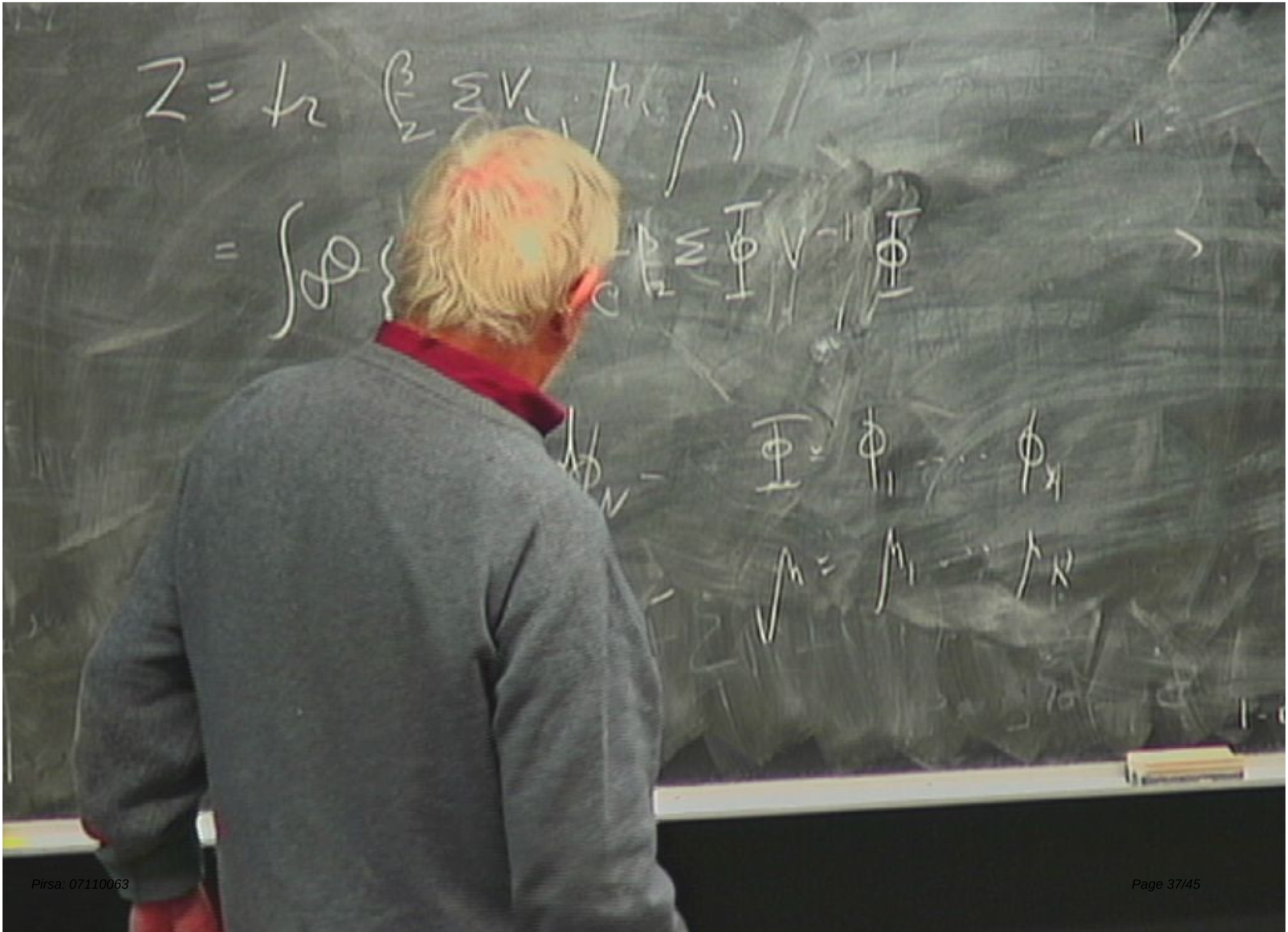

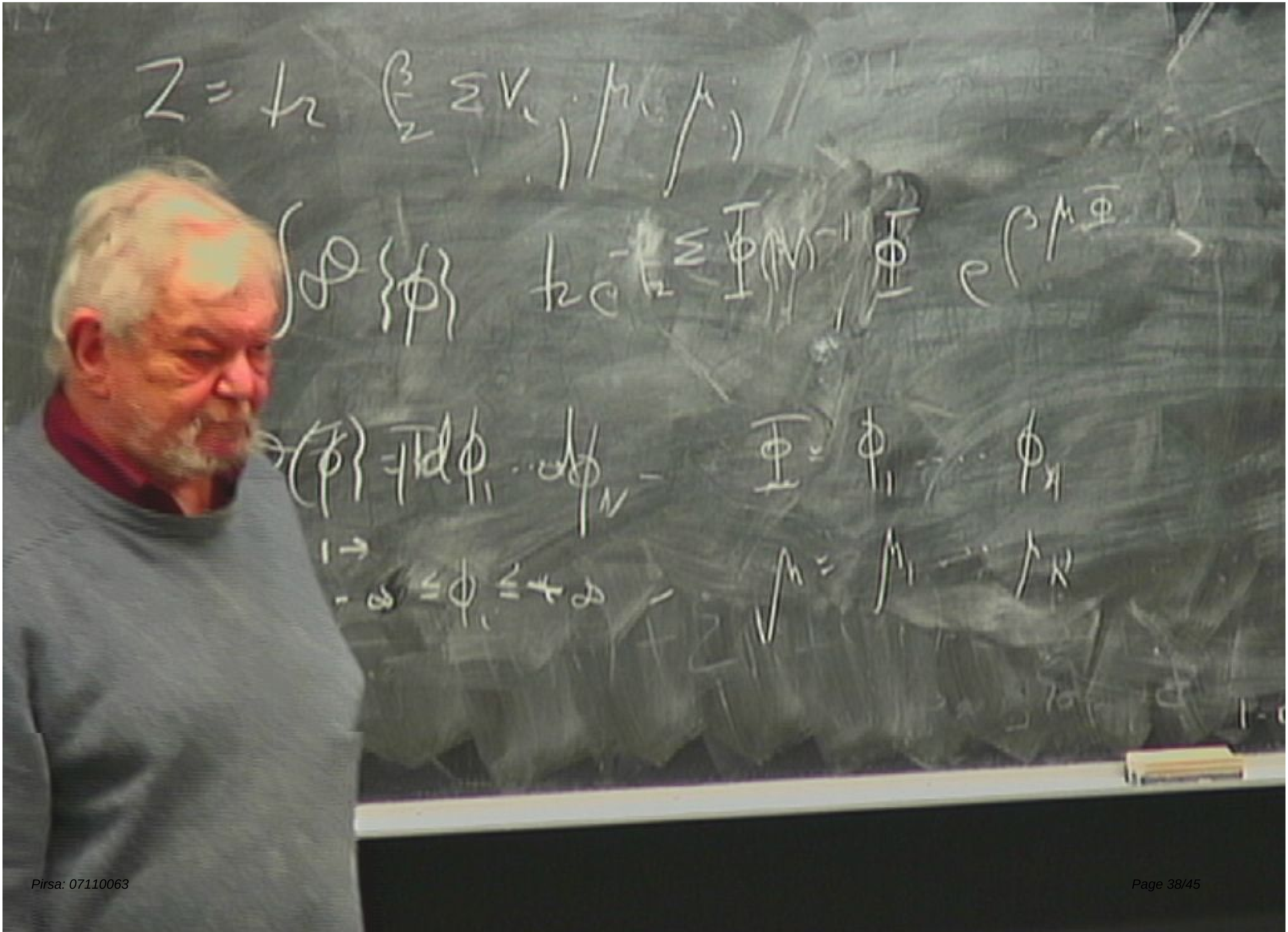

