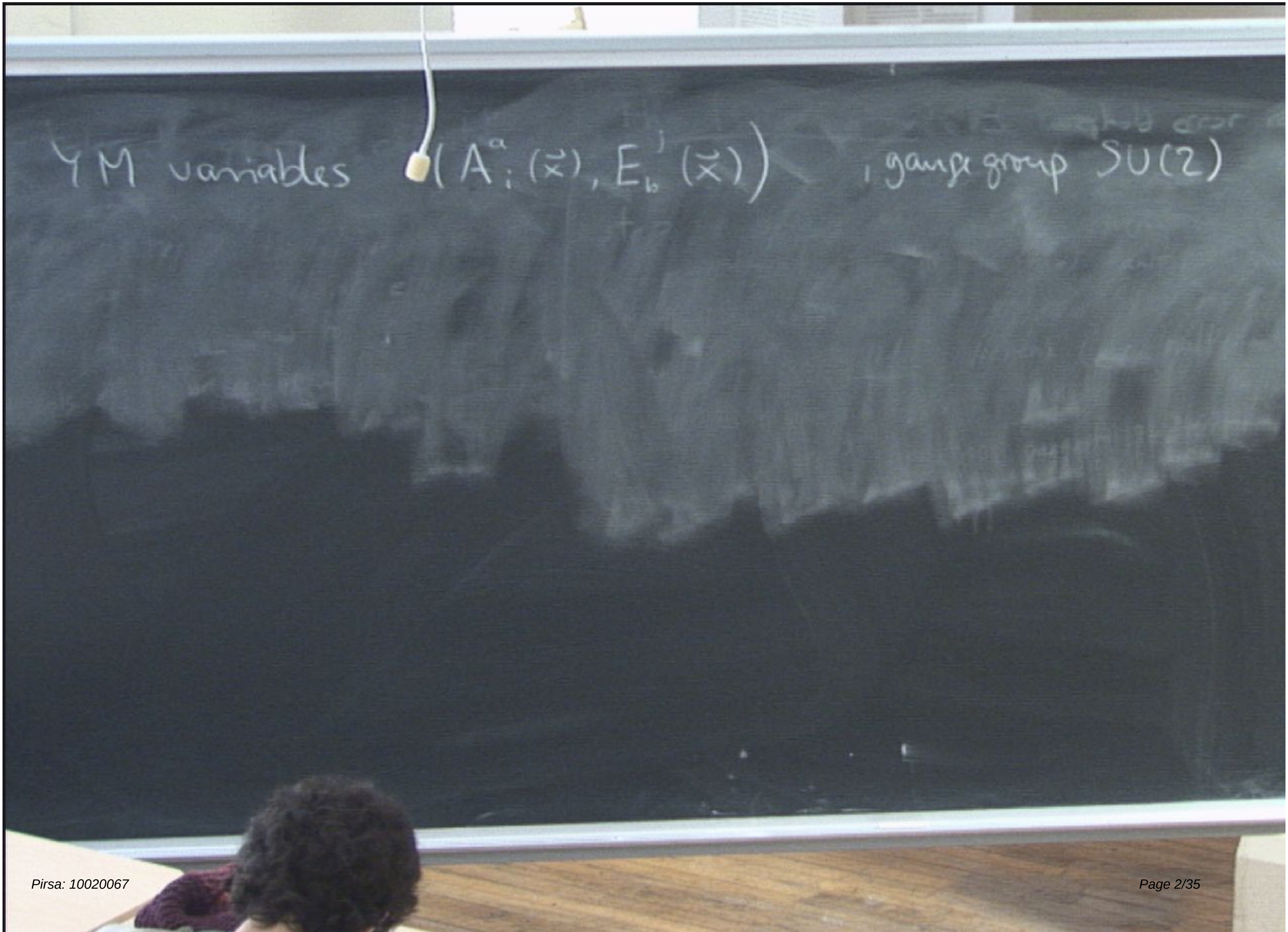
Title: Quantum Gravity - Review (PHYS 638) - Lecture 13

Date: Feb 10, 2010 10:00 AM

URL: http://pirsa.org/10020067

Abstract: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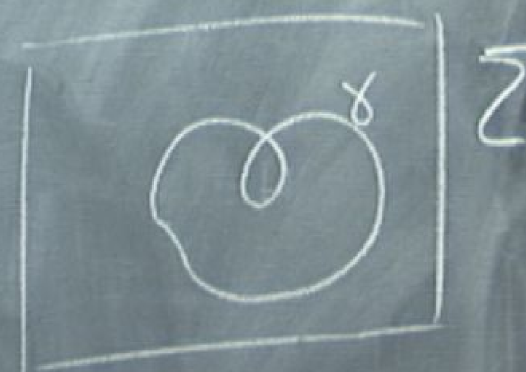
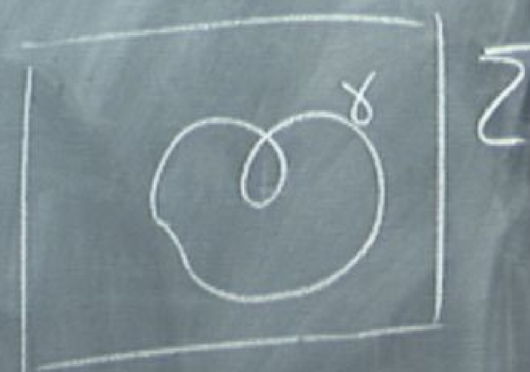


IDEA: Choose Wilson loops $W_\gamma[A] = \mathrm{Tr}\, U_\gamma[A]$

as "coordinates" on $\mathcal{A}^{SU(2)} / \mathcal{G}^{SU(2)}$



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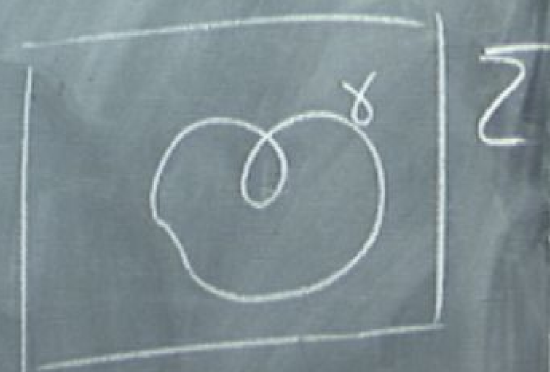

