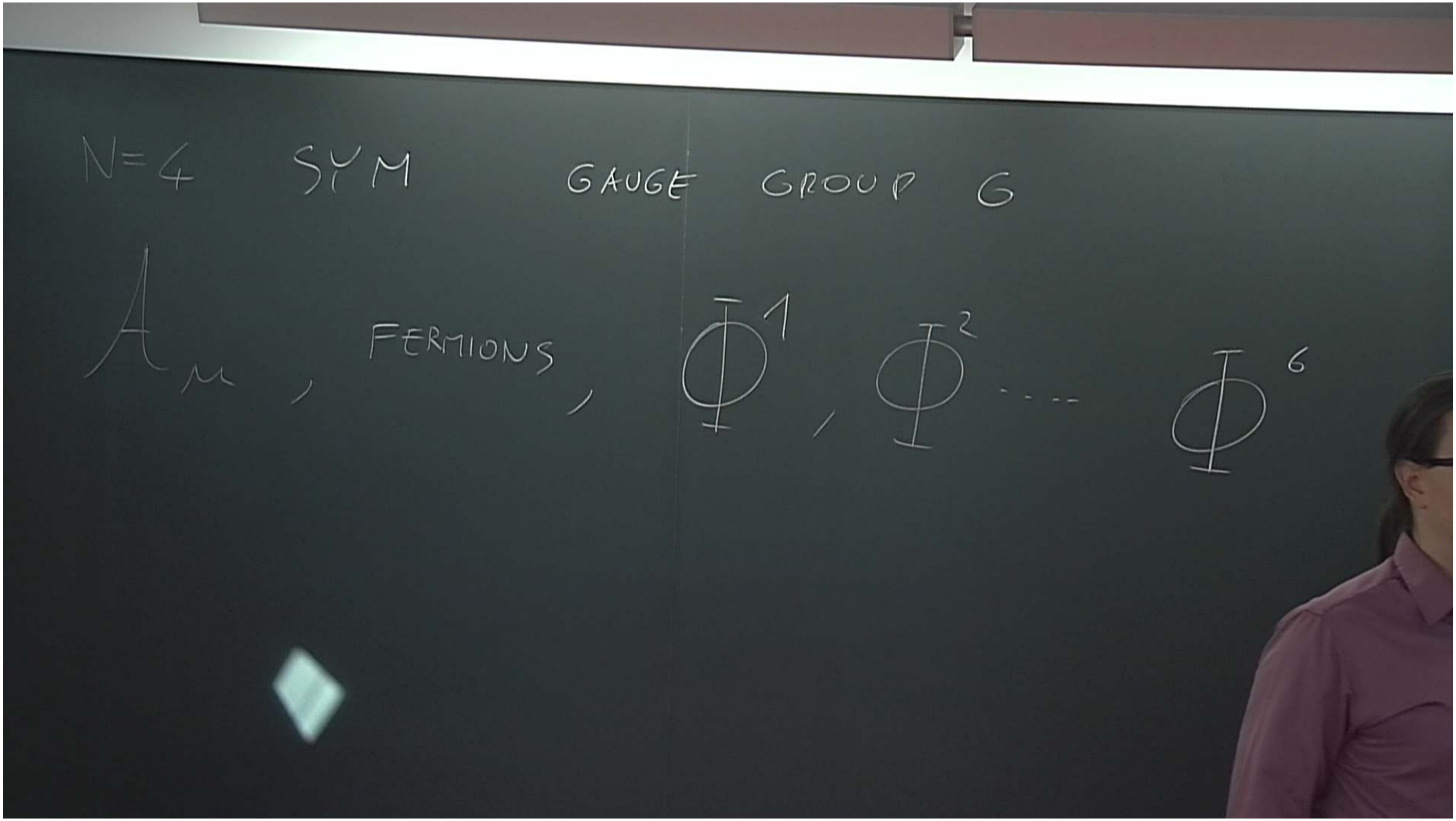
Title: Strings Group Meeting

Date: Oct 07, 2016 10:00 AM

URL: http://pirsa.org/16100055

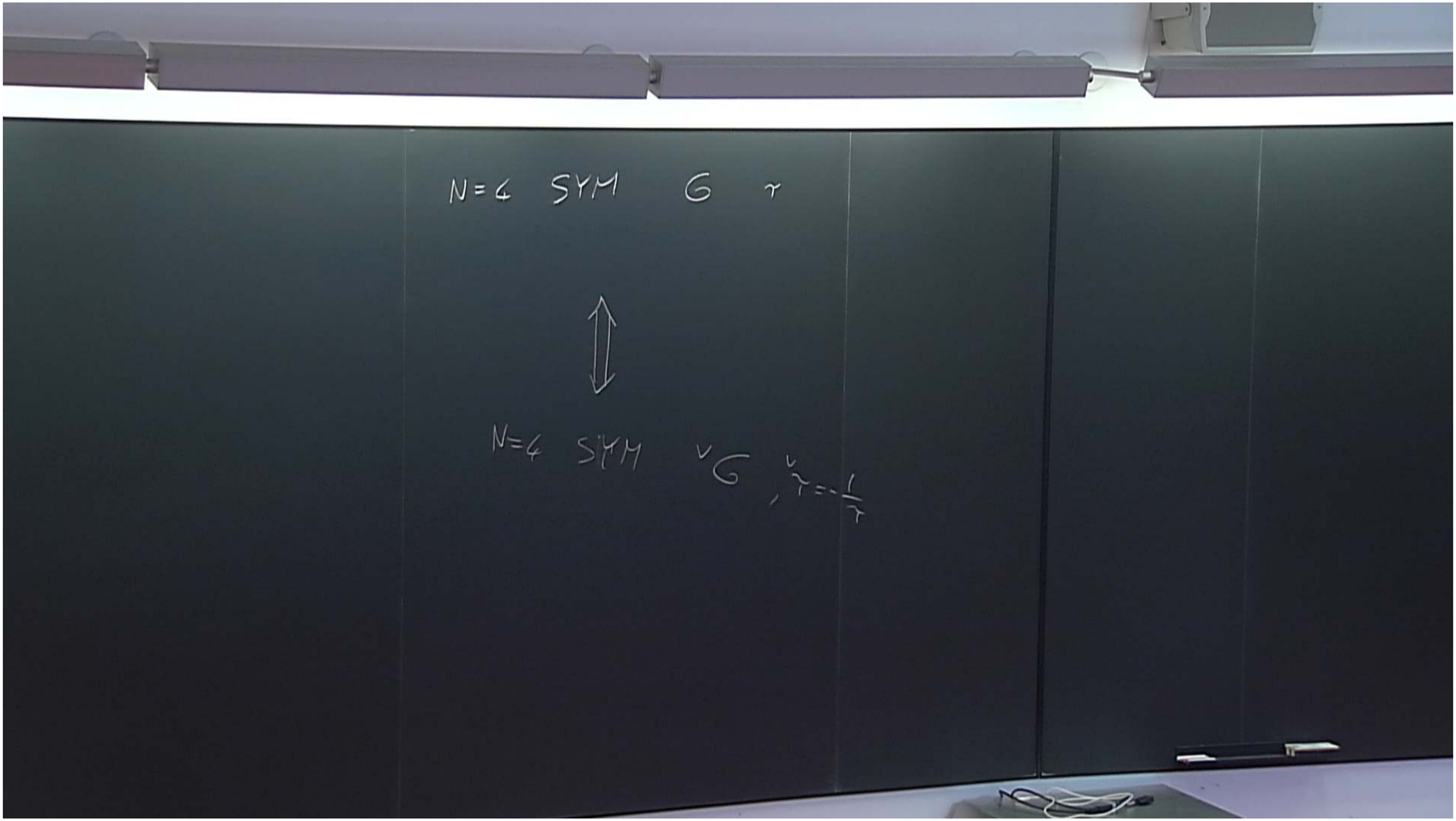
Abstract:

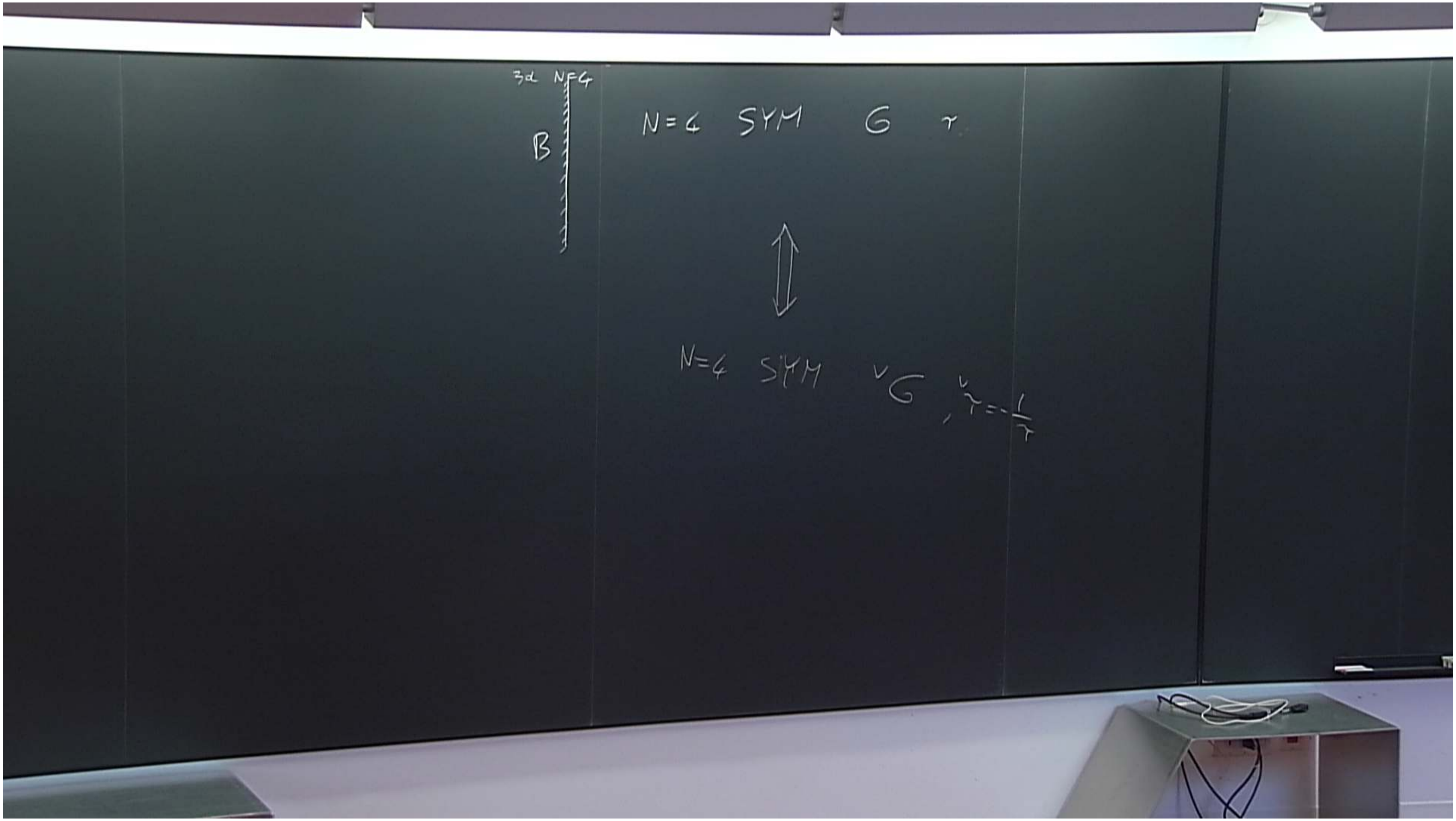

N=4 SYM
GAUGE GROUP G
A_μ, FERMIONS, Φ^1, Φ^2 .... Φ^6

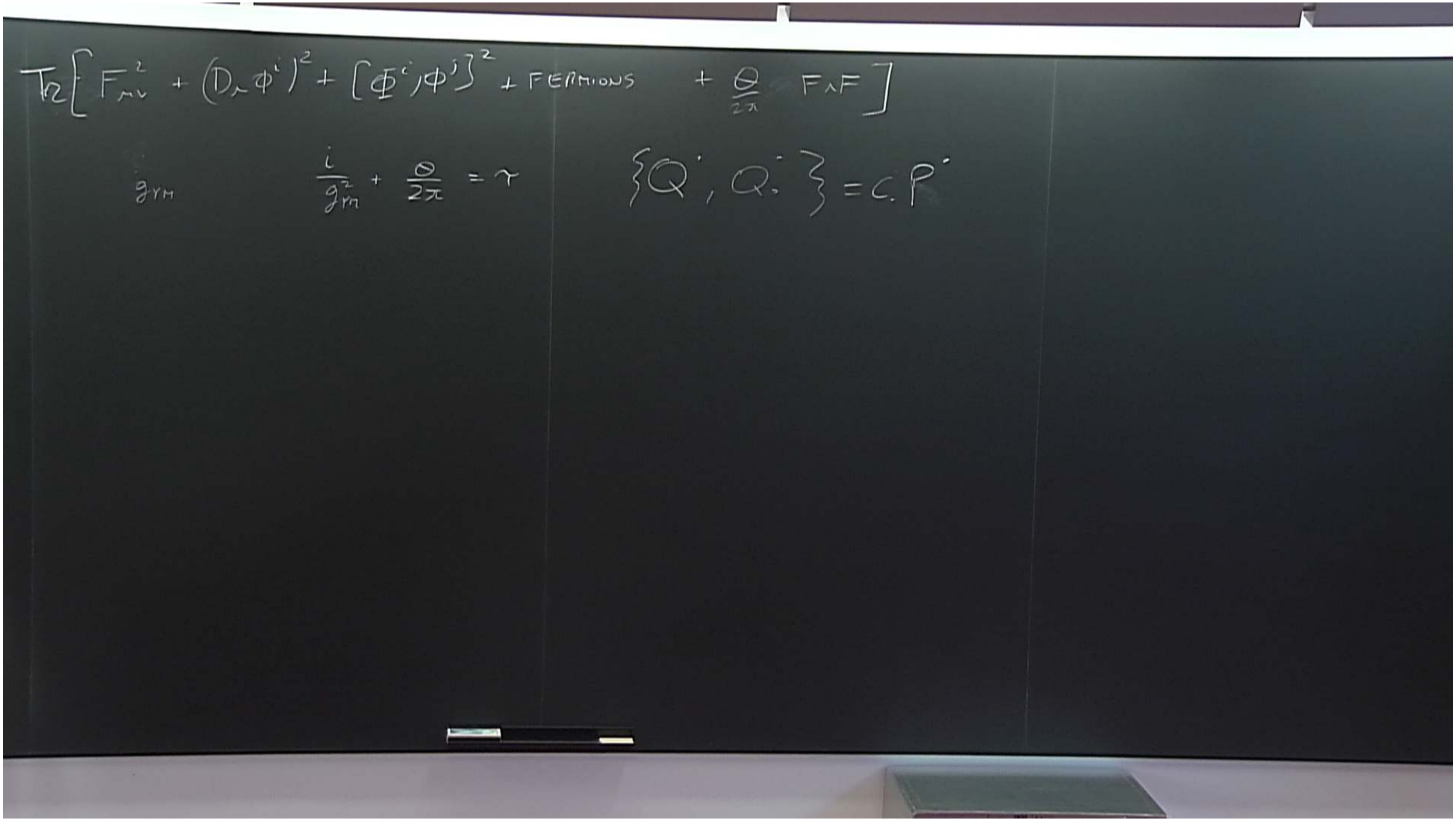
$$\mathrm{Tr}\left[F_{\mu\nu}^2 + (D_\mu \Phi^i)^2 + [\Phi^i, \Phi^j]^2 + \text{FERMIONS} + \frac{\theta}{2\pi} F \wedge F \right]$$