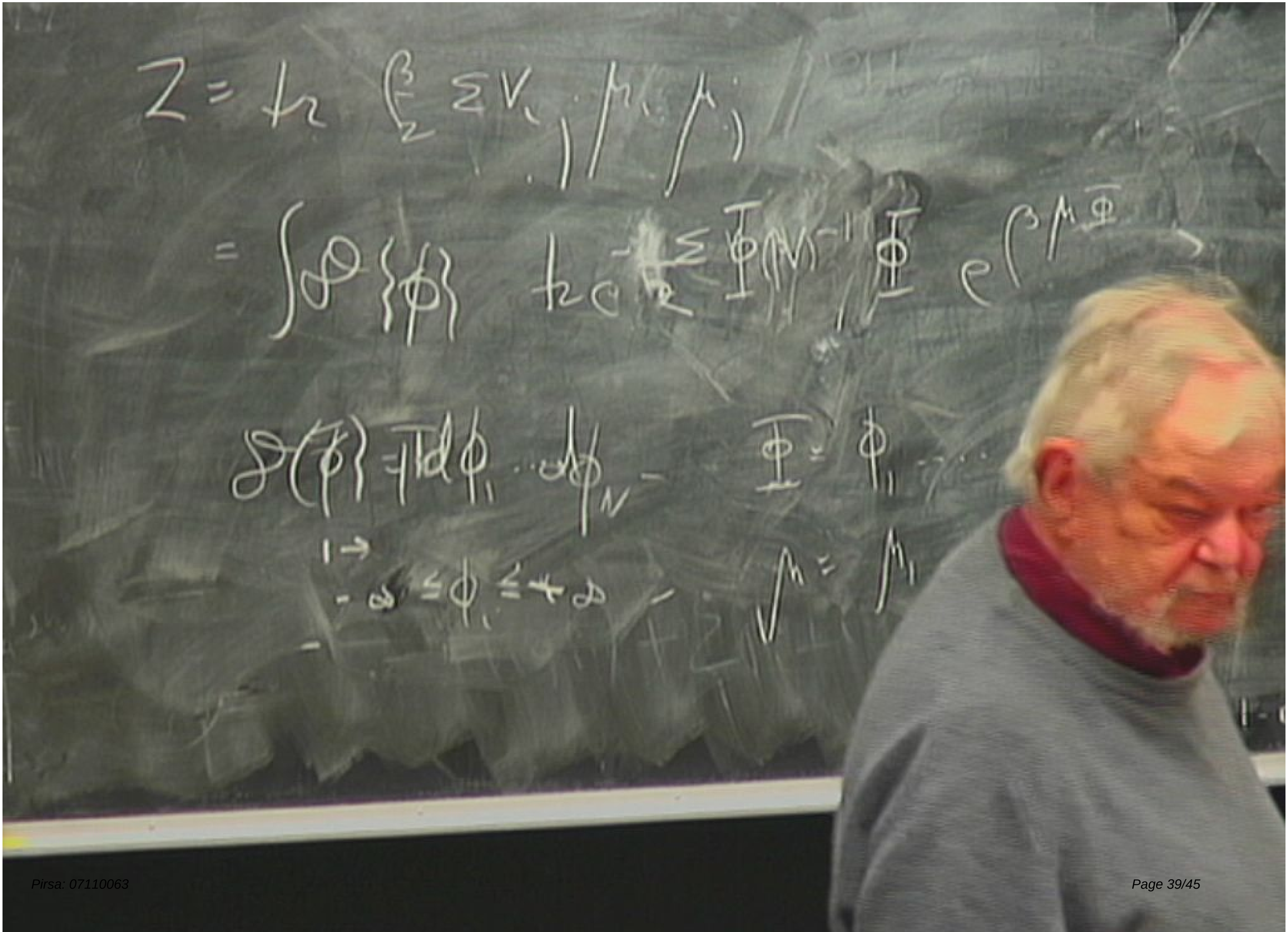