CHOICE: promote $\{W_\gamma[A]\}$ (+ suitable momentum

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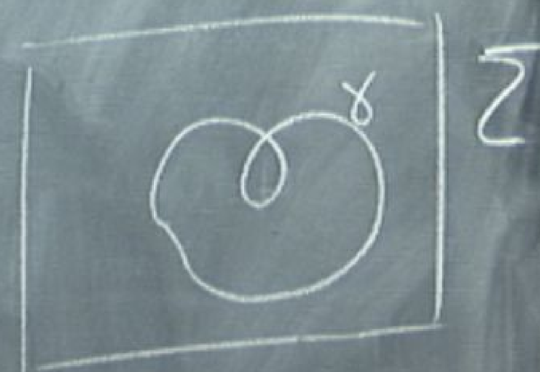

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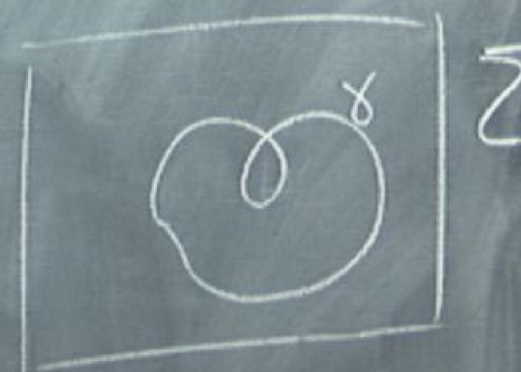

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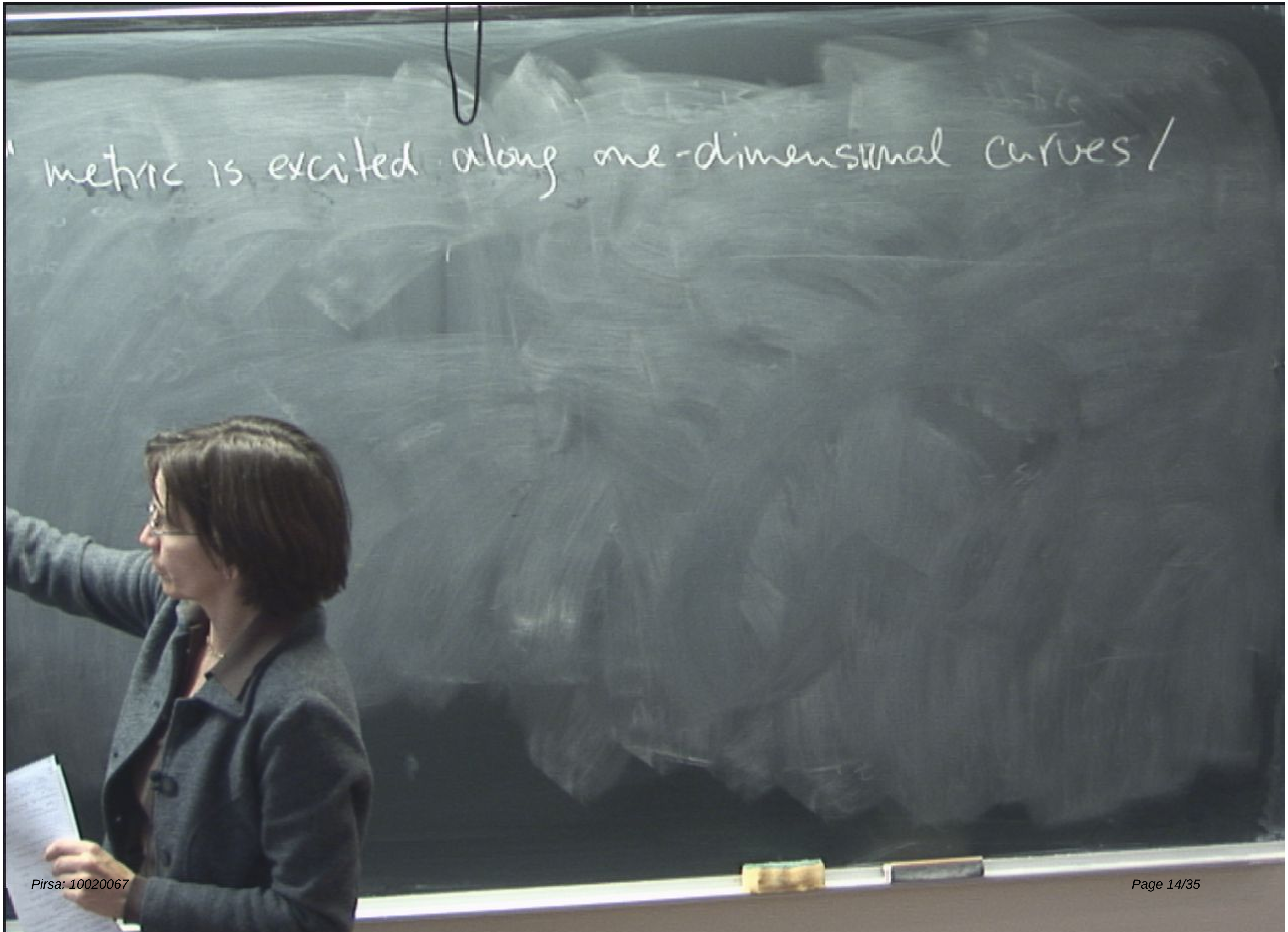
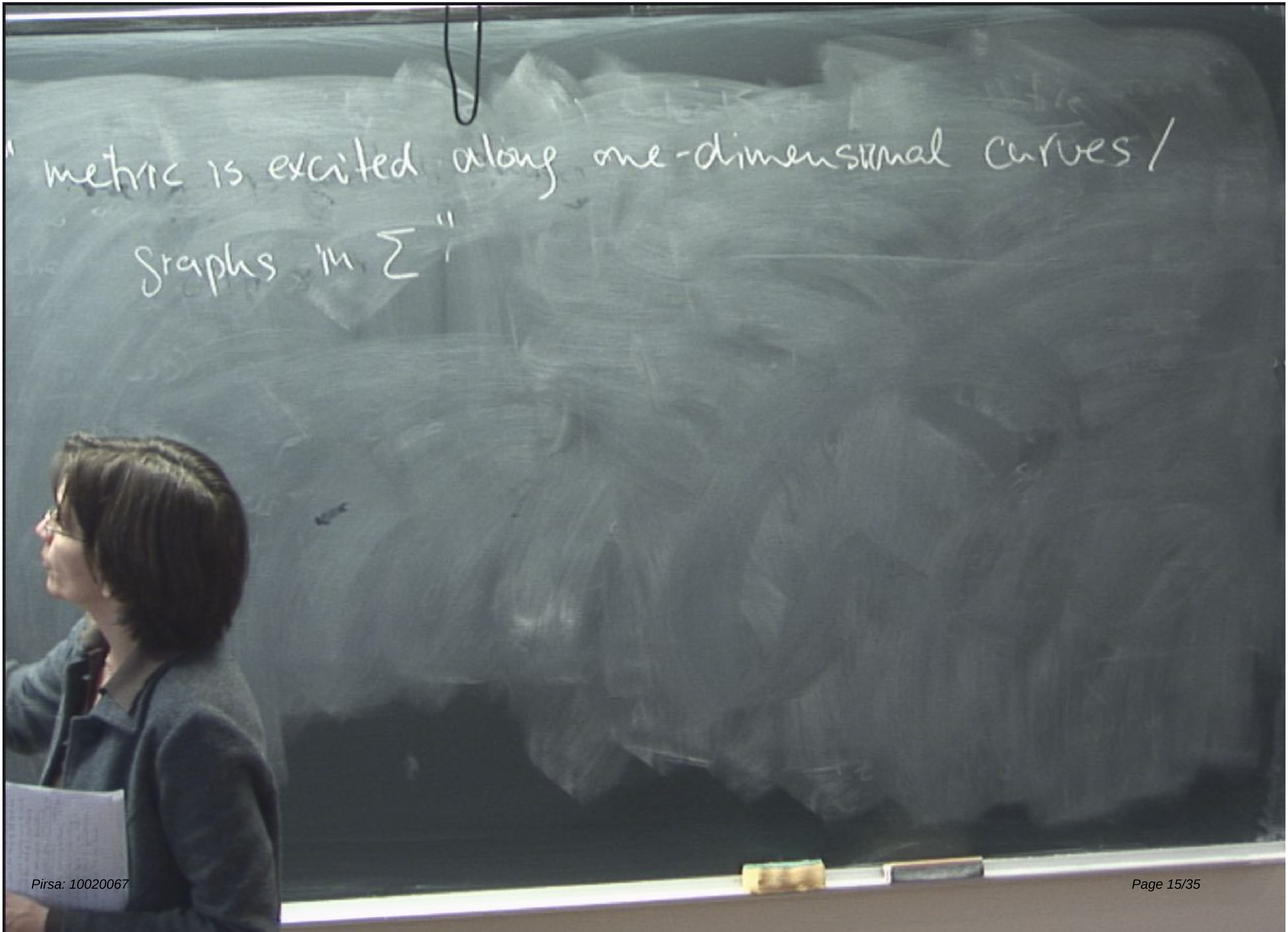