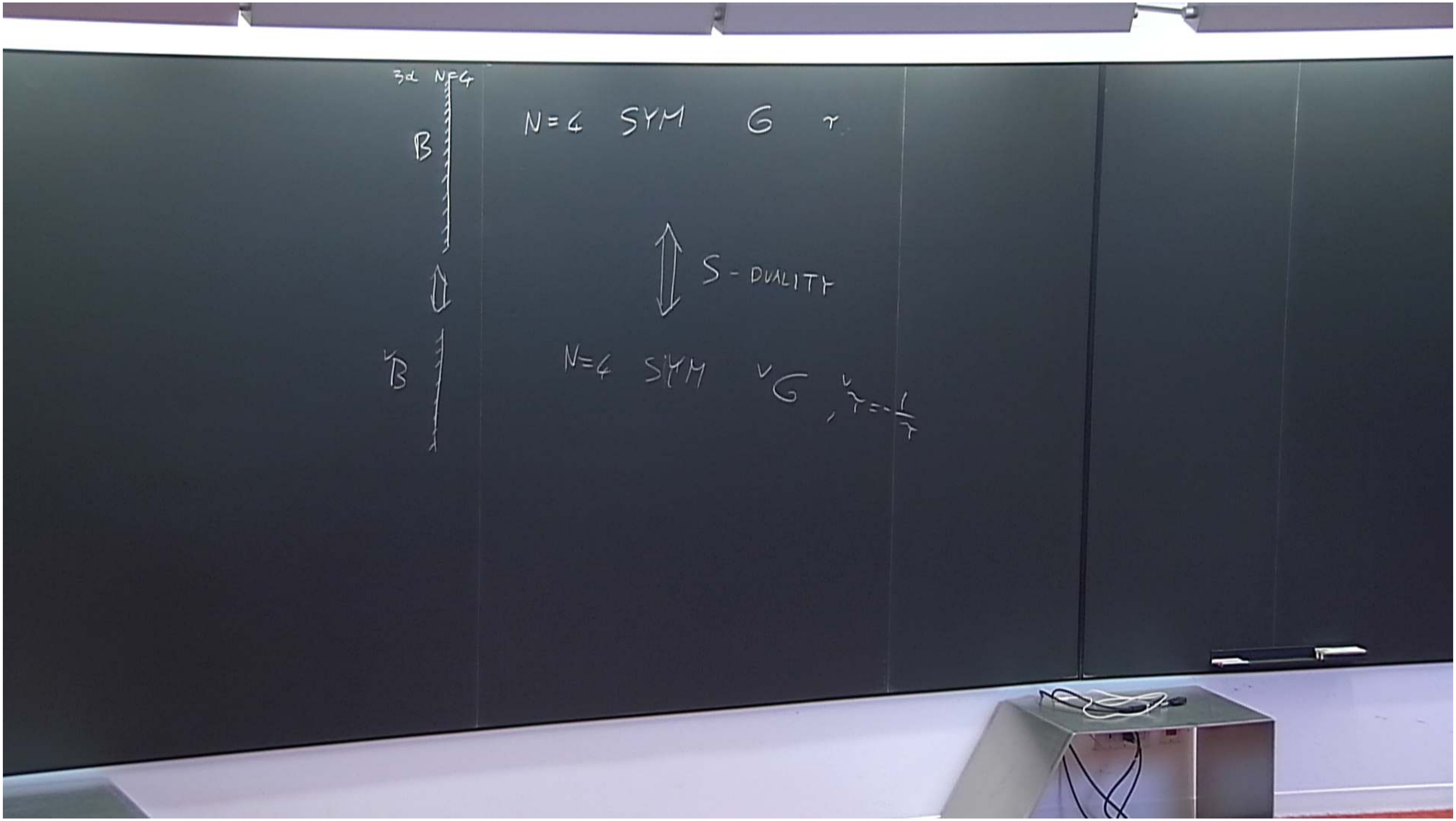
g_{YM}

$$\frac{i}{g_{YM}^2} + \frac{\theta}{2\pi} = \tau$$


N=4 SYM G τ
N=4 SYM ᴸG , ᴸτ = -1/τ

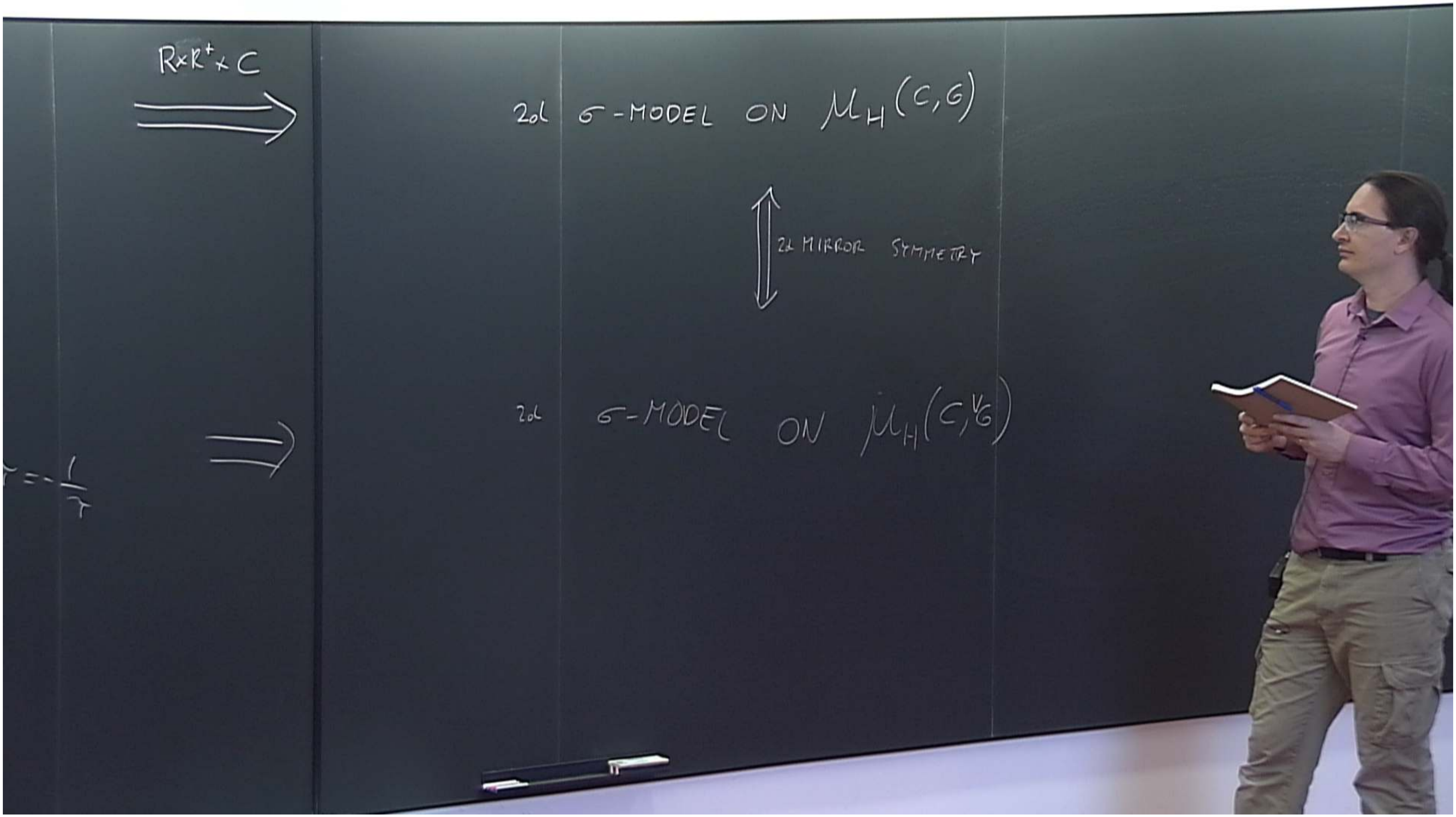

3d N=4
B
N=4 SYM G τ
N=4 SYM ᵛG , ᵛτ = -1/τ


$\mathrm{Tr}\left[F_{\mu\nu}^2 + (D_\mu \Phi^i)^2 + [\Phi^i, \Phi^j]^2 + \text{FERMIONS} + \frac{\theta}{2\pi} F \wedge F \right]$
g_{YM}
$\frac{i}{g_{YM}^2} + \frac{\theta}{2\pi} = \tau$
$\{Q^i, Q_j\} = C.P$



3d NFG
N=4 SYM G τ
B
S-DUALITY
N=4 SYM ᵛG , ᵛτ = -1/τ
ᵛB


R×R+×C
G τ
DUALITY
G , τ = -1/τ


R×R⁺×C
2d σ-MODEL ON M_H(C,G)
2d MIRROR SYMMETRY
2d σ-MODEL ON M_H(C,ᴸG)

$\mathbb{R}\times\mathbb{R}^{+}\times C$

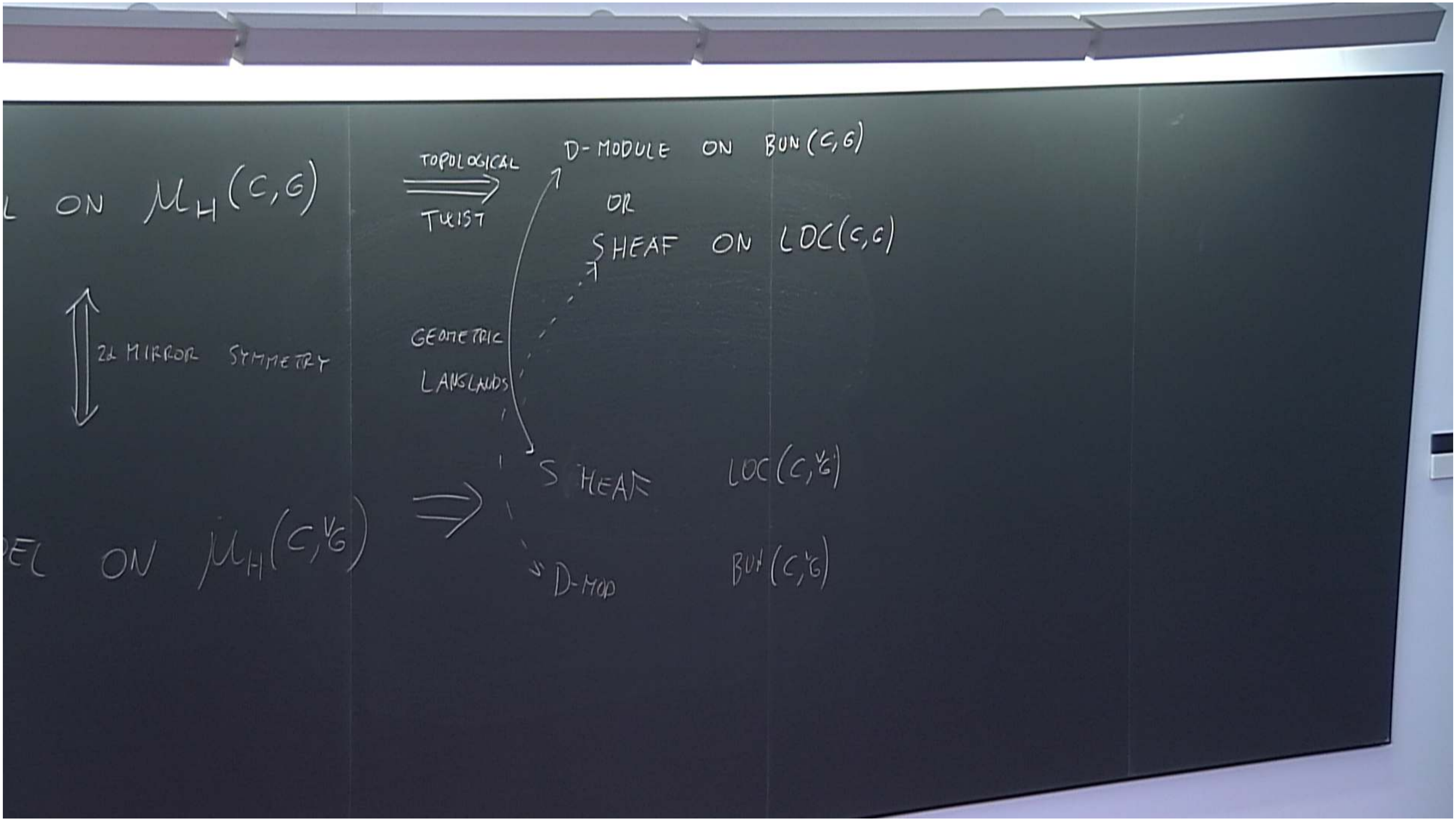
$\Longrightarrow$

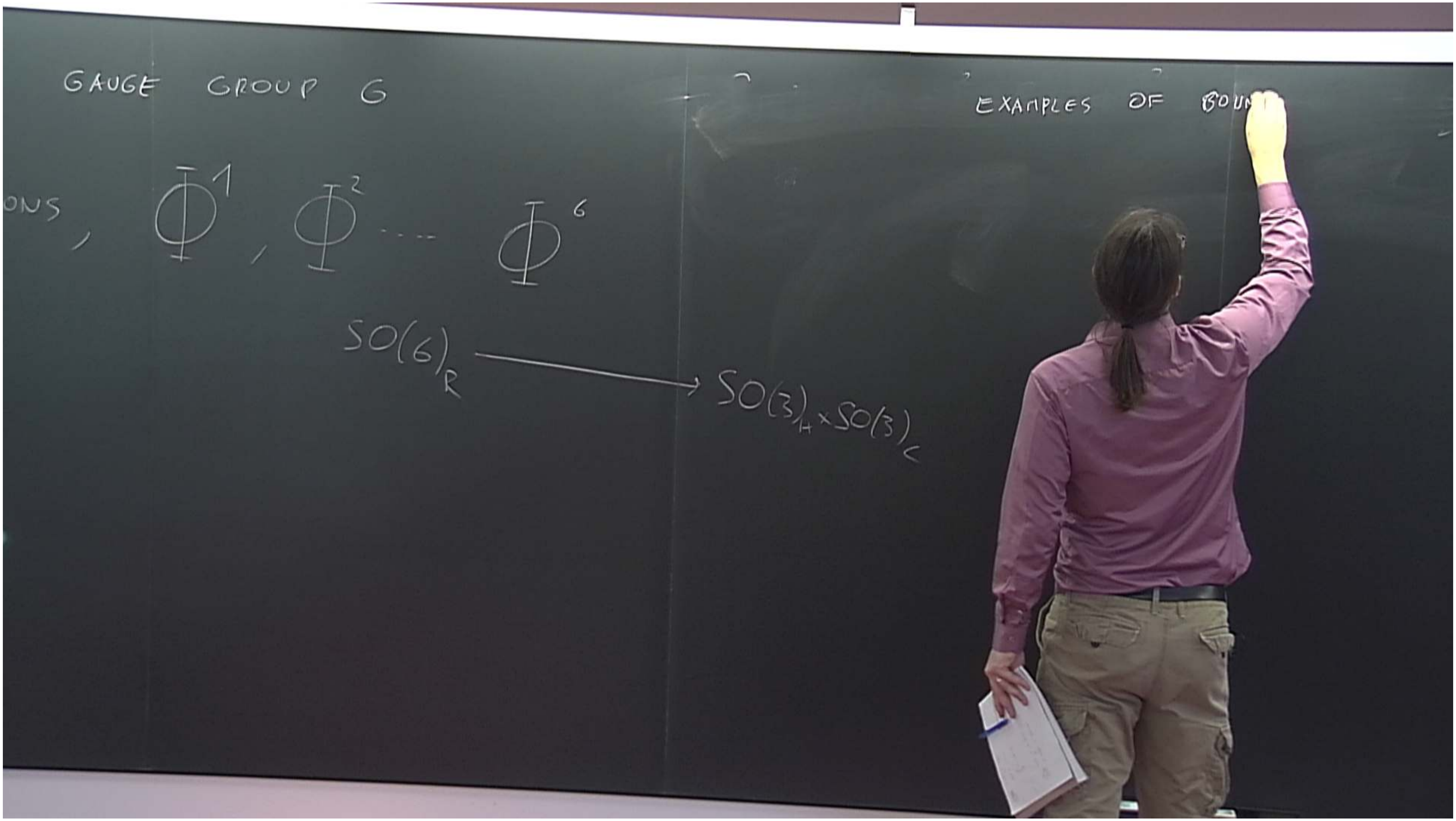
B_{BAA} or B_{BBB} — 2d $(4,4)$ σ-MODEL ON $\mathcal{M}_H(C,G)$