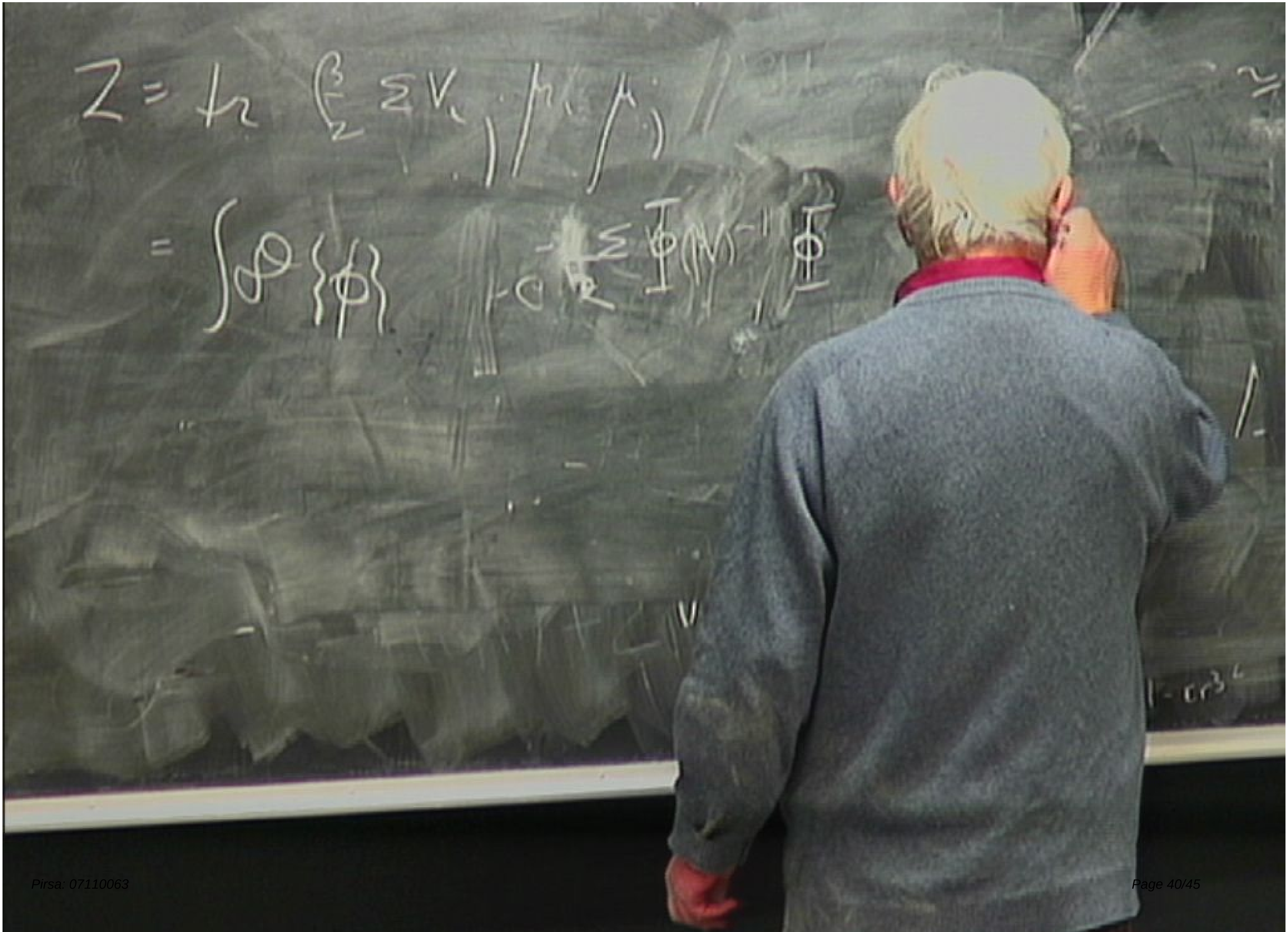

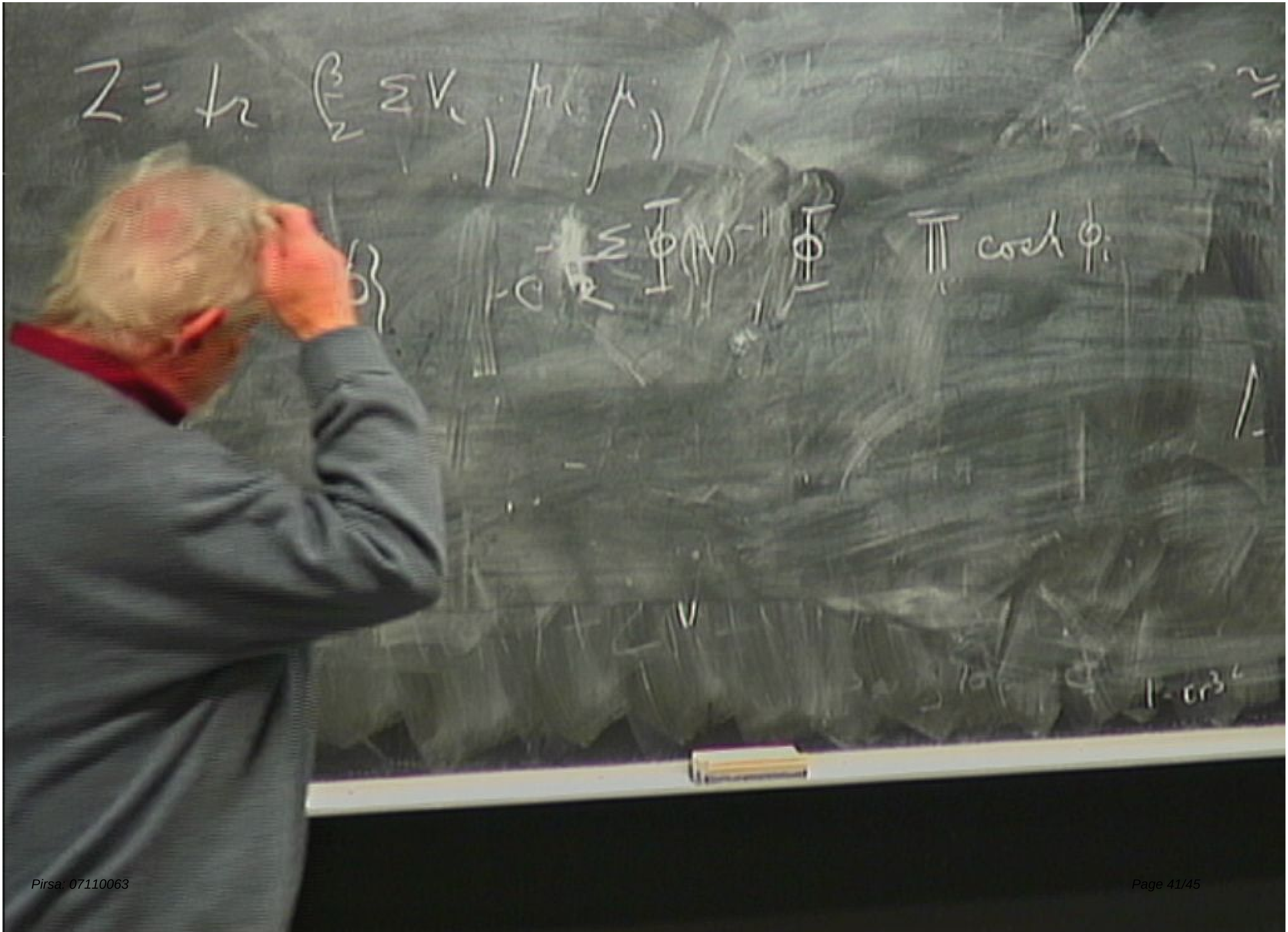