metric is excited along one-dimensional curves /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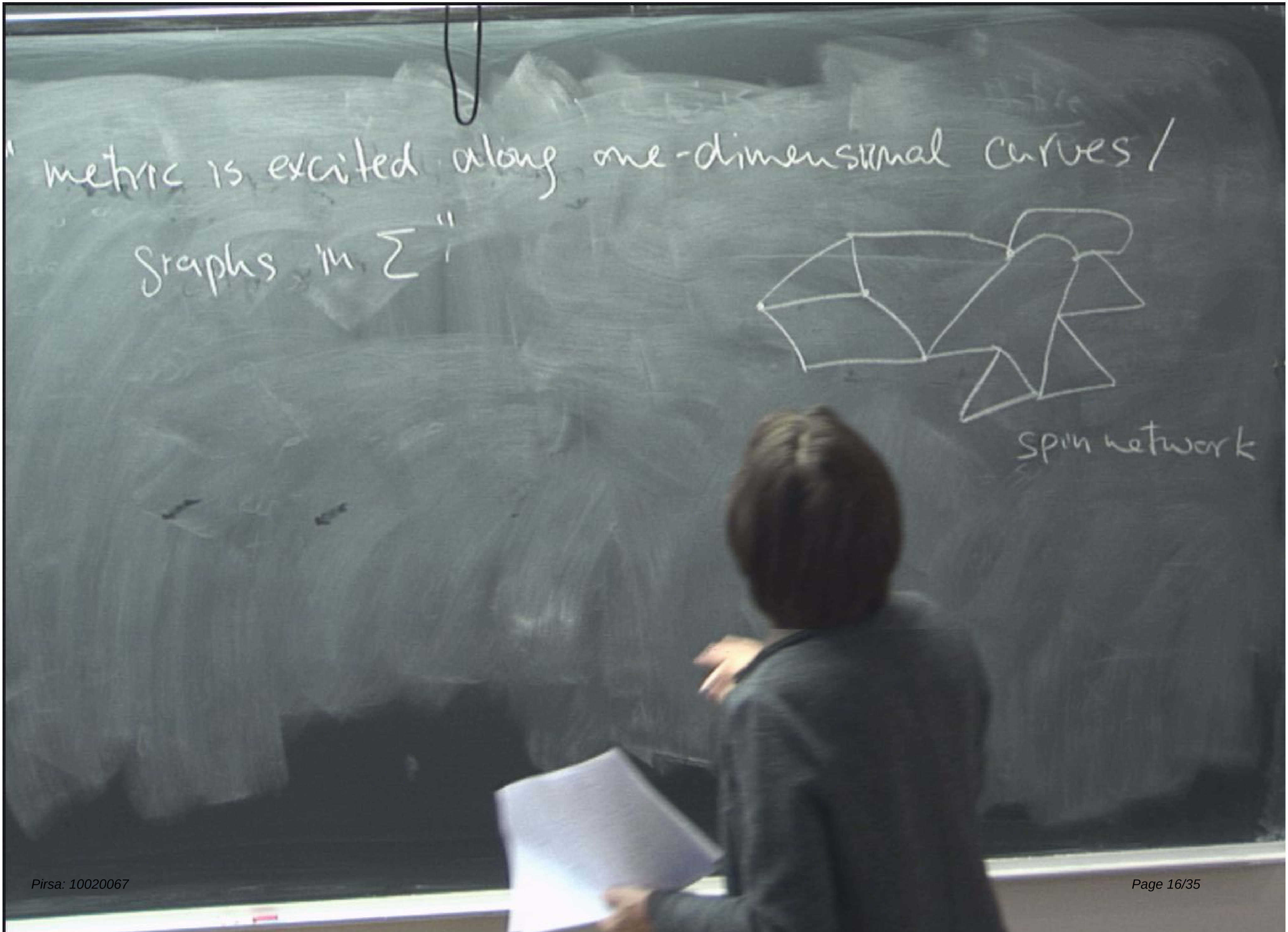
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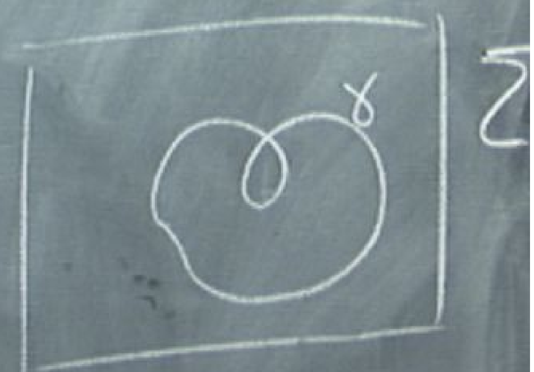