$\Updownarrow$ — $\Updownarrow$ 2d MIRROR SYMMETRY

${}^{\vee}B_{BBB}$ or ${}^{\vee}B_{BAA}$ — 2d $(4,4)$ σ-MODEL ON $\mathcal{M}_H(C,{}^{\vee}G)$

$= -\frac{1}{\tau}$ $\Longrightarrow$


TOPOLOGICAL
TWIST
D-MODULE ON BUN(C,G)
OR
SHEAF ON LOC(C,G)
2d MIRROR SYMMETRY
GEOMETRIC
LANGLANDS
SHEAF
LOC(C,ᵛG)
D-MOD
BUN(C,ᵛG)

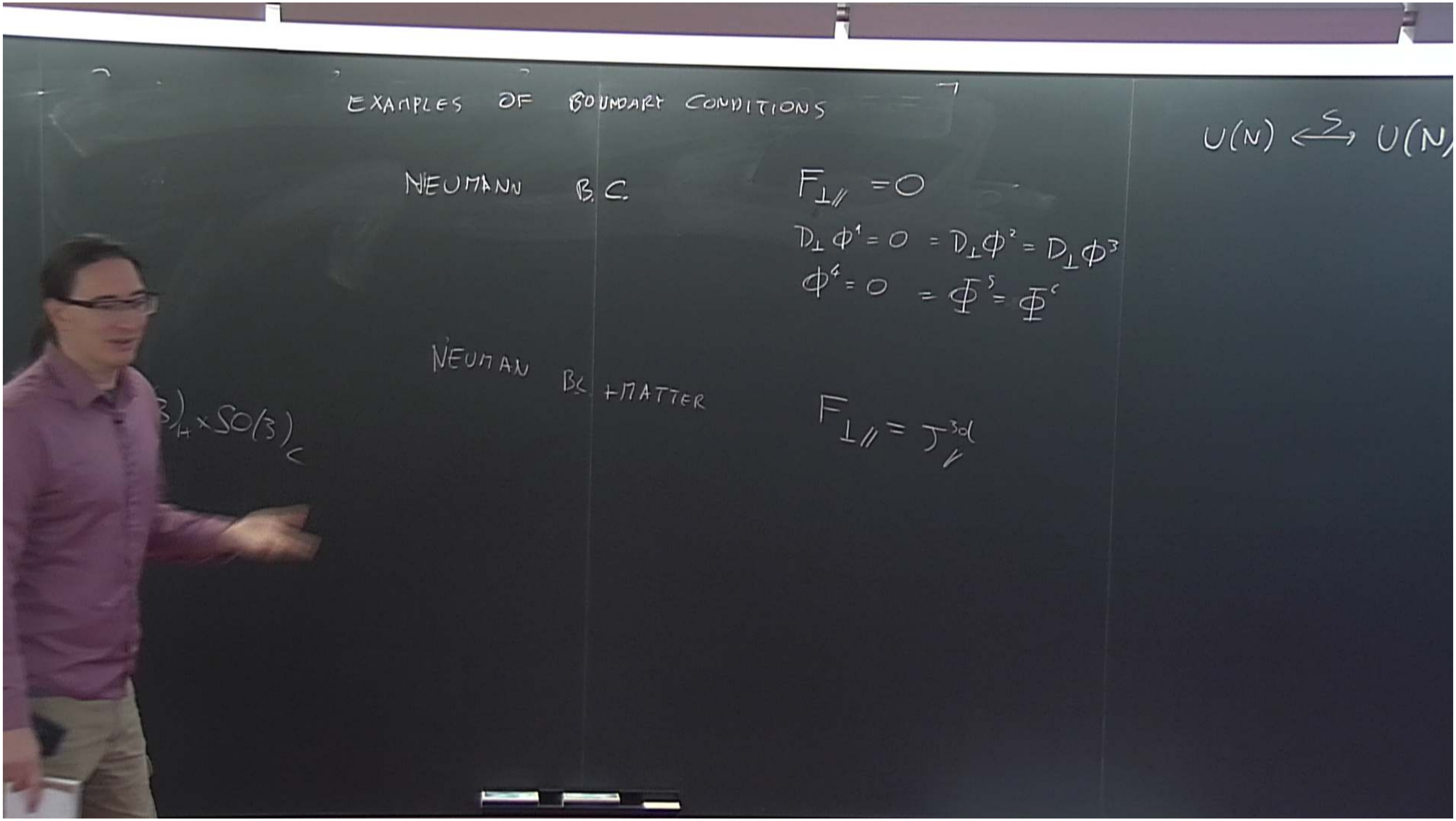

GAUGE GROUP G
Φ^1 , Φ^2 .... Φ^6
SO(6)_R → SO(3)_H × SO(3)_C
EXAMPLES OF

EXAMPLES OF BOUNDARY CONDITIONS

$U(N) \overset{S}{\longleftrightarrow} U(N$

NEUMANN B.C. $F_{\perp /\!/} = 0$

$\longrightarrow SO(3)_H \times SO(3)_C$


EXAMPLES OF BOUNDARY CONDITIONS
$U(N) \overset{S}{\longleftrightarrow} U(N$
NEUMANN B.C.
$F_{\perp /\!/} = 0$
$D_\perp \Phi^1 = 0 = D_\perp \Phi^2 = D_\perp \Phi^3$
$\Phi^4 = 0 = \Phi^5 = \Phi^6$
NEUMAN B.C. + MATTER
$F_{\perp /\!/} = J^{3d}_{/\!/}$
$3)_H \times SO(3)_C$

EXAMPLES OF BOUNDARY CONDITIONS

$U(N) \overset{S}{\longleftrightarrow} U(N)$

NEUMANN B.C.

$F_{\perp \parallel} = 0$

$D_\perp \Phi^1 = 0 = D_\perp \Phi^2 = D_\perp \Phi^3$

$\Phi^4 = 0 = \Phi^5 = \Phi^6$

$\rightarrow SO(3)_H \times SO(3)_C$

NEUMAN BC + MATTER

$F_{\perp \parallel} = J^{3d}_\parallel$

$\Phi^4 = \mu_1^{3d}$ $\quad \Phi^5 = \mu_2^{3d}$ $\quad \Phi^6 = \mu_3^{3d}$

EXAMPLES OF BOUNDARY CONDITIONS

$U(N) \overset{S}{\longleftrightarrow} U(N)$

NEUMANN B.C.

$F_{\perp /\!/} = 0$

$D_\perp \Phi^1 = 0 = D_\perp \Phi^2 = D_\perp \Phi^3$

$\Phi^4 = 0 = \Phi^5 = \Phi^6$

NEUMAN BC + MATTER

$\rightarrow SO(3)_H \times SO(3)_C$

$F_{\perp /\!/} = J^{3d}_{/\!/}$

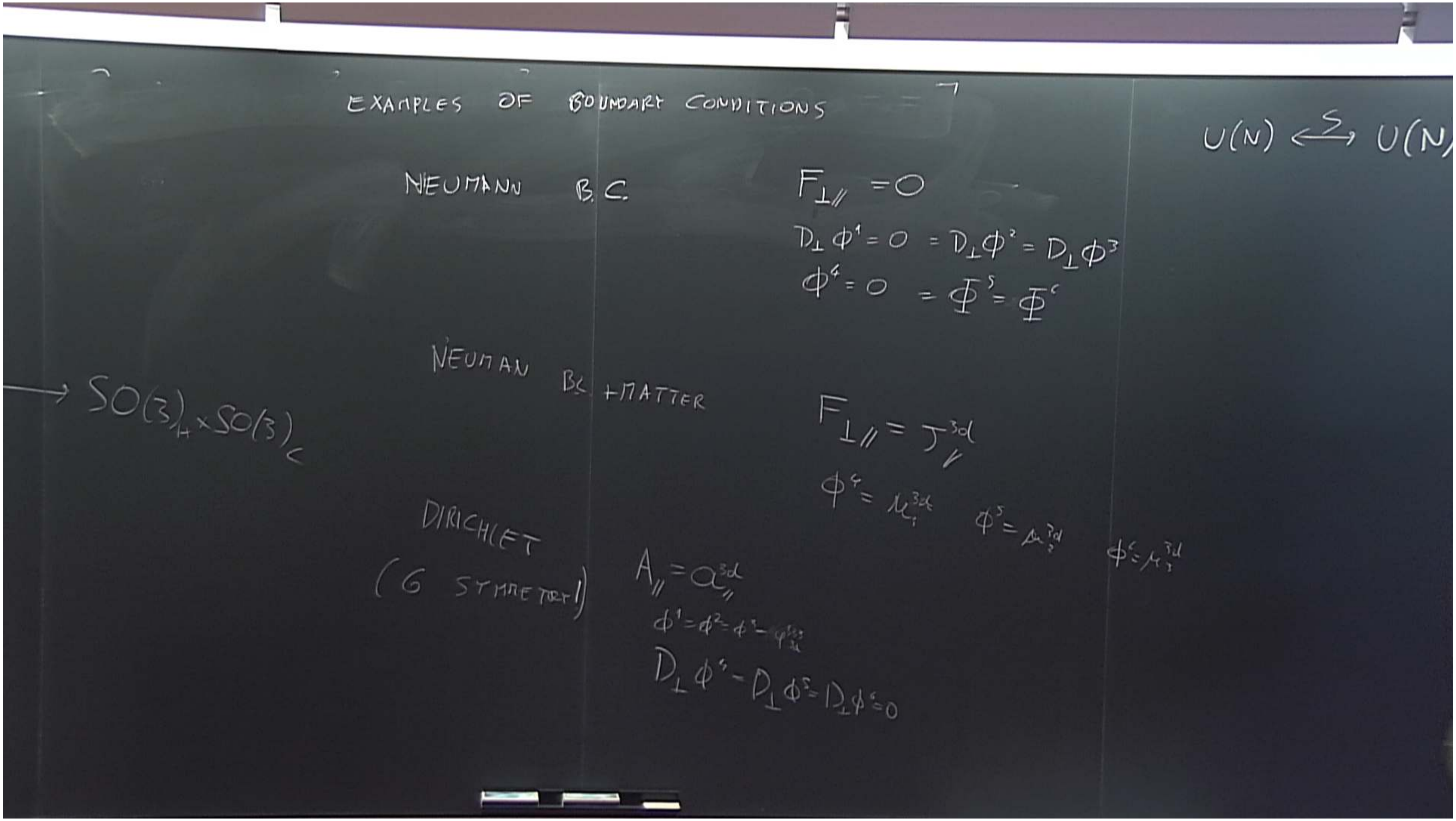
$\Phi^4 = \mu_1^{3d} \quad \Phi^5 = \mu_2^{3d} \quad \Phi^6 = \mu_3^{3d}$

DIRICHLET

$A_{/\!/} = 0$

$\Phi^1 = \Phi^2 = \Phi^3 = 0$

$D_\perp \Phi^4 = D_\perp \Phi^5 = D_\perp \Phi^6 = 0$


EXAMPLES OF BOUNDARY CONDITIONS
$U(N) \xleftrightarrow{S} U(N)$
NEUMANN B.C.
$F_{\perp /\!/} = 0$
$D_\perp \Phi^1 = 0 = D_\perp \Phi^2 = D_\perp \Phi^3$
$\Phi^4 = 0 = \Phi^5 = \Phi^6$
NEUMAN BC + MATTER
$\to SO(3)_H \times SO(3)_C$
$F_{\perp /\!/} = J^{3d}_{/\!/}$
$\Phi^4 = \mu^{3d}_1 \quad \Phi^5 = \mu^{3d}_2 \quad \Phi^6 = \mu^{3d}_3$
DIRICHLET
(G SYMMETRY)
$A_{/\!/} = a^{3d}_{/\!/}$
$D_\perp \Phi^4 = D_\perp \Phi^5 = D_\perp \Phi^6 = 0$

EXAMPLES OF BOUNDARY CONDITIONS

$SO(6) \to SO(3) \times SO(3)$

$U(N) \overset{S}{\longleftrightarrow} U$

NEUMANN B.C.