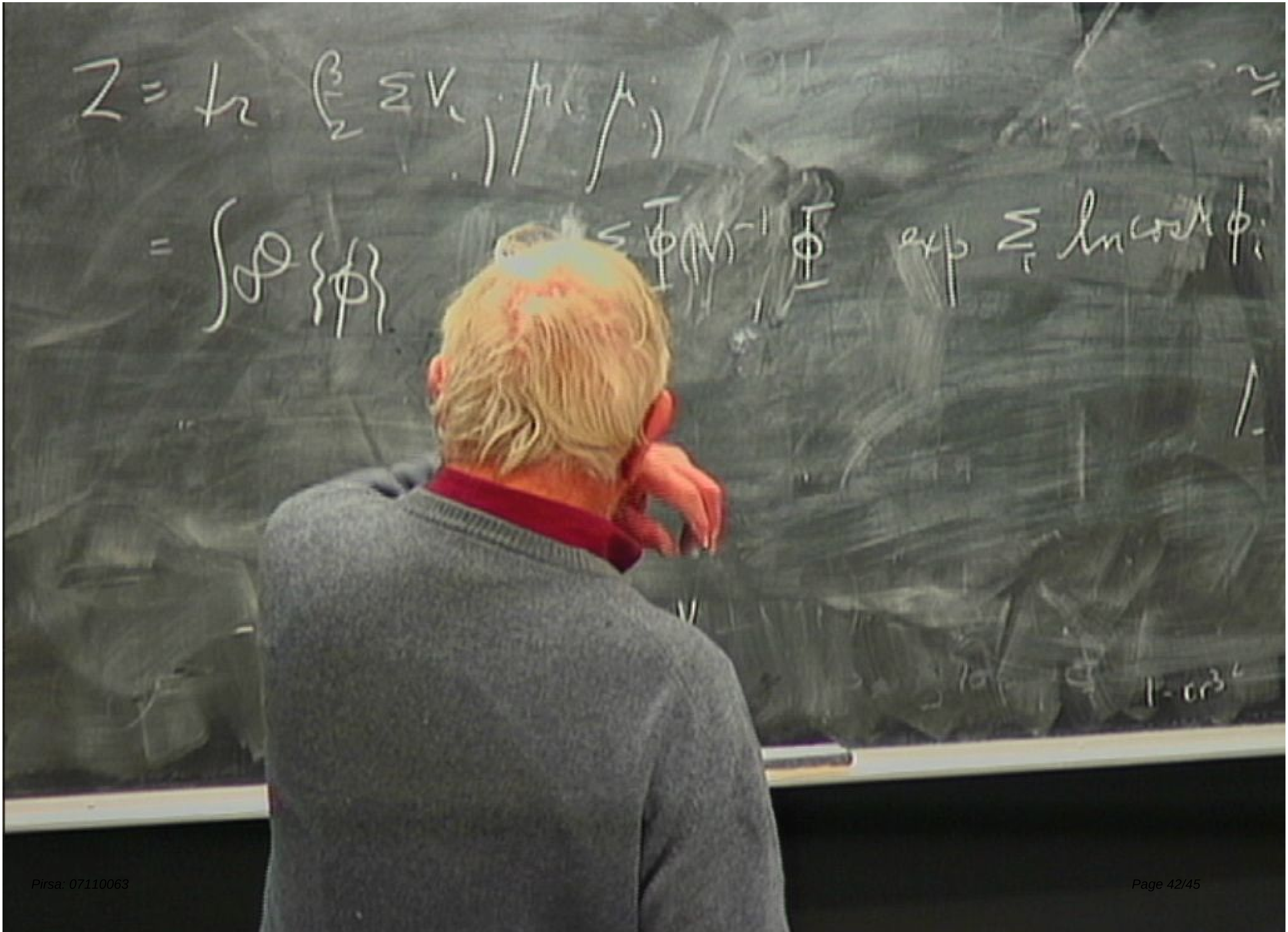

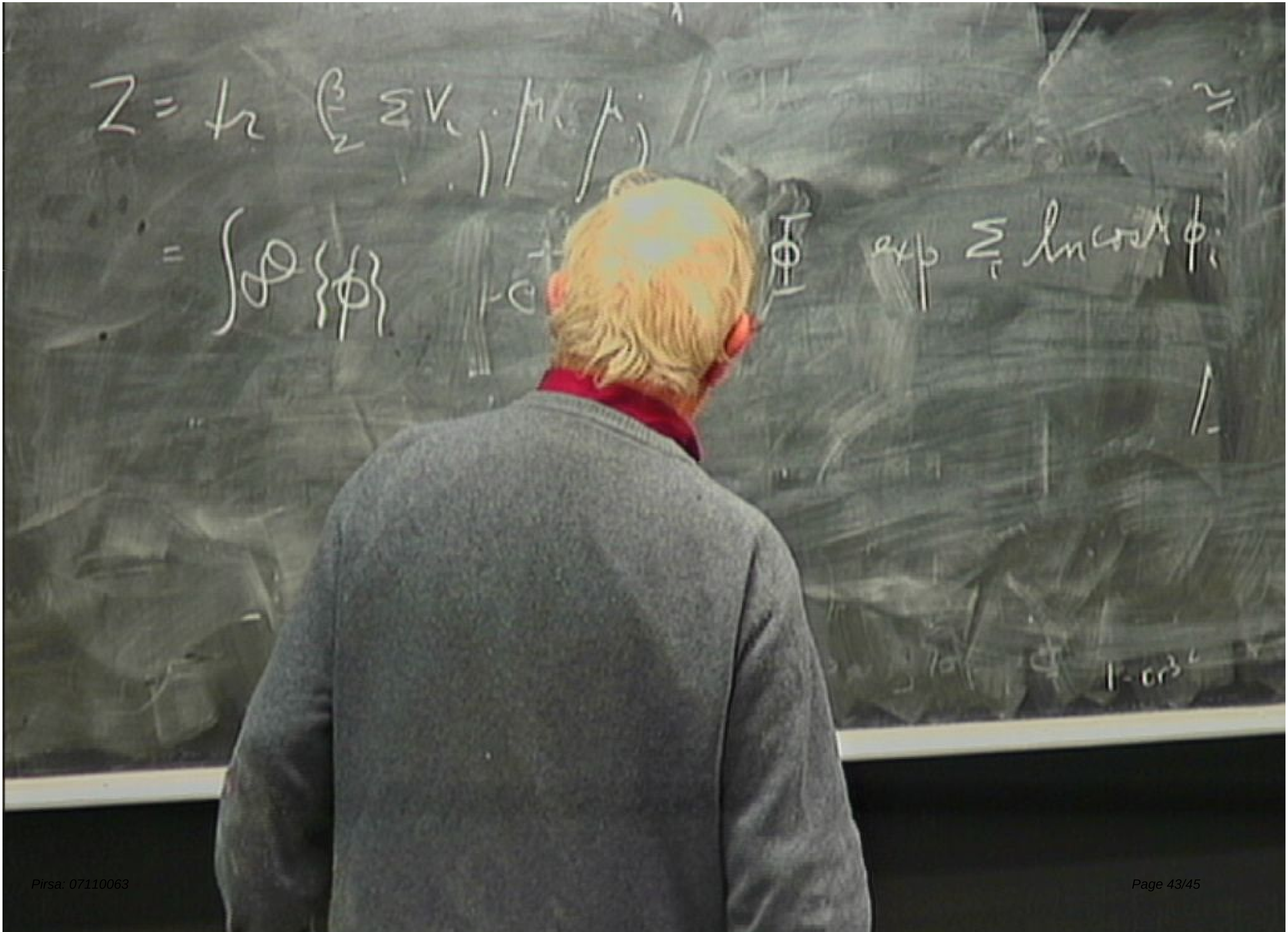