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spin network

well-defined Hilbert space

$$\mathcal{H}^{aux} = L^2(\overline{\mathcal{A}/\mathcal{G}}, d\mu_{AL})$$

↖ Ashtekar / Lewandowski measure

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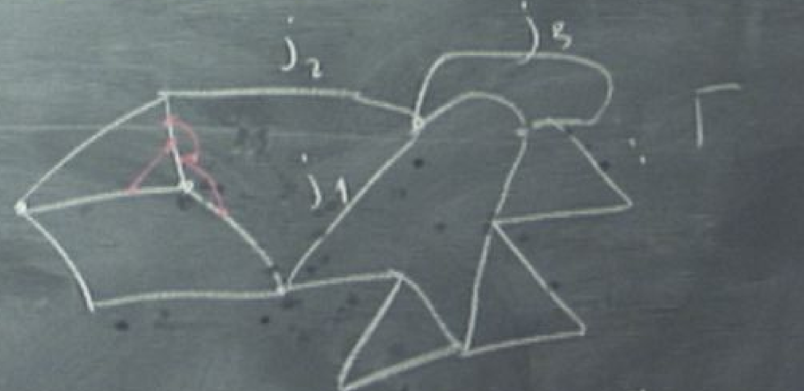

spin network

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$$\mathcal{H}^{\text{aux}'} = L^2(\overline{\mathcal{A}/\mathcal{G}}, d\mu_{AL})$$

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$\hat{\mathcal{H}}_\perp$ has a "combinatorial" action on spin network states

$\Rightarrow$ commutator algebra of $\hat{\mathcal{H}}_n$ close "on-shell"

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$\hat{\mathcal{H}}_\perp$ has a "combinatorial" action on spin network states (Thiemann 1996)

$\Rightarrow$ can make algebra of $\hat{\mathcal{H}}_\mu$ close "on-shell"