$F_{\perp /\!/} = 0$

$D_\perp \phi^1 = 0 = D_\perp \phi^2 = D_\perp \phi^3$

$\phi^4 = 0 = \Phi^5 = \Phi^6$

NEUMAN BC + MATTER

$F_{\perp /\!/} = J^{3d}_{/\!/}$

$\phi^4 = \mu_1^{3d}$ $\phi^5 = \mu_2^{3d}$ $\phi^6 = \mu_3^{3d}$

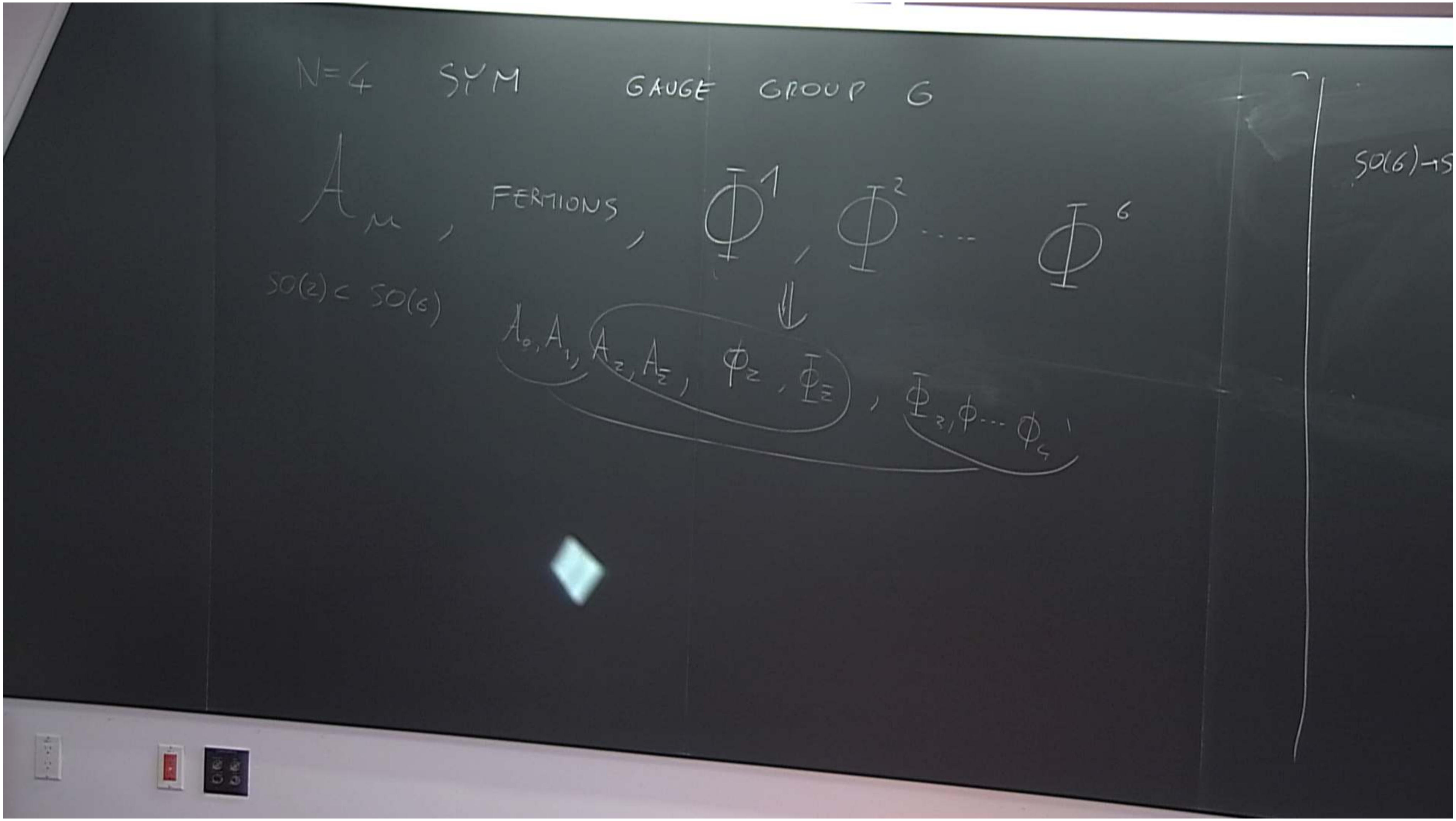
DIRICHLET

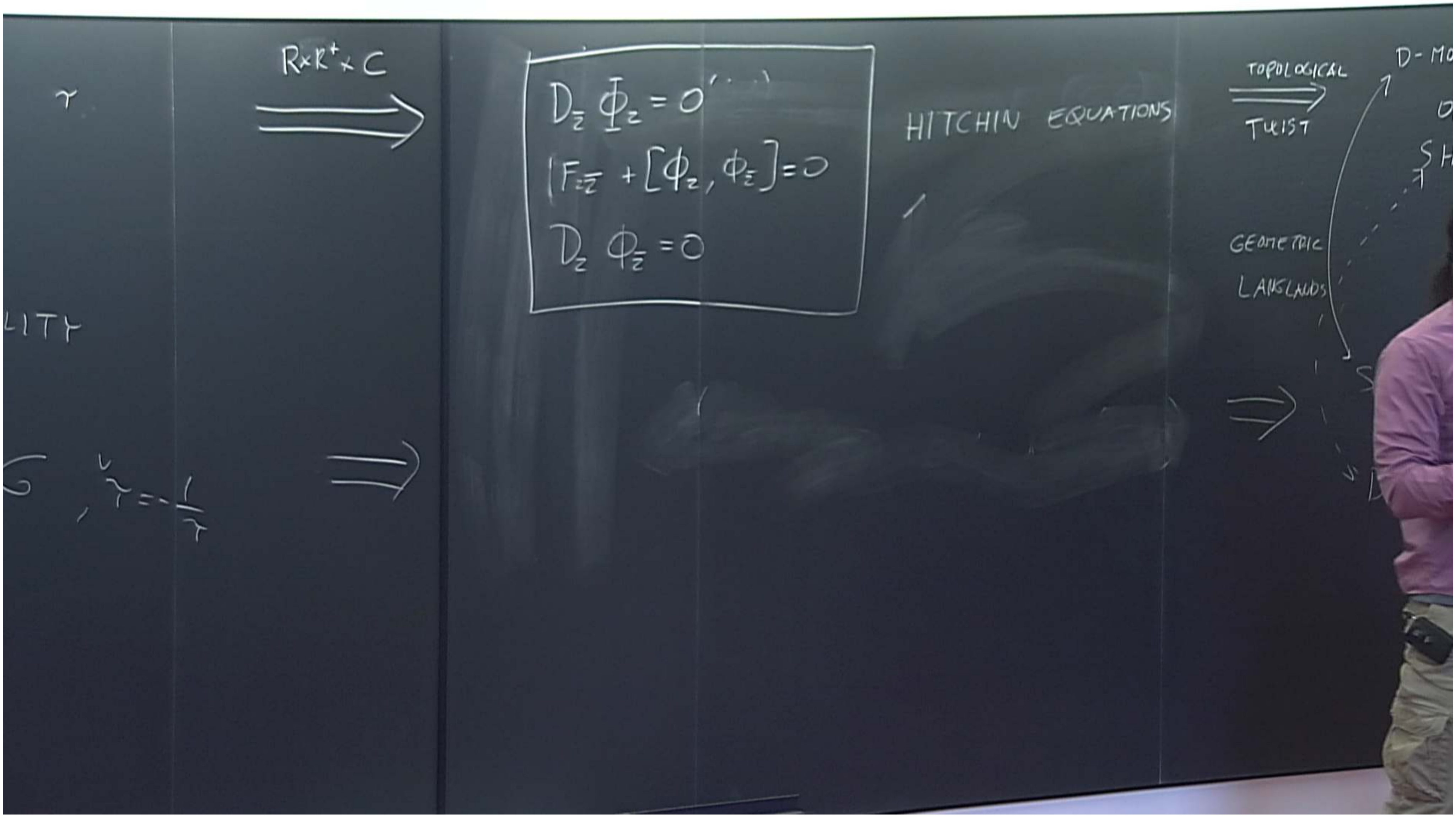
(6 SYMMETRY!)

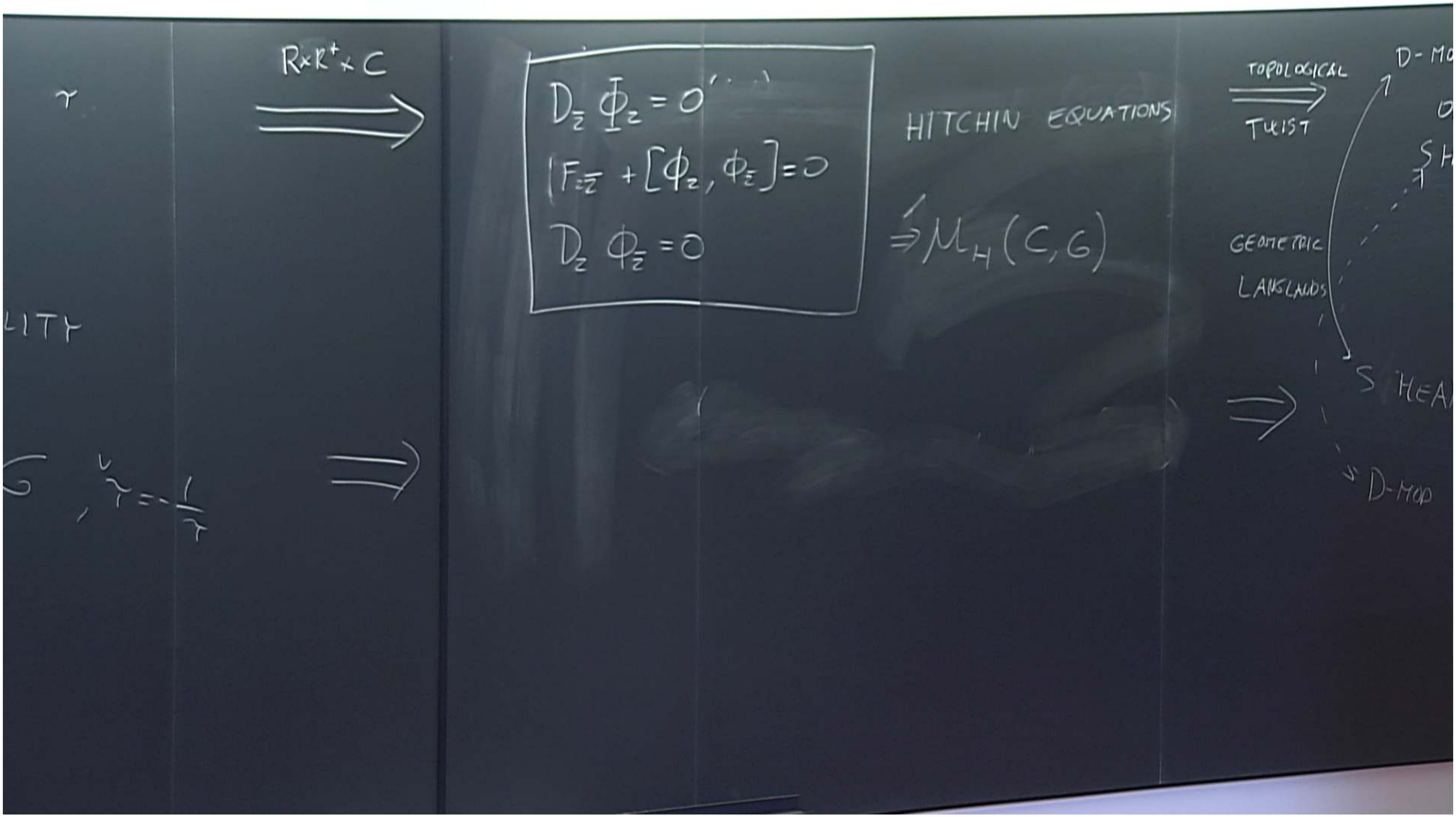
$A_{/\!/} = a^{3d}_{/\!/}$

$\phi^1 = \phi^2 = \phi^3 = \varphi^{1,2,3}_{3d}$

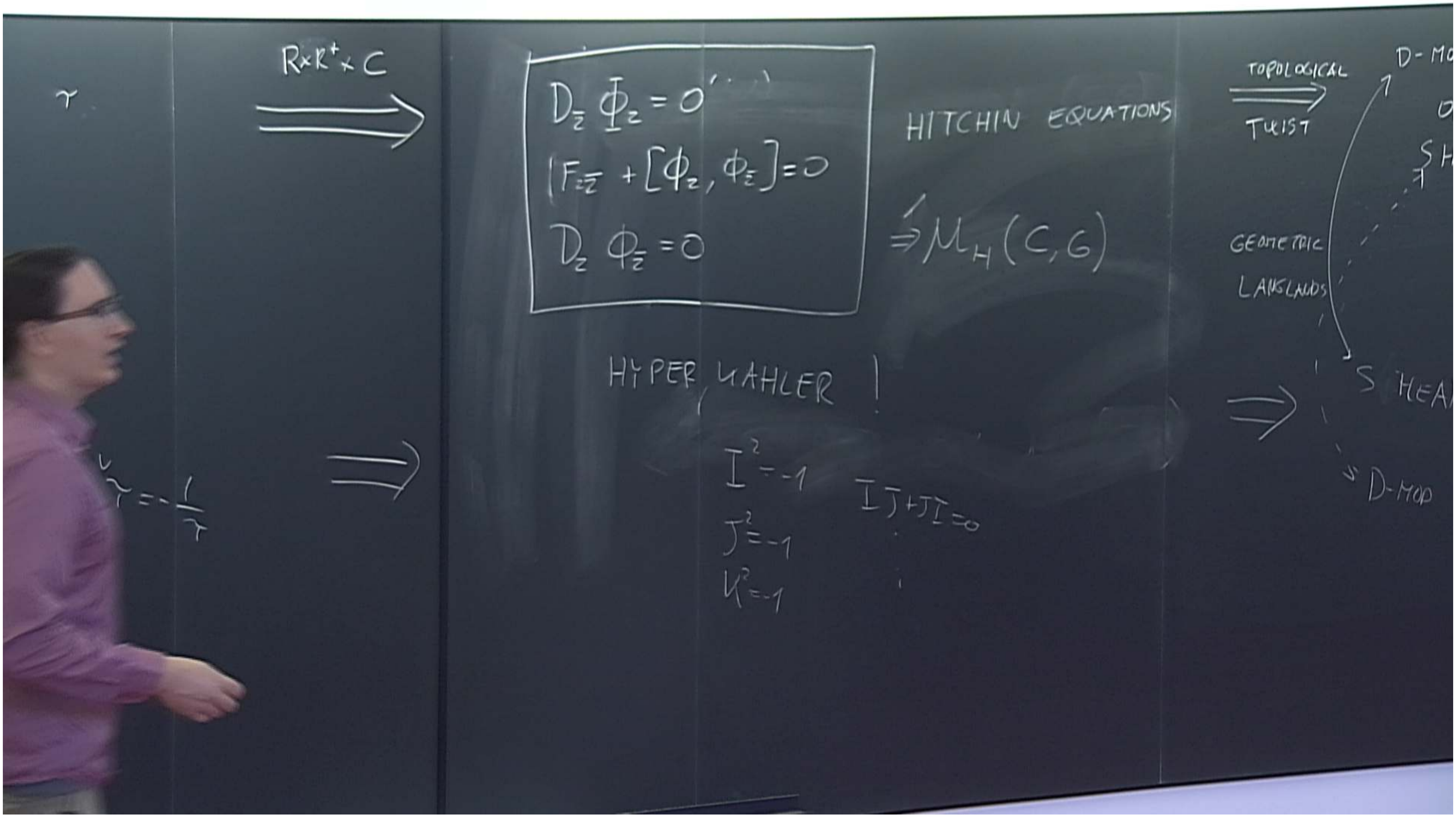
$D_\perp \phi^4 = D_\perp \phi^5 = D_\perp \phi^6 = 0$

