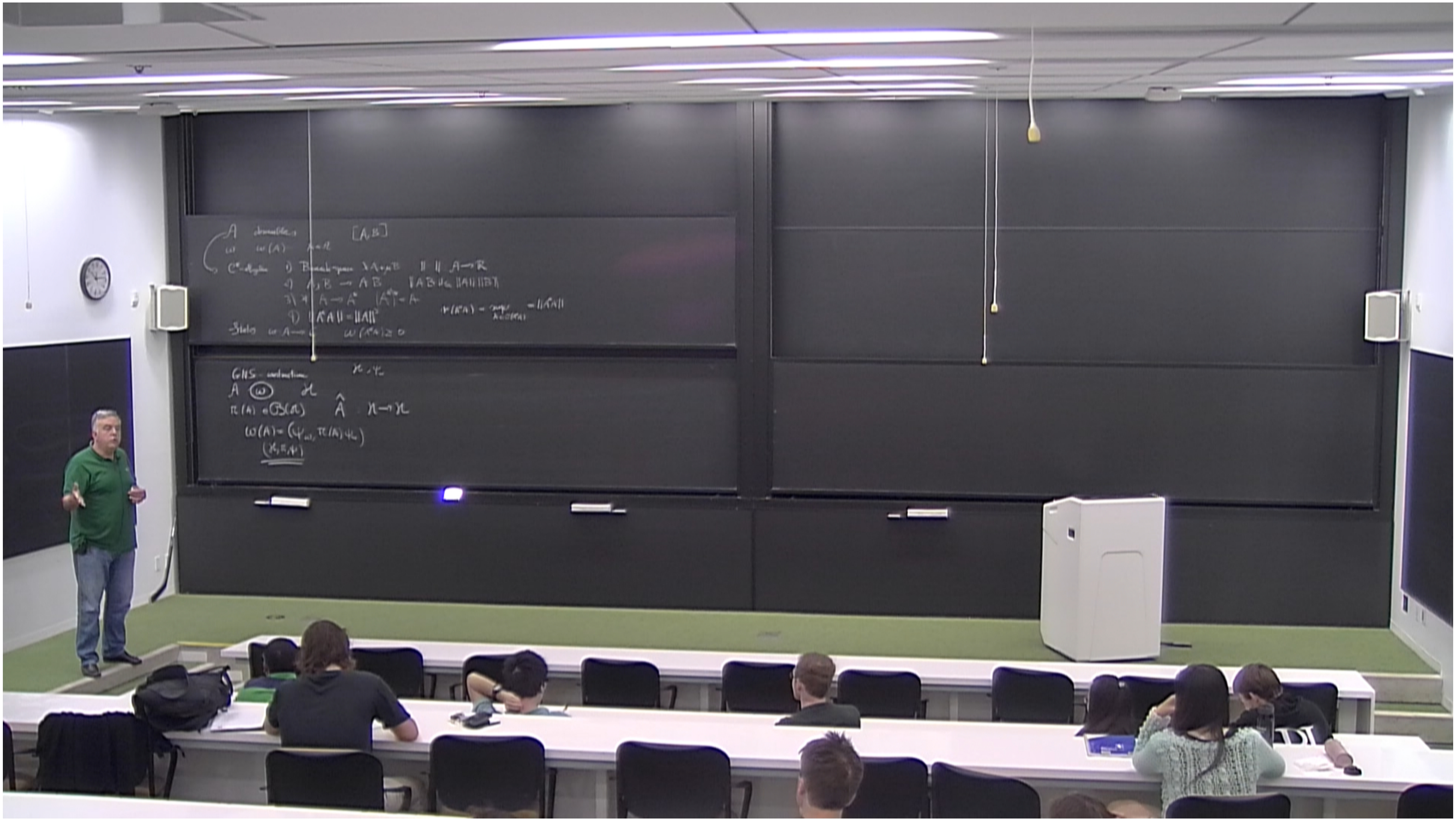