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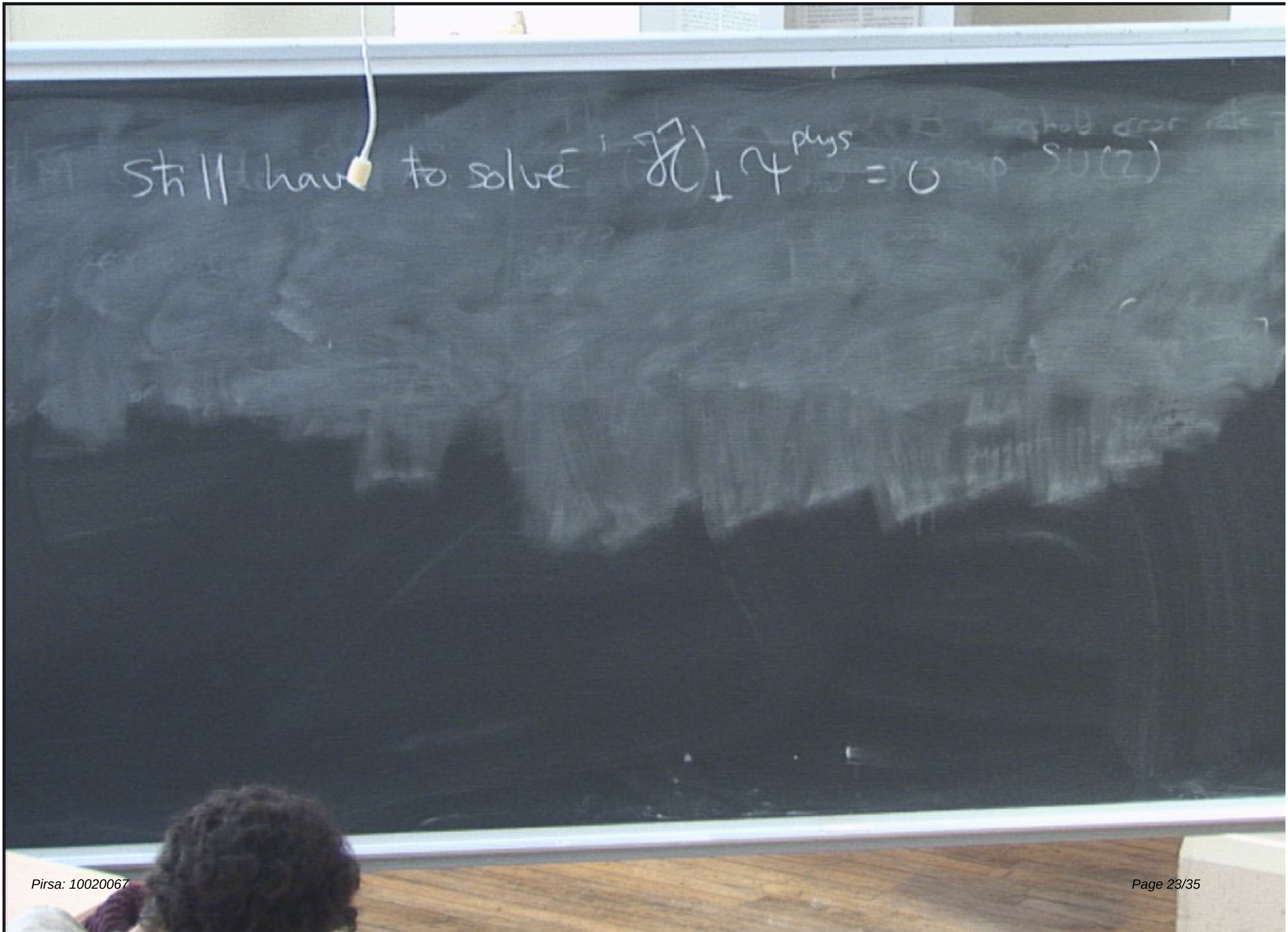
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