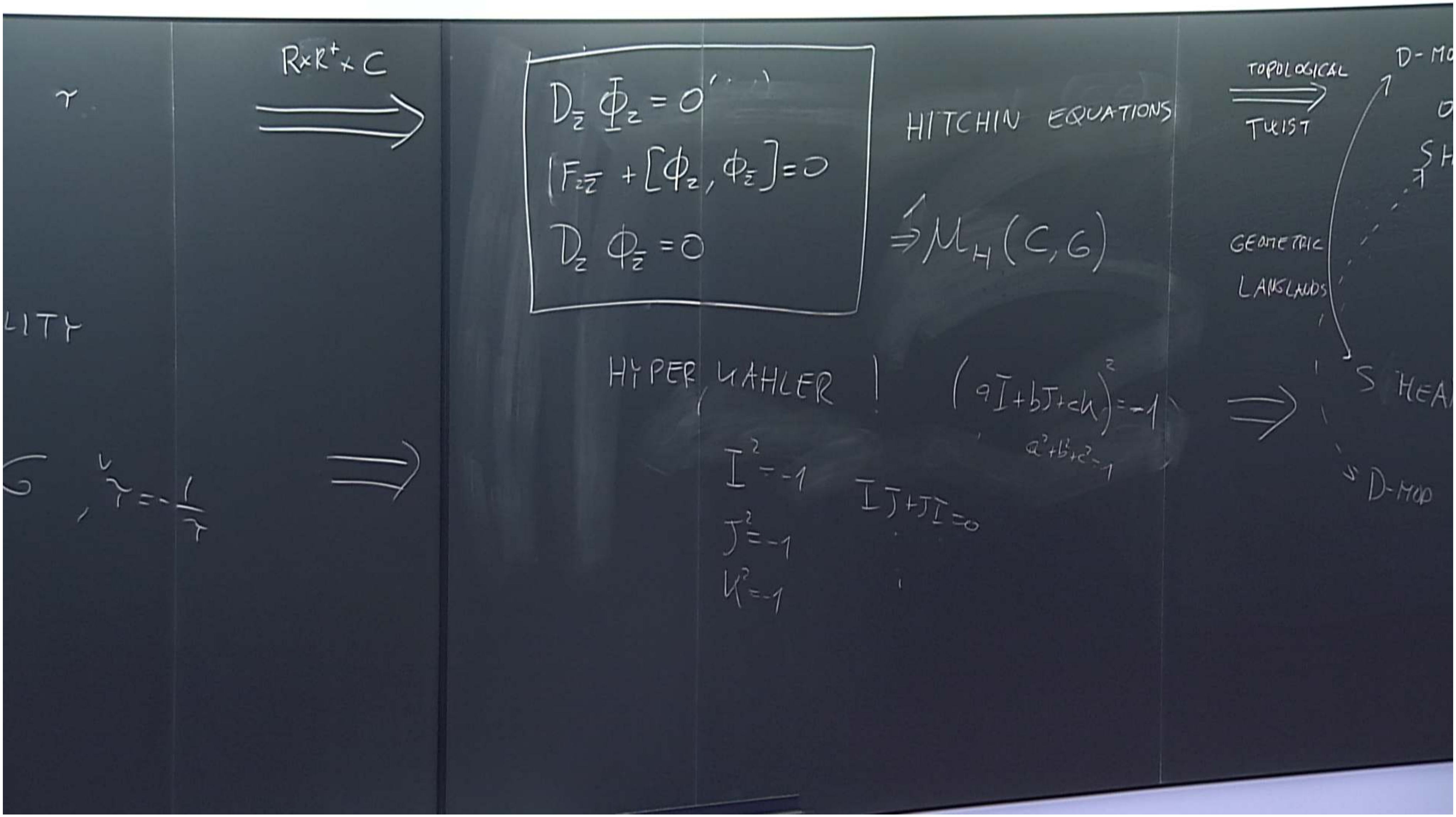

N=4 SYM GAUGE GROUP G
FERMIONS
SO(2) < SO(6)
SO(6)→S

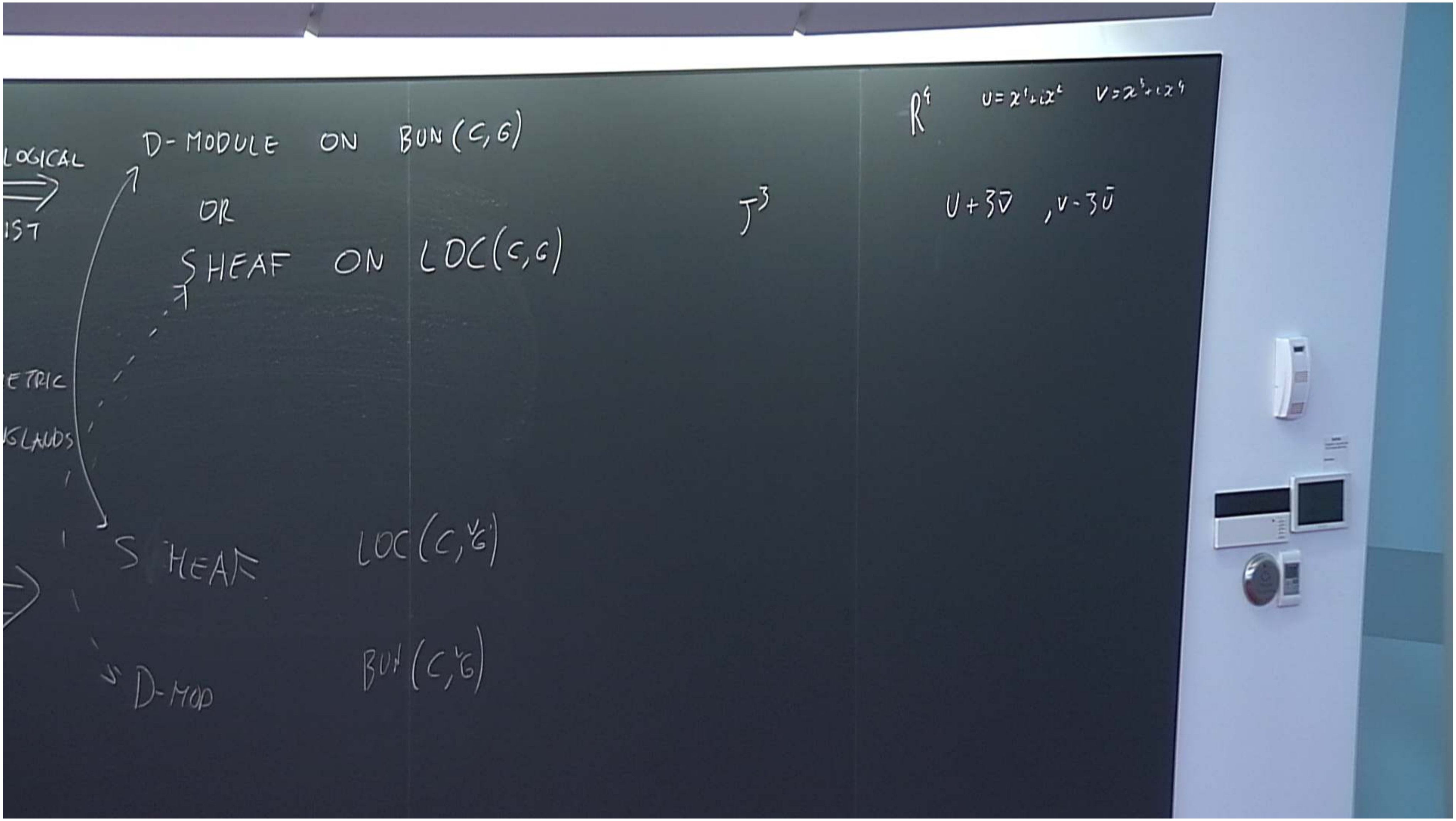

R×R⁺×C
HITCHIN EQUATIONS
TOPOLOGICAL
TWIST
GEOMETRIC
LANGLANDS
D-MO
LITY

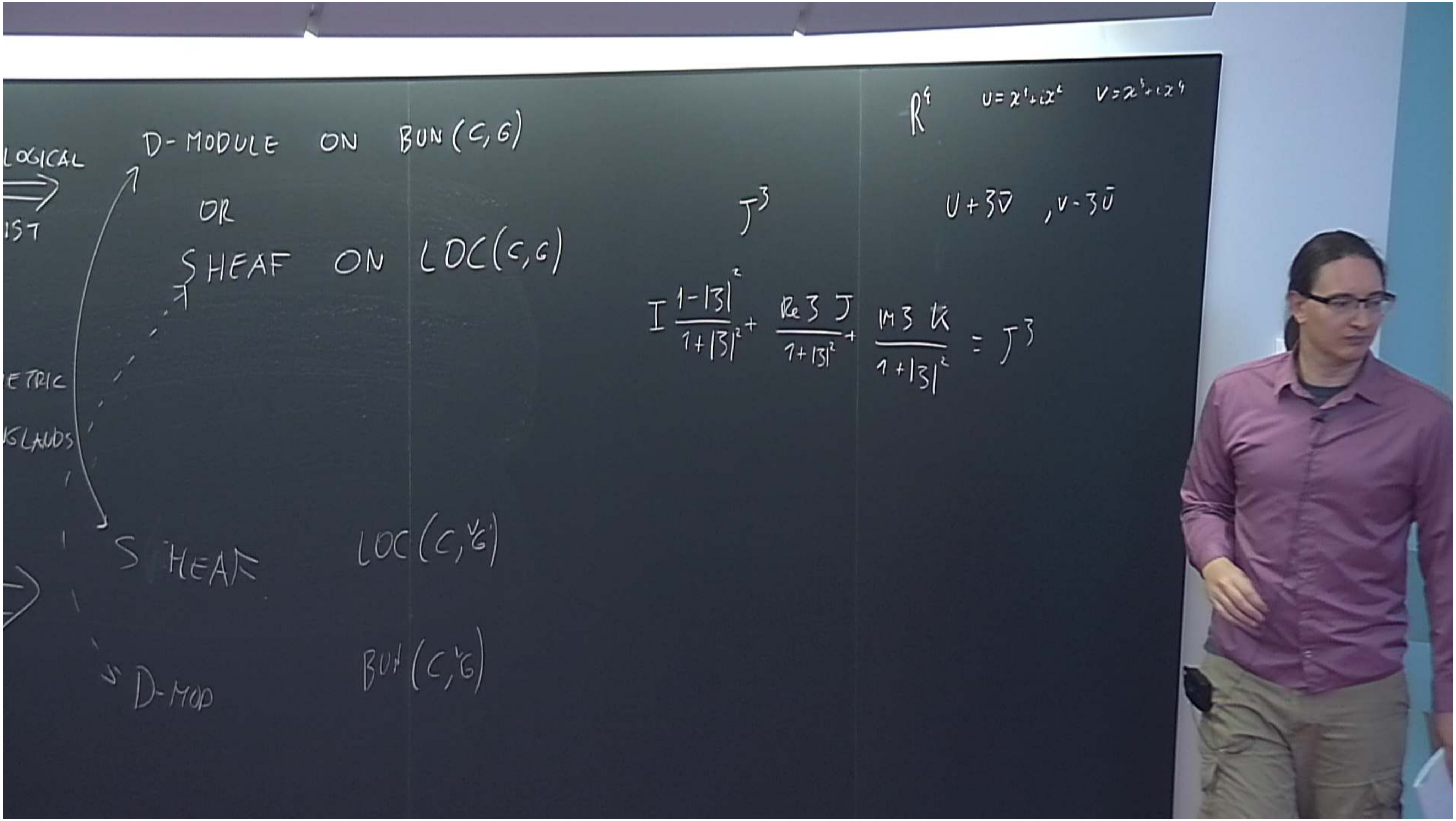


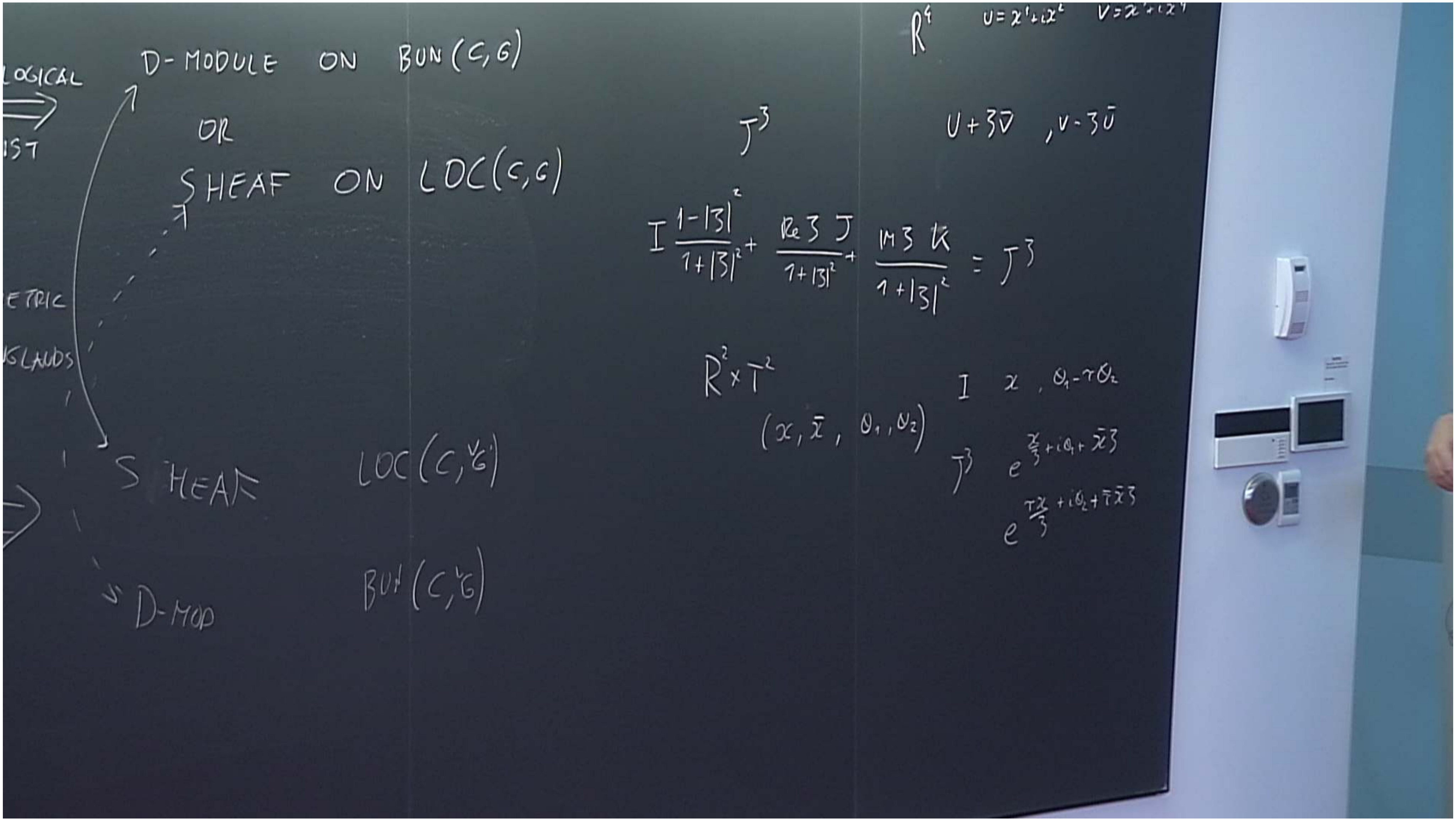
R×R⁺×C
HITCHIN EQUATIONS
TOPOLOGICAL
TWIST
GEOMETRIC
LANGLANDS
D-MOD

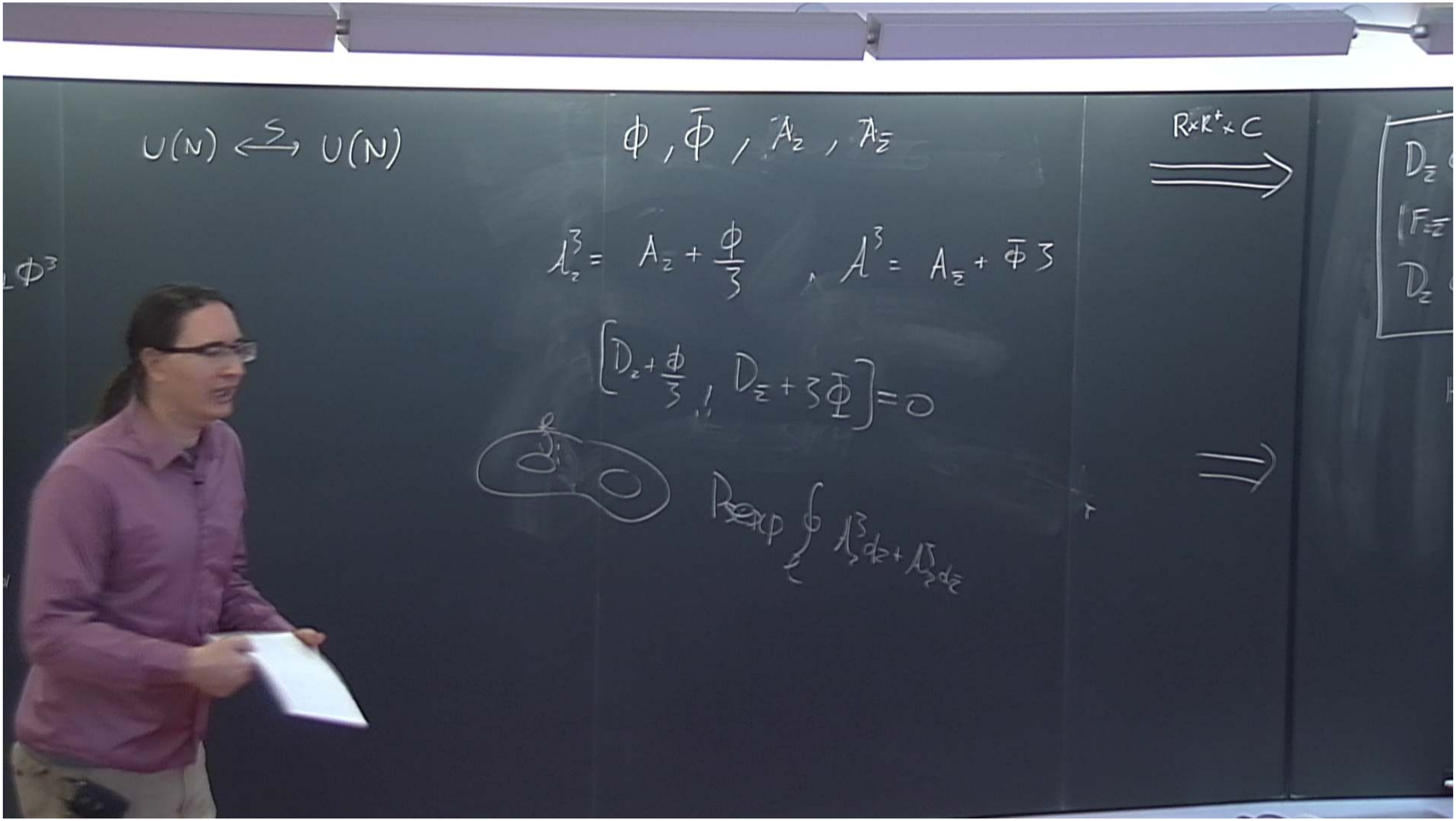

R×R⁺×C
HITCHIN EQUATIONS
HYPER KAHLER
TOPOLOGICAL
TWIST
GEOMETRIC
LANGLANDS
D-MOD

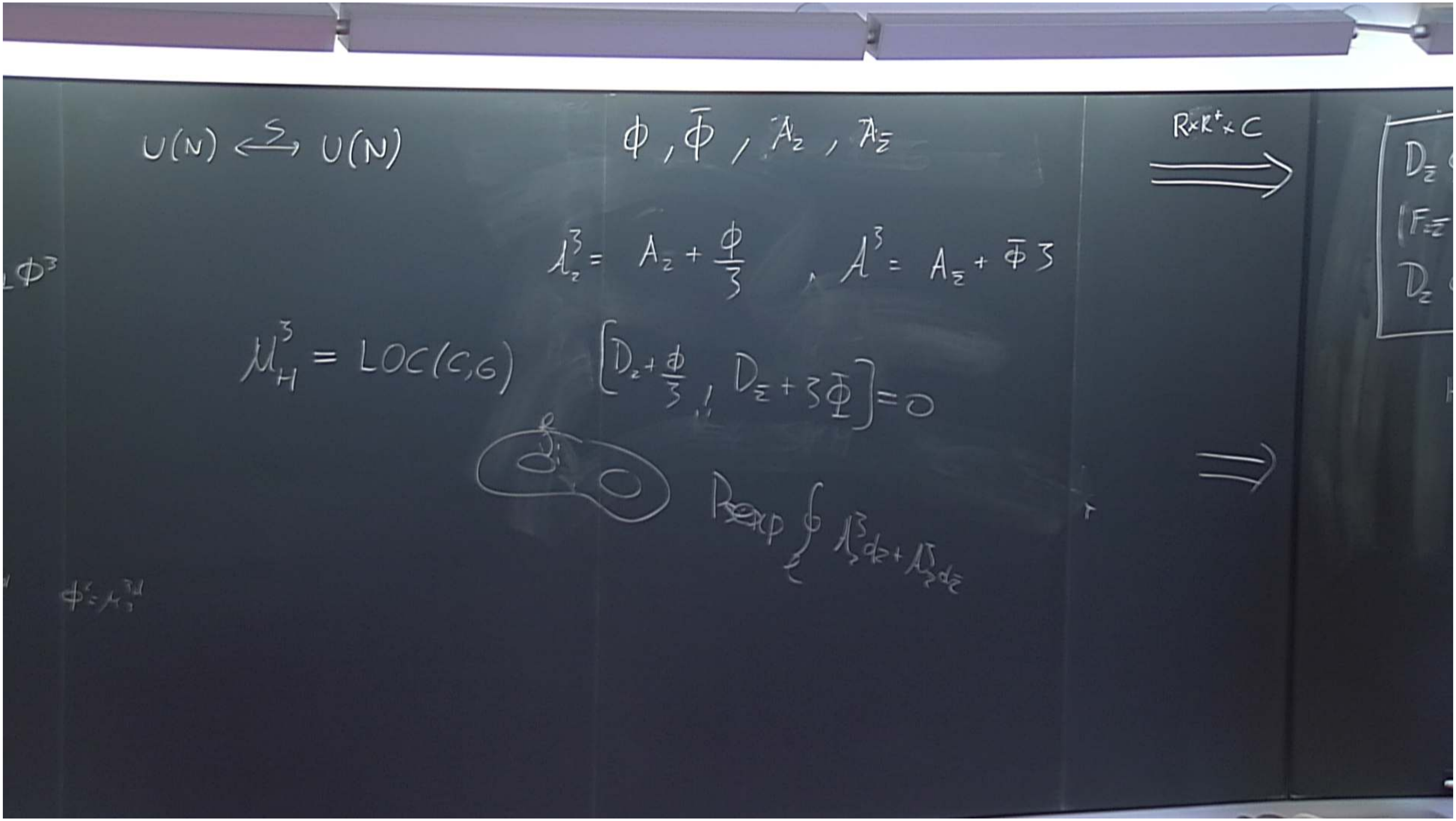

R×R⁺×C
LITY
D_z̄ Φ_z = 0
F_zz̄ + [Φ_z, Φ_z̄] = 0
D_z Φ_z̄ = 0
HITCHIN EQUATIONS
⇒ M_H(C, G)