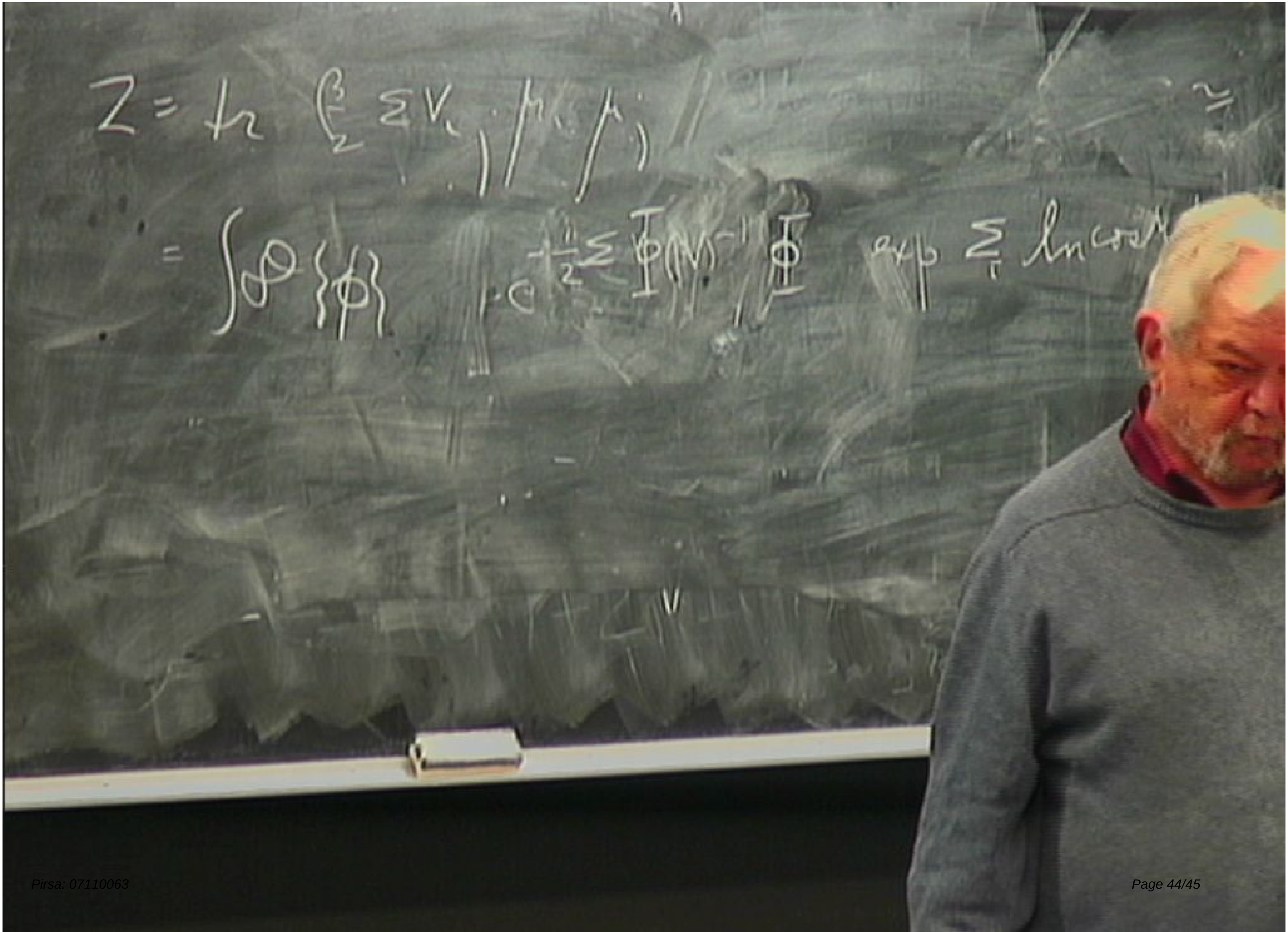