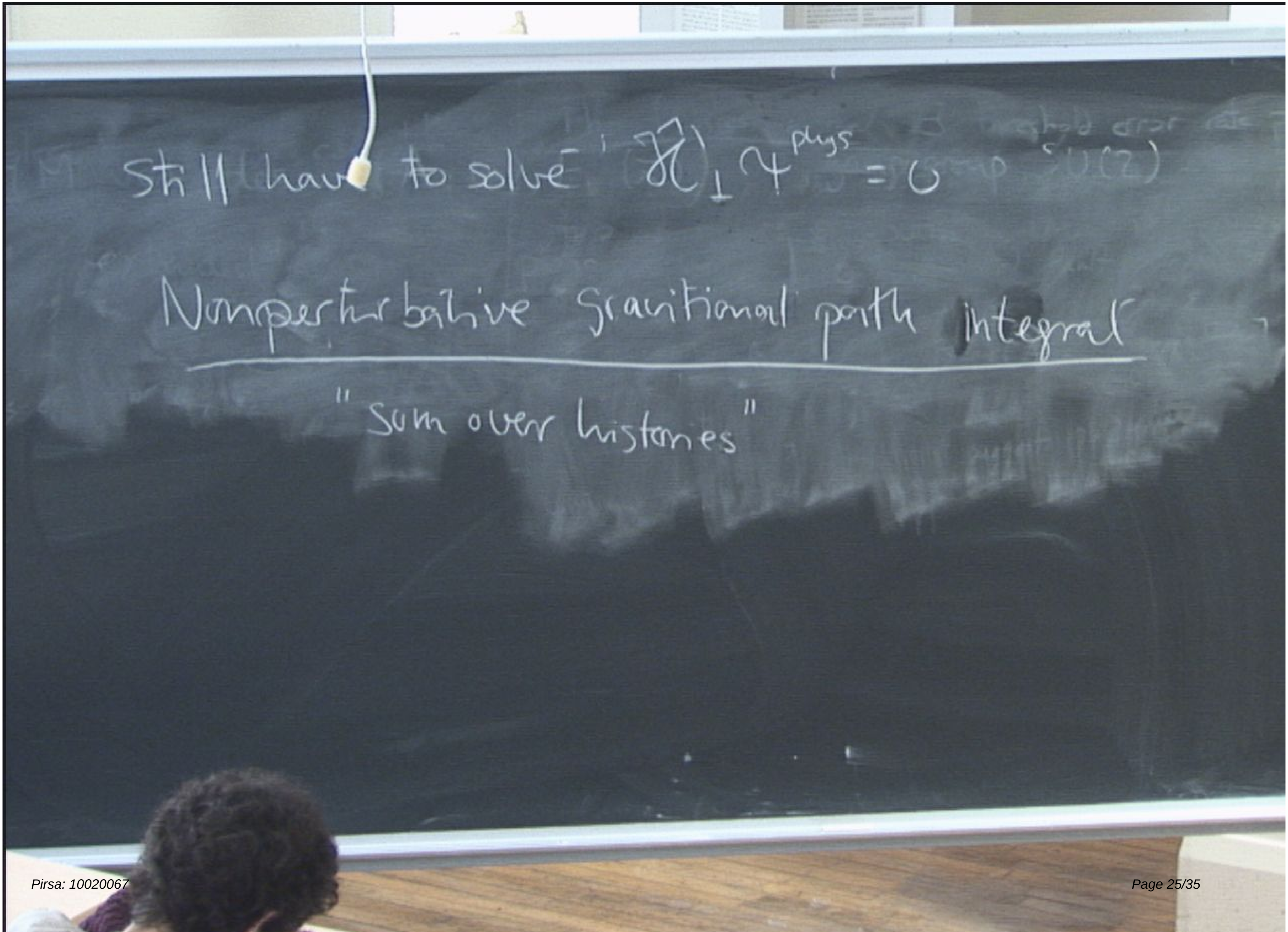
<u>Nonperturbative gravitational path integral</u>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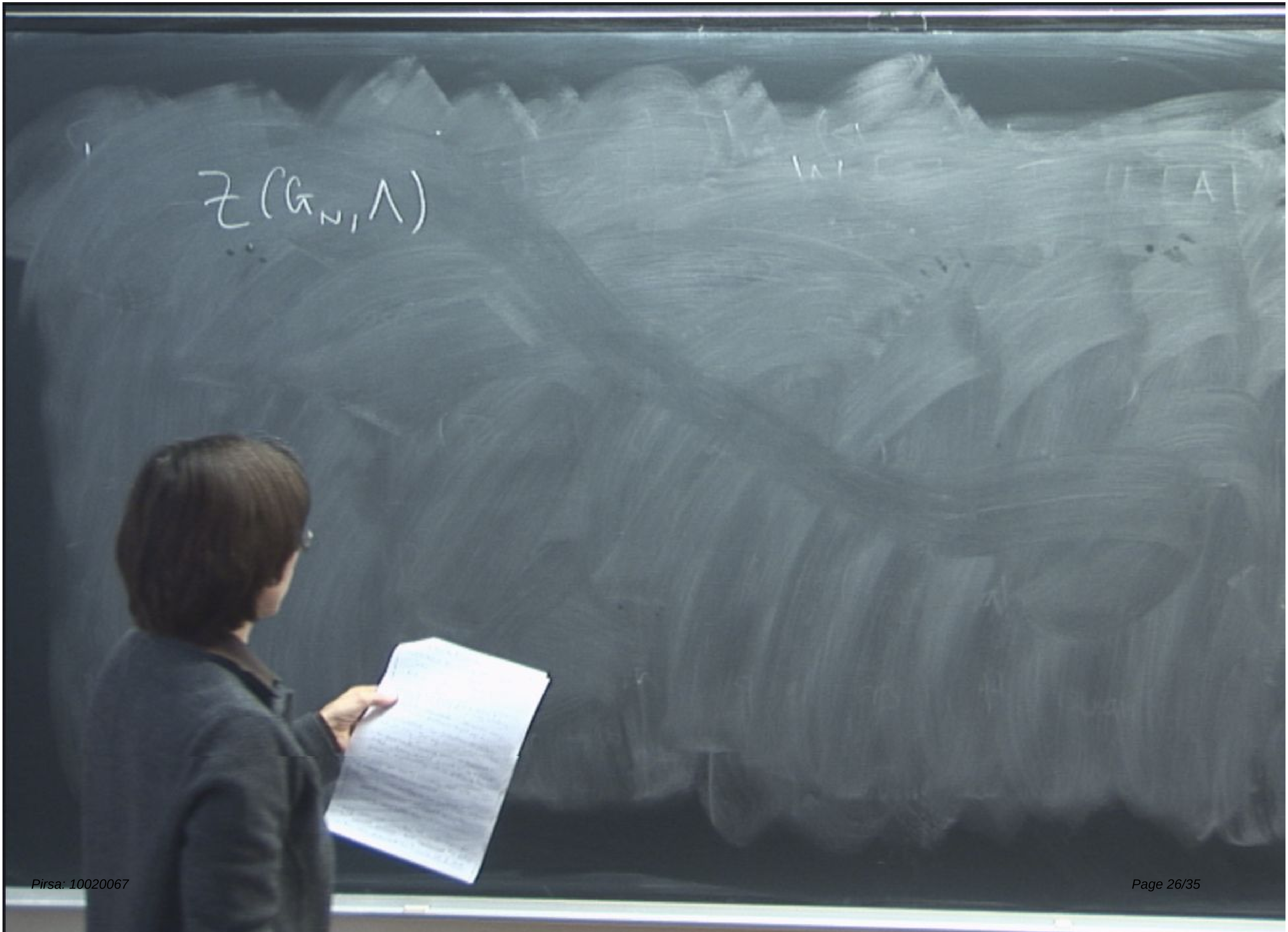