HYPER KAHLER
(aI+bJ+cK)² = −1
a²+b²+c² = 1
I² = −1
J² = −1
K² = −1
IJ+JI = 0
TOPOLOGICAL
TWIST
GEOMETRIC
LANGLANDS
D-MO
SH
SHEA
D-MOD

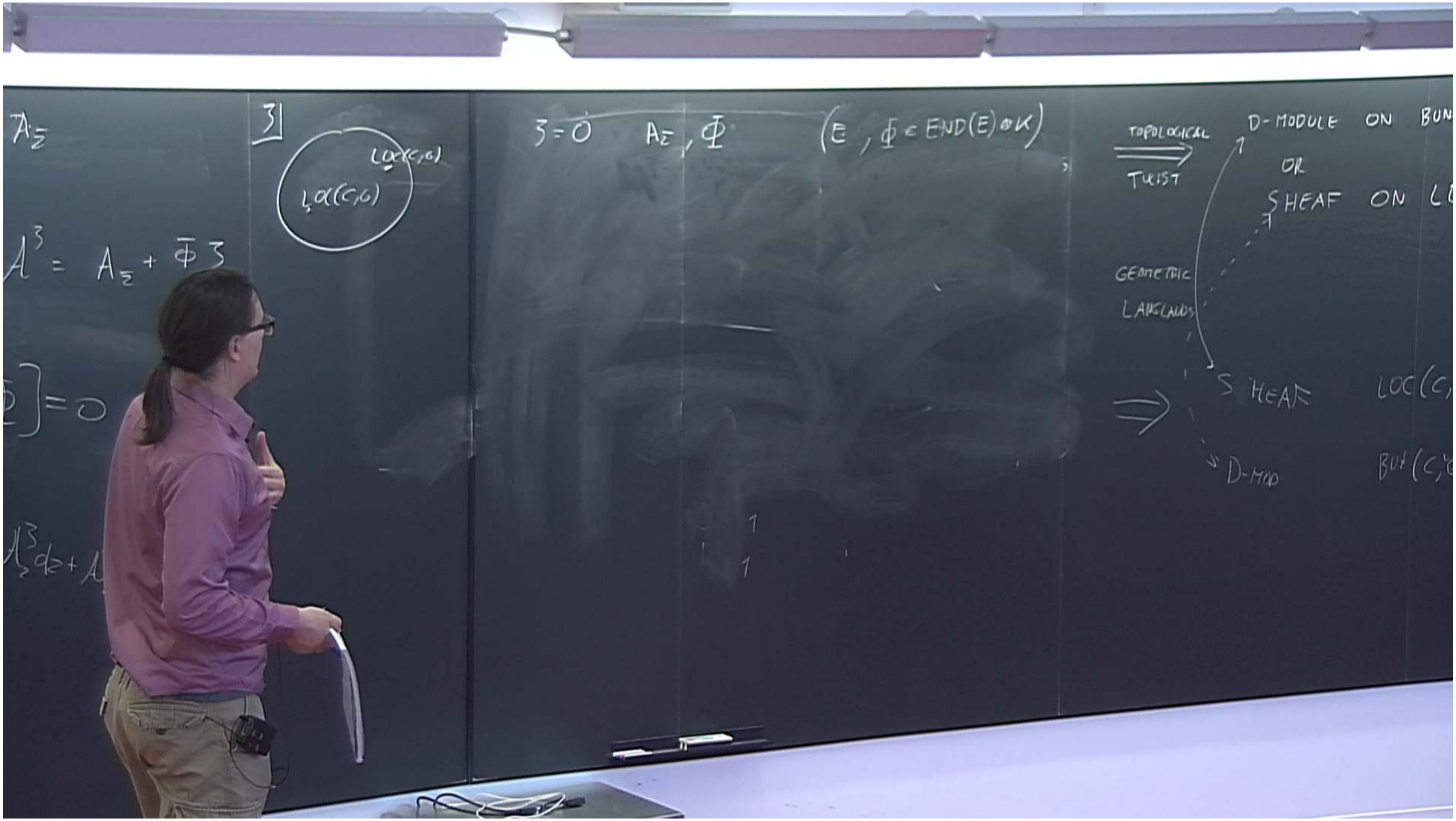

D-MODULE ON BUN(C, G)
OR
SHEAF ON LOC(C, G)
LOGICAL
ETRIC
GLANDS
SHEAF LOC(C, ᵛG)
D-MOD BUN(C, ᵛG)
J³
R⁴ U = x¹ + ix² V = x³ + ix⁴
U + 3V̄ , V - 3Ū

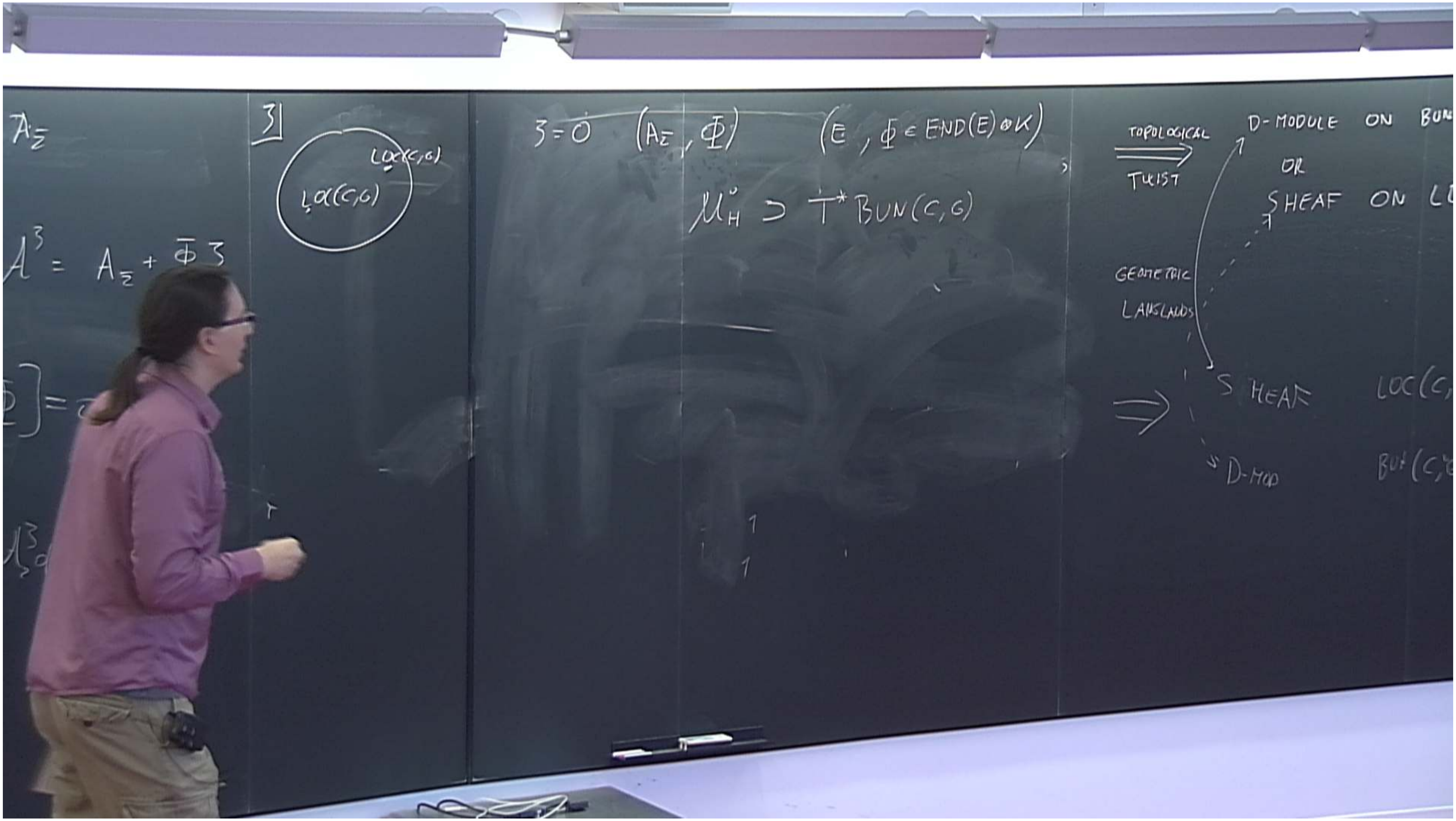

D-MODULE ON BUN(C,G)
OR
SHEAF ON LOC(C,G)
SHEAF
LOC(C,ᴸG)
D-MOD
BUN(C,ᴸG)
J^3
$I\frac{1-|z|^2}{1+|z|^2}+\frac{\mathrm{Re}\,z\,J}{1+|z|^2}+\frac{\mathrm{Im}\,z\,K}{1+|z|^2}=J^3$
$\mathbb{R}^4$
$u=x^1+ix^2$ $v=x^3+ix^4$
$u+z\bar{v}$, $v-z\bar{u}$