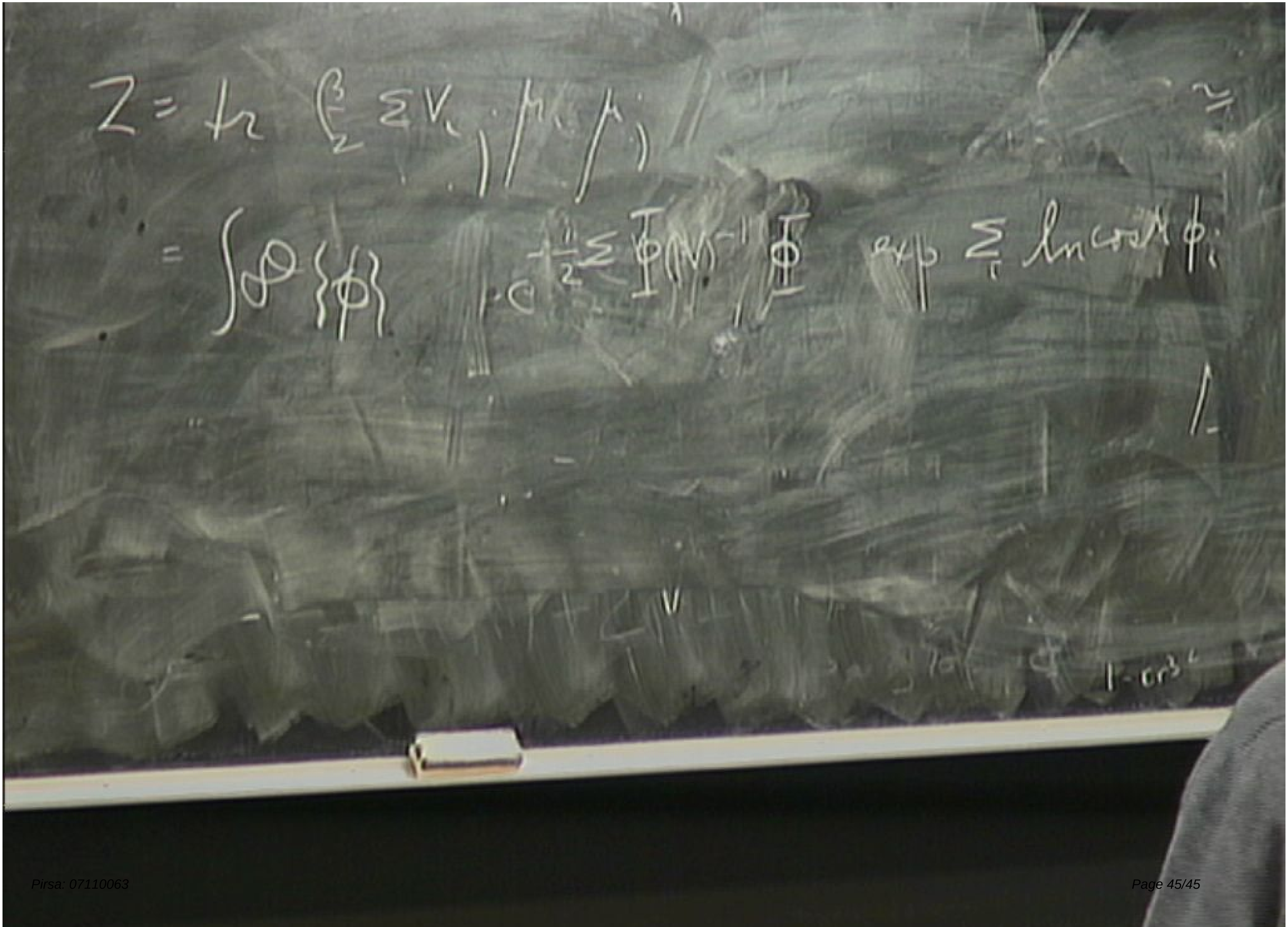
$Z = \mathrm{tr}\left(\frac{\beta}{2} \sum V_{ij}\, \mu_i \mu_j\right)$
$= \int \mathcal{D}\{\phi\}\, e^{-\frac{1}{2}\sum \Phi (V)^{-1} \Phi} \exp \sum_i \ln\cosh \phi_i$