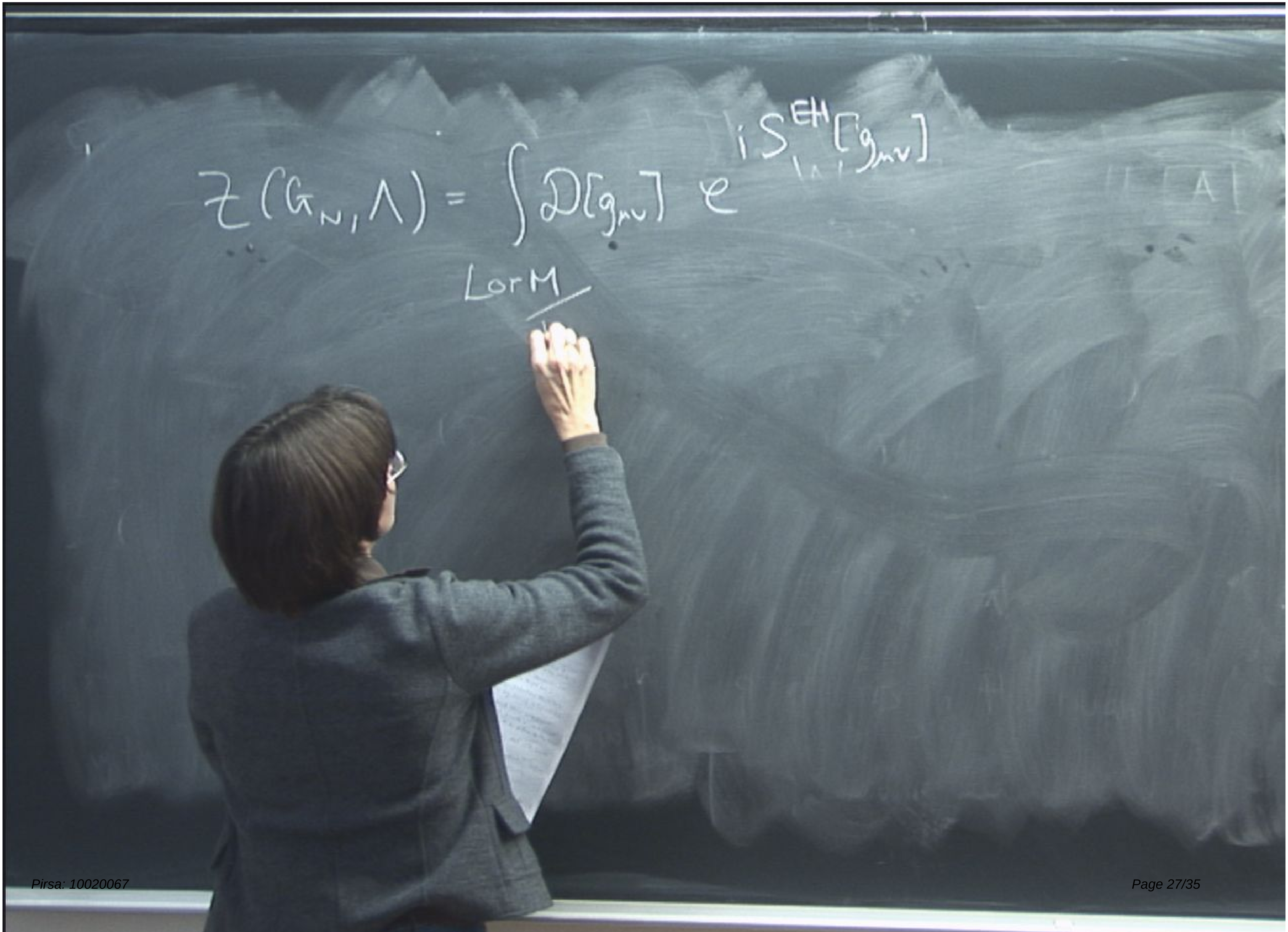
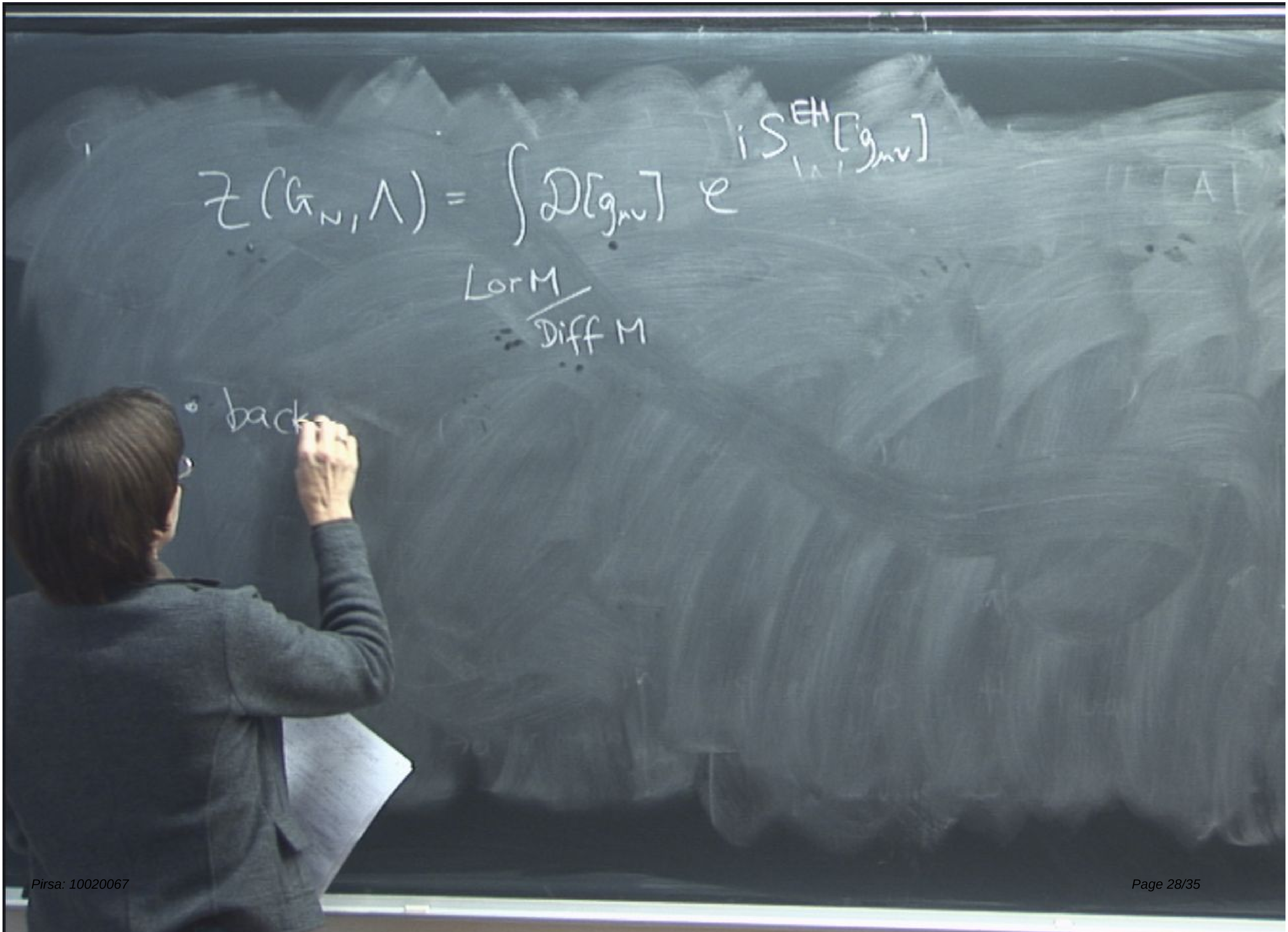
Nonperturbative gravitational path integral
"sum over histories"