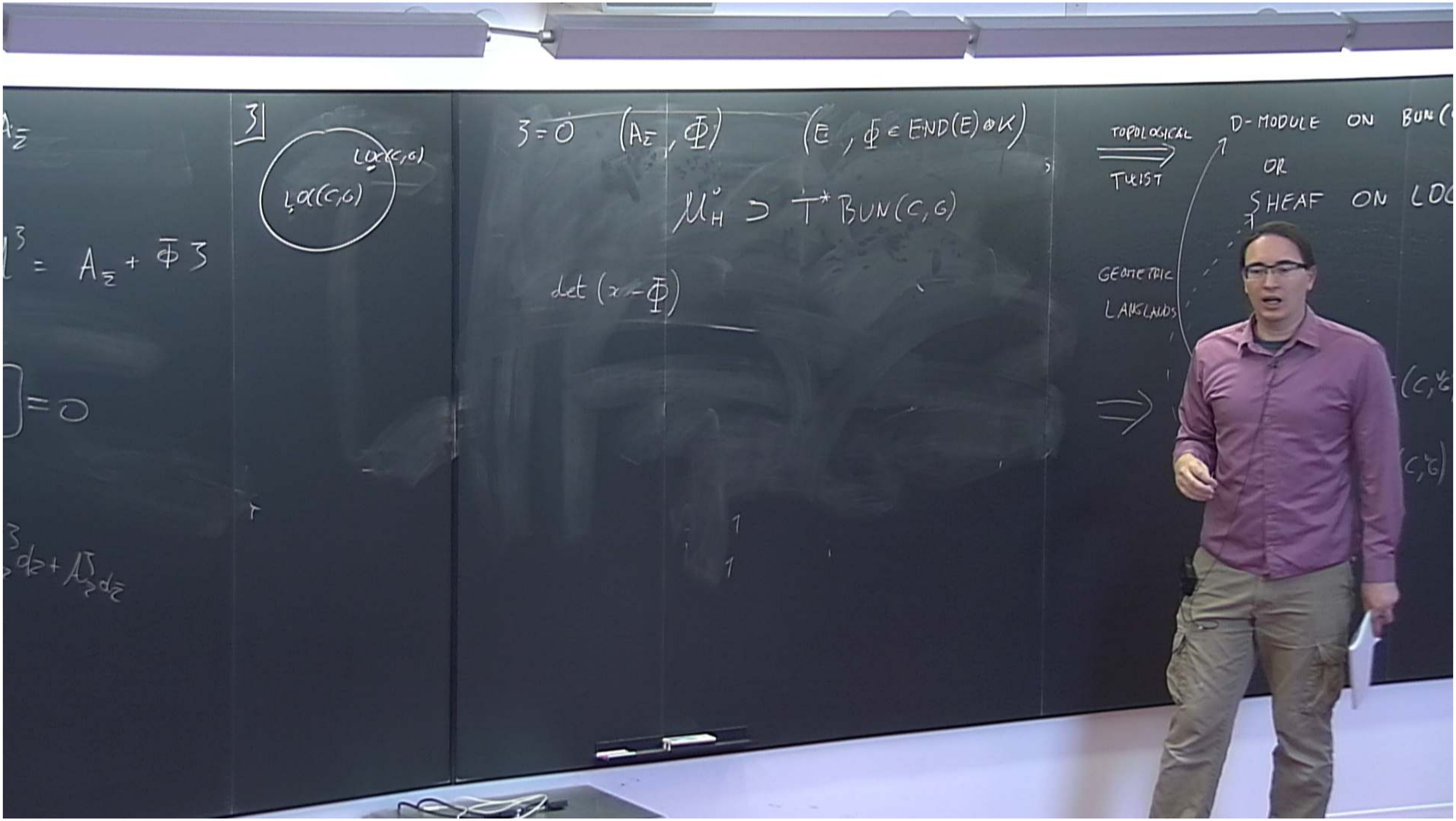

D-MODULE ON BUN(C, G)
OR
SHEAF ON LOC(C, G)
SHEAF
LOC(C, ᴸG)
D-MOD
BUN(C, ᴸG)
R⁴
U = x¹ + ix²
U + zV̄ , V - zŪ
J³
R² × T²
(x, x̄, θ₁, θ₂)

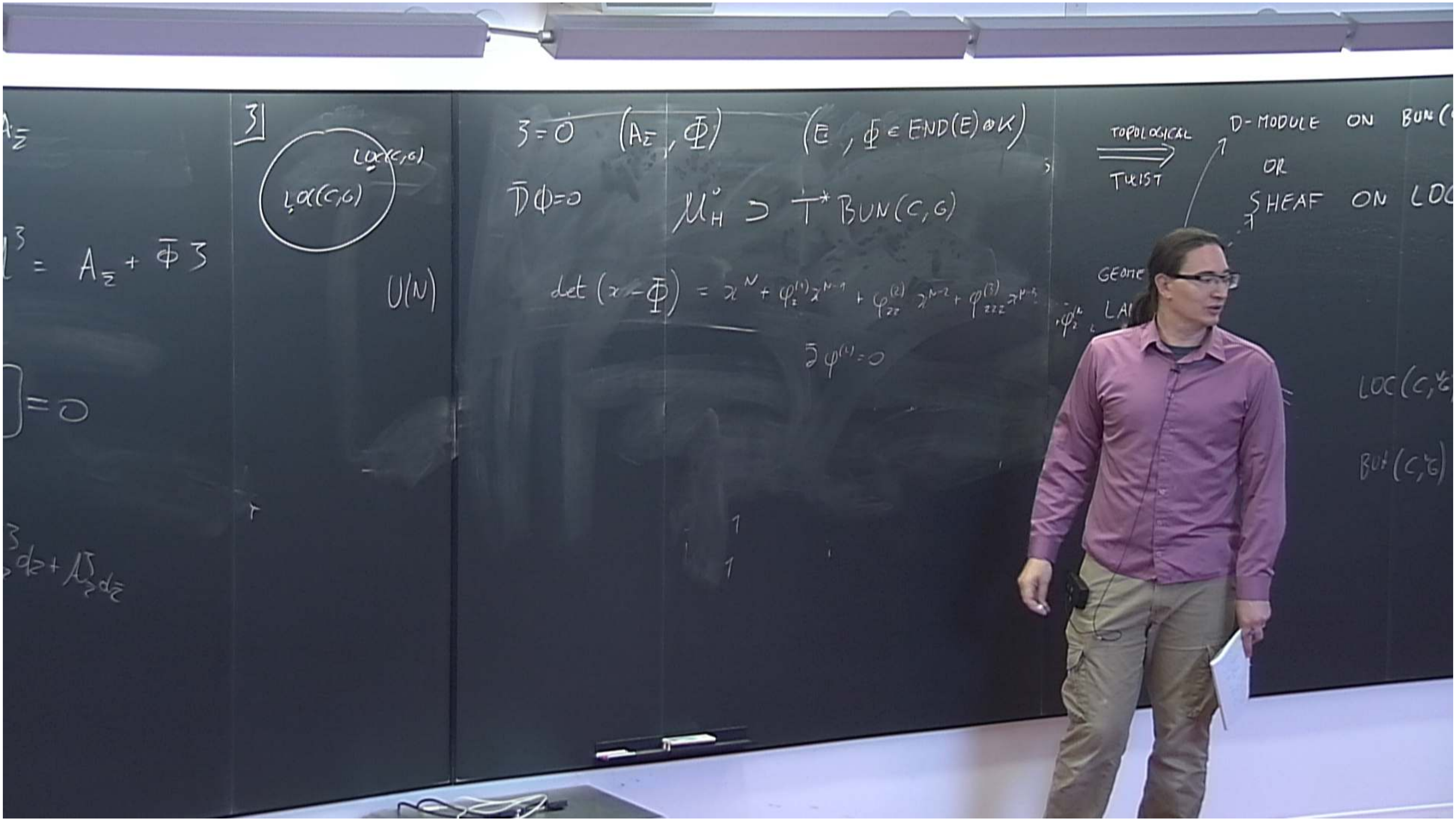

U(N) ⟷ U(N)
Φ , Φ̄ , A_z , A_z̄
R×R⁺×C
𝒜_z = A_z + Φ/ζ , 𝒜_z̄ = A_z̄ + Φ̄ ζ
[D_z + Φ/ζ , D_z̄ + ζΦ̄] = 0
P exp ∮ 𝒜_z dz + 𝒜_z̄ dz̄

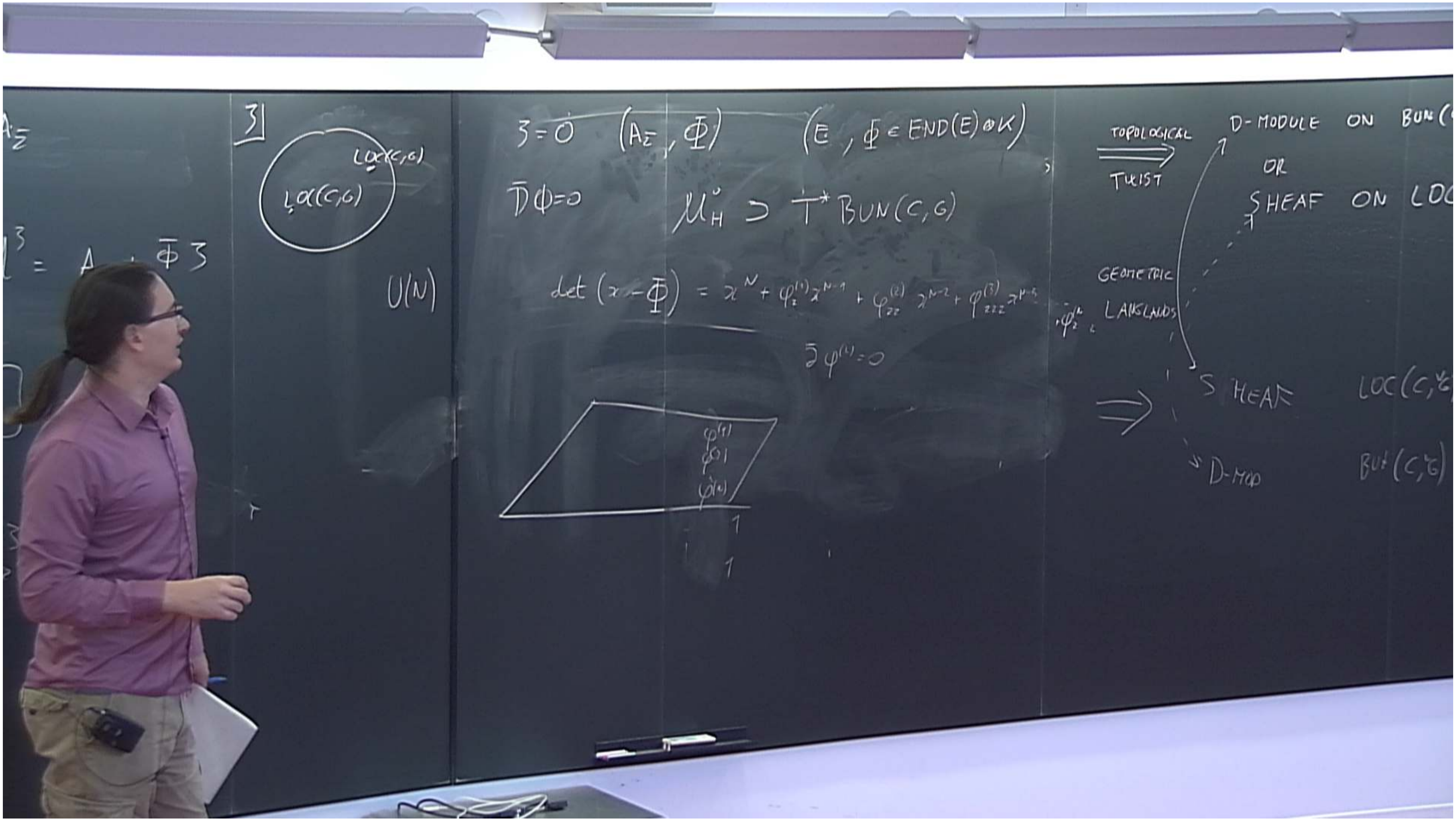

U(N) ⟷ U(N)
Φ, Φ̄, A_z, A_z̄
R×R⁺×C
𝒜_z^3 = A_z + Φ/3 , 𝒜^3 = A_z̄ + Φ̄ 3
ℳ_H^3 = LOC(C,G)
[D_z + Φ/3 , D_z̄ + 3Φ̄] = 0
Pexp ∮ 𝒜_z^3 dz + 𝒜_z̄^3 dz̄