Z(G_N,Λ)


$Z(G_N, \Lambda) = \int \mathcal{D}[g_{\mu\nu}]\, e^{iS^{EH}_{\Lambda}[g_{\mu\nu}]}$
LorM


Z(G_N, Λ) = ∫ D[g_μν] e^{iS^EH_{G_N,Λ}[g_μν]}
LorM / Diff M
• back

$$Z(G_N,\Lambda) = \int_{\mathrm{Lor}\,M/\mathrm{Diff}\,M} \mathcal{D}[g_{\mu\nu}]\; e^{\,i S^{EH}_{\Lambda}[g_{\mu\nu}]}$$

- background-independence

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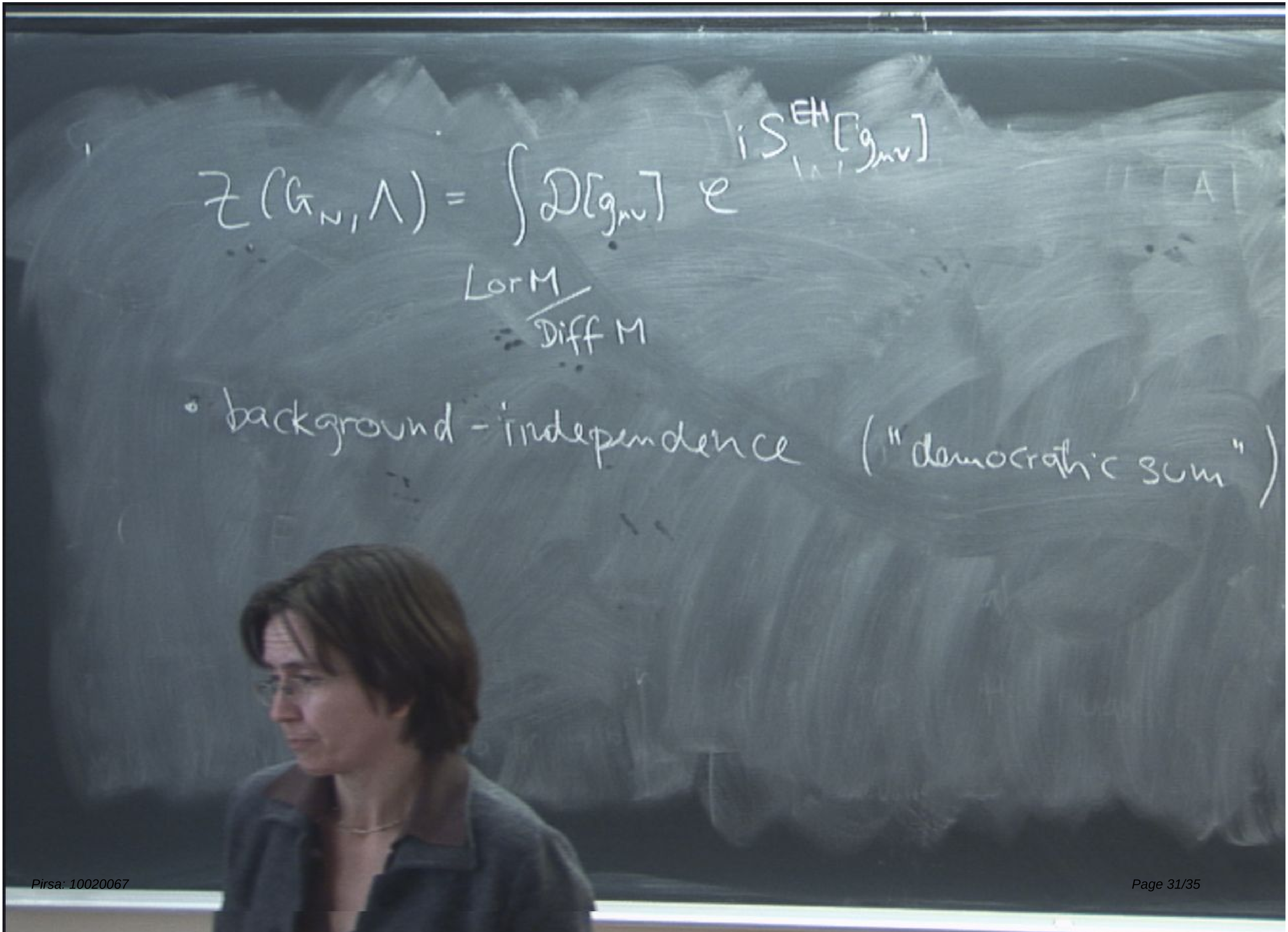
- background-independence ("democratic sum")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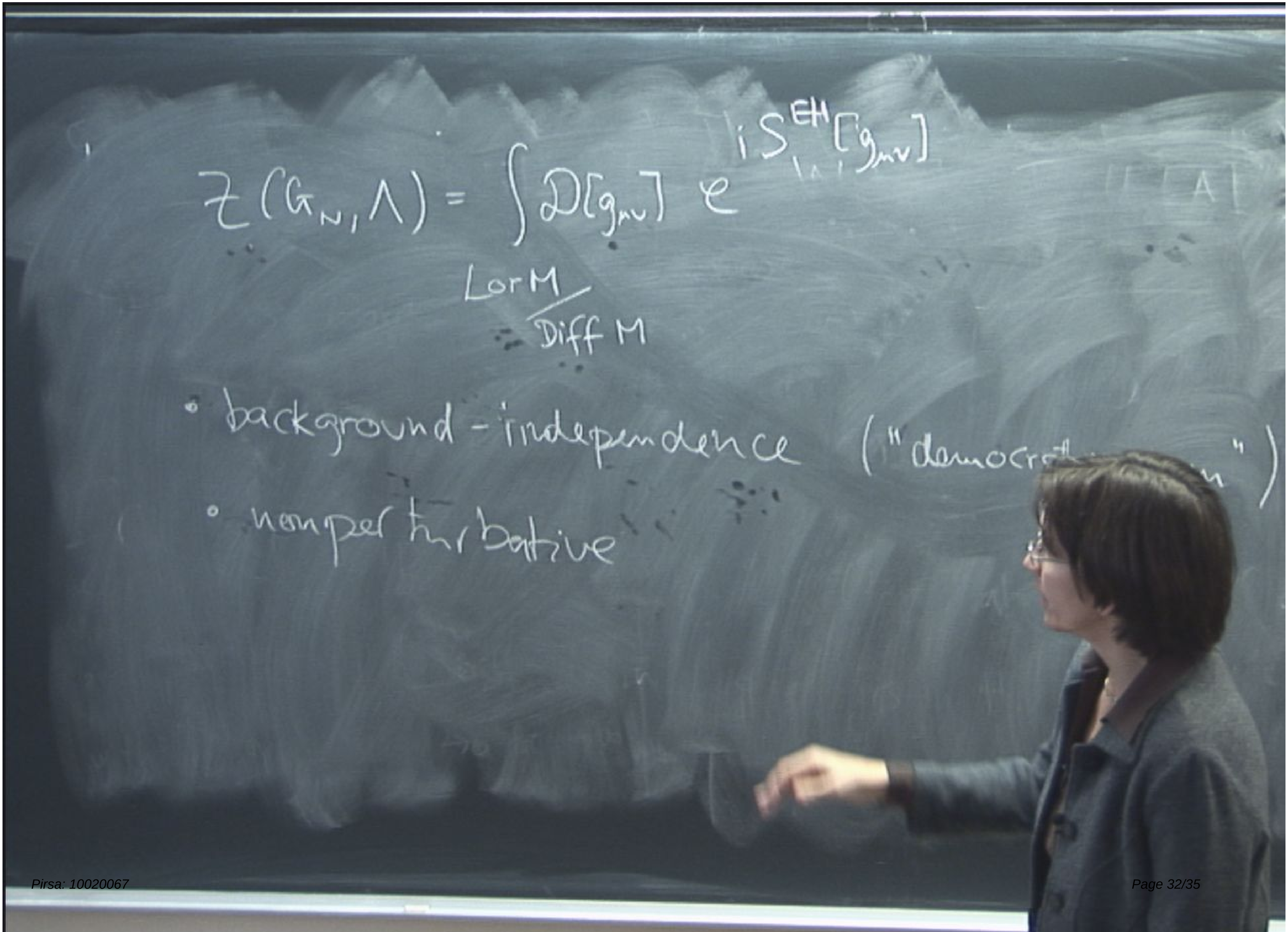
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Lor M / Diff M
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- how to regularize / renormalize
- how to deal with the "i"

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