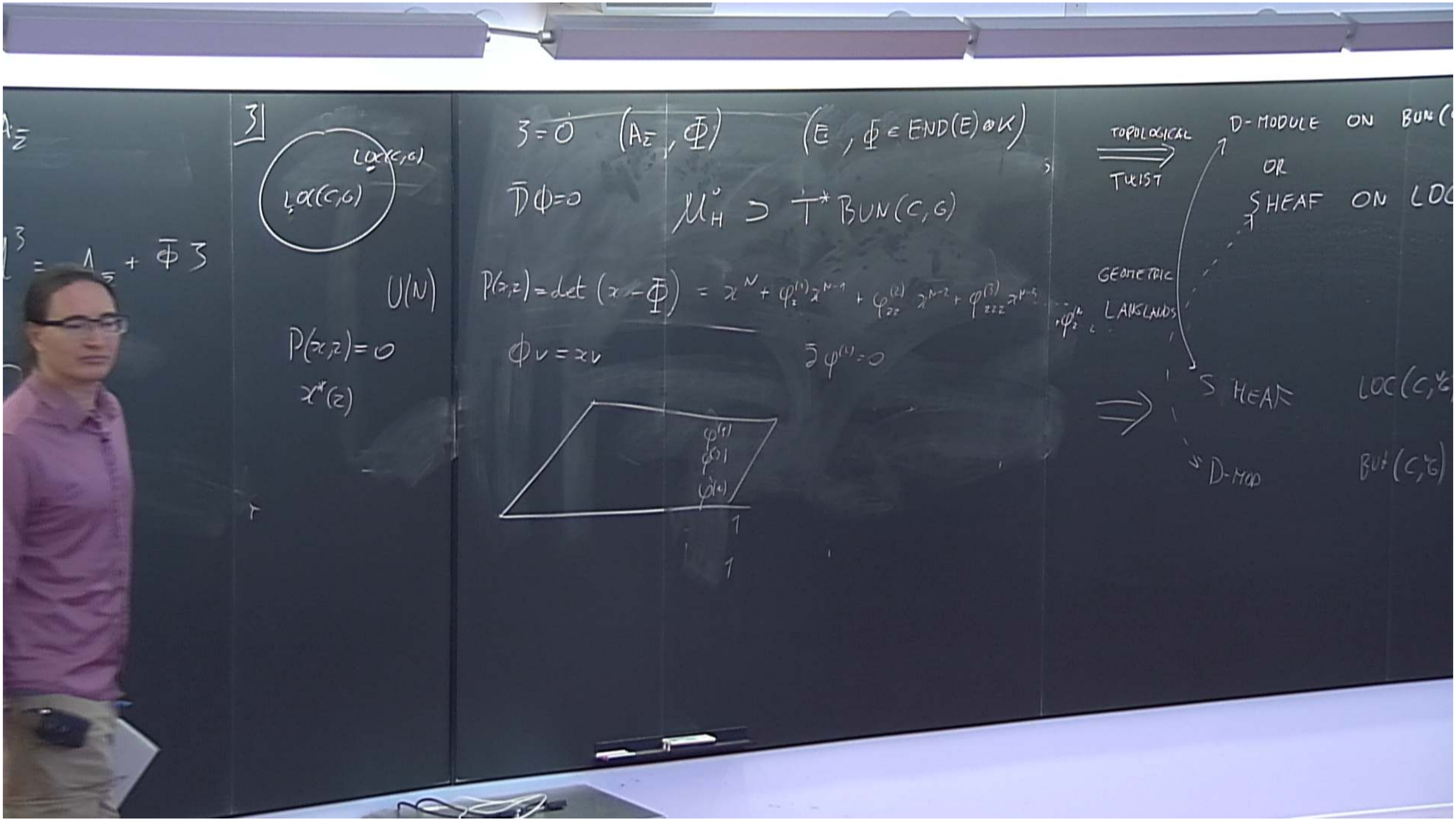

TOPOLOGICAL
TWIST
D-MODULE ON BUN
OR
SHEAF ON
GEOMETRIC
LANGLANDS
SHEAF
D-MOD

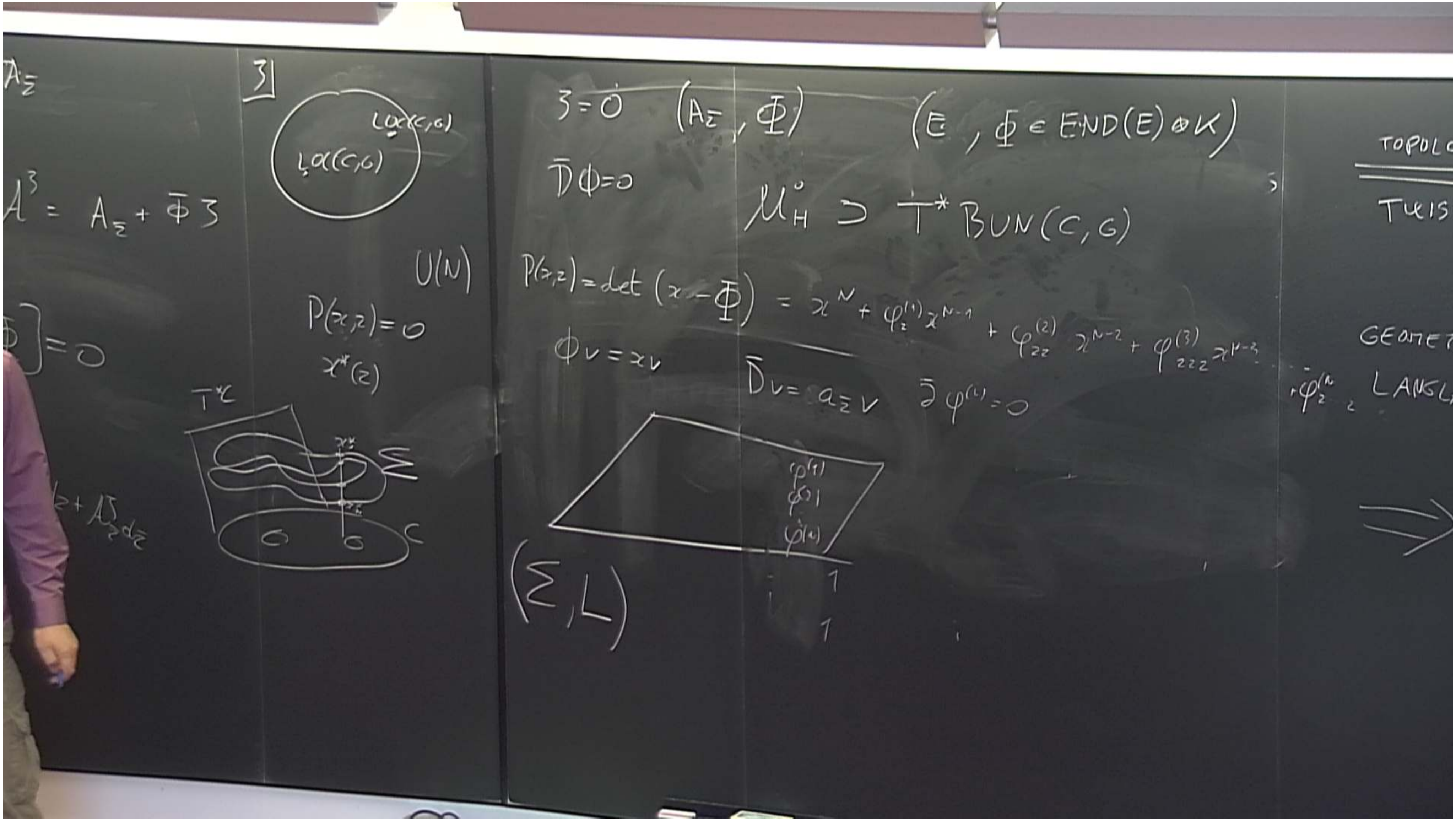

TOPOLOGICAL
TWIST
D-MODULE ON BUN
OR
SHEAF ON LOC
GEOMETRIC
LANGLANDS
SHEAF
D-MOD

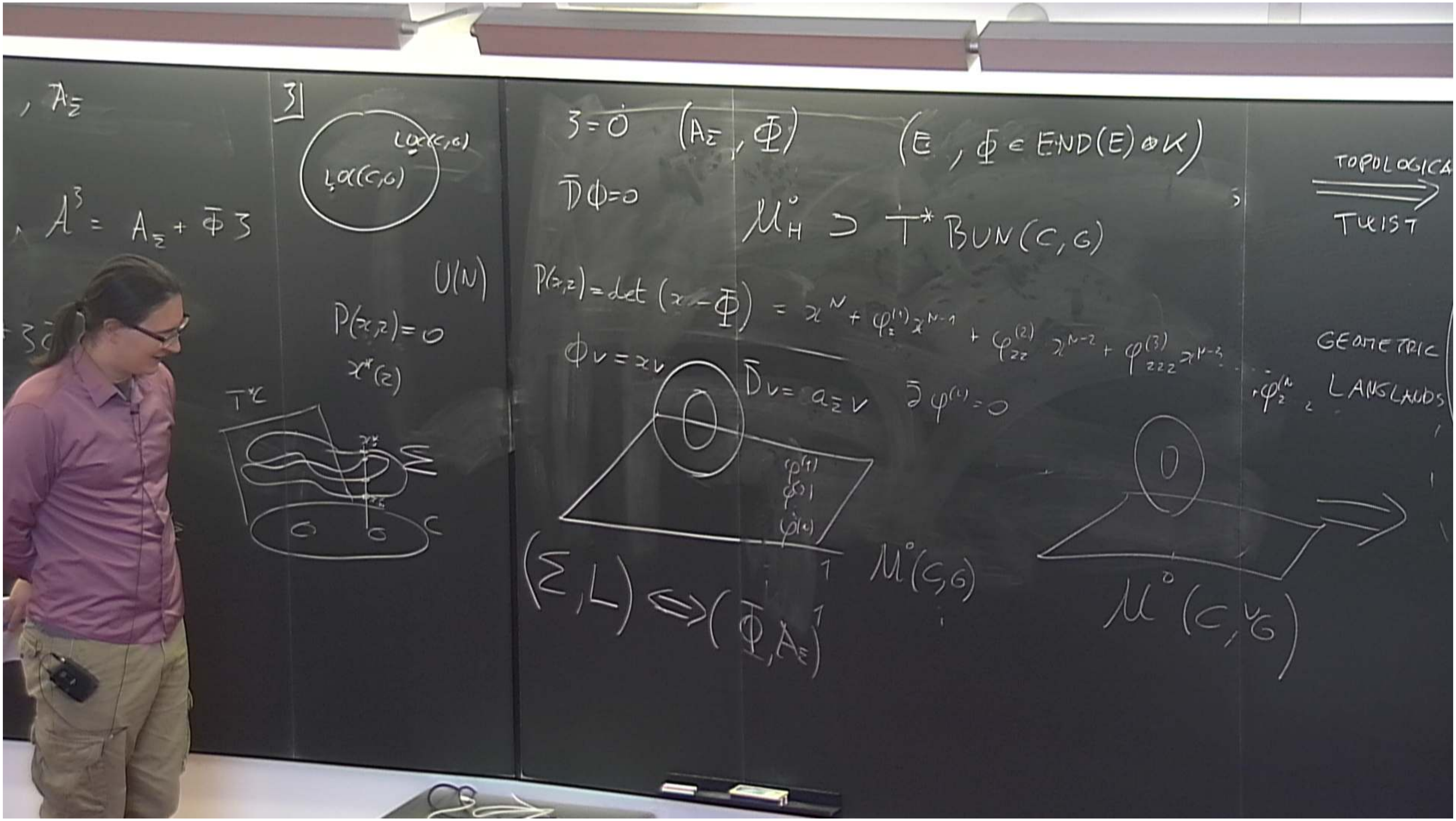

TOPOLOGICAL
TWIST
D-MODULE ON BUN(
OR
SHEAF ON LOC
GEOMETRIC
LANGLANDS


TOPOLOGICAL
TWIST
D-MODULE ON
OR
SHEAF ON
U(N)

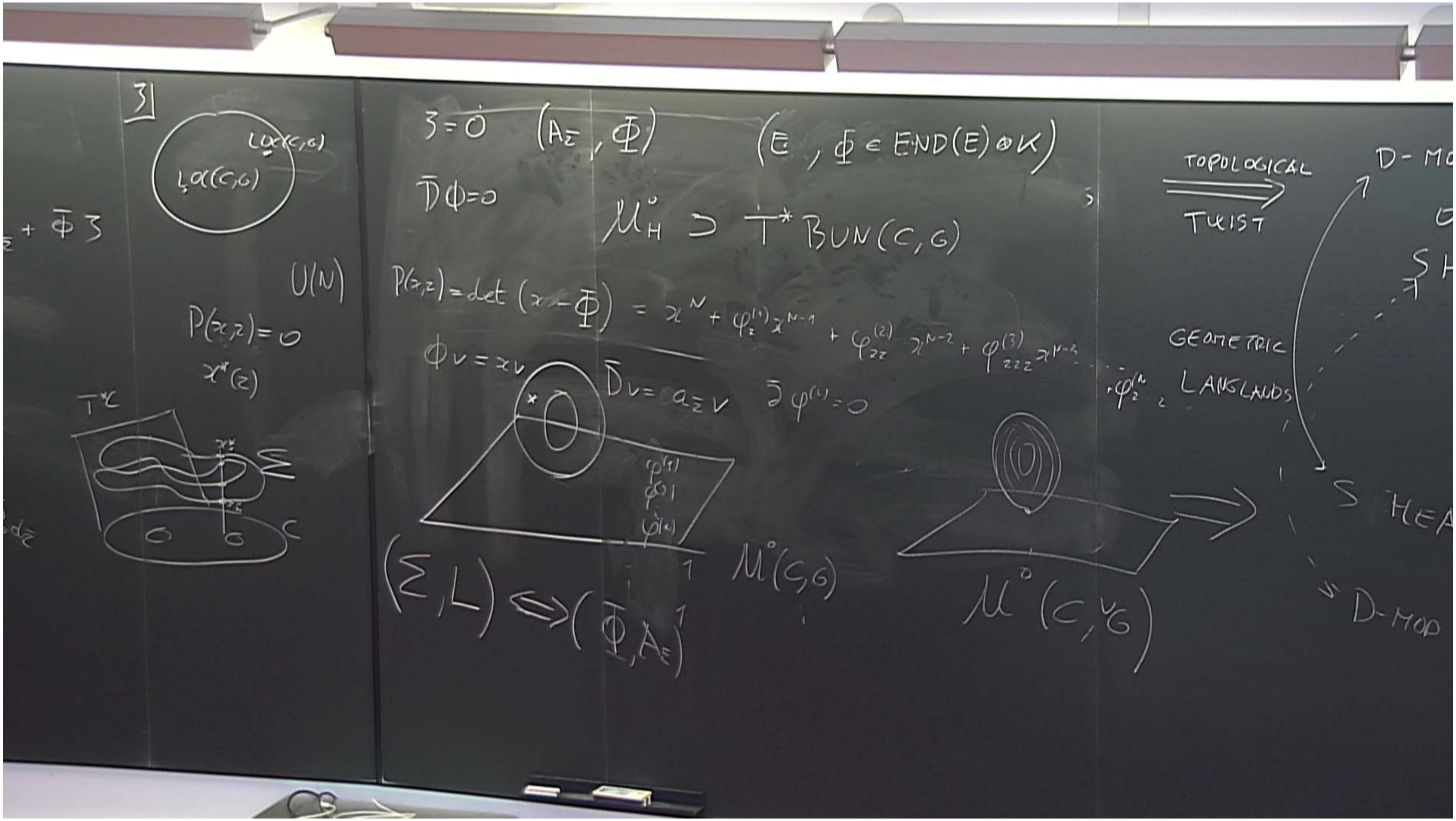

Loc(C,G)
U(N)
$\bar{D}\Phi = 0$
$\mathcal{M}_H \supset T^* \mathrm{BUN}(C,G)$
$(E, \Phi \in \mathrm{END}(E) \otimes K)$
$\det(x - \Phi) = x^N + \varphi^{(1)}_z x^{N-1} + \varphi^{(2)}_{zz} x^{N-2} + \varphi^{(3)}_{zzz} x^{N-3}$
$\bar{\partial} \varphi^{(1)} = 0$
TOPOLOGICAL
TWIST
D-MODULE ON BUN
OR
SHEAF ON LOC
GEOMETRIC
LANGLANDS
SHEAF
D-MOD


LOC(C,G)
U(N)
P(x,z) = 0
TOPOLOGICAL
TWIST
D-MODULE ON BUN(
OR
SHEAF ON LOC
GEOMETRIC
LANGLANDS
SHEAF
LOC(C,
D-MOD
BUN(C,


U(N)
P(x,z) = 0
T*C
Σ
C
(Σ, L)
TOPOL
TWIS
GEOME
LANGL



TOPOLOGICA
TWIST
GEOMETRIC
LANGLANDS



U(N)
TOPOLOGICAL
TWIST
GEOMETRIC
LANGLANDS
D-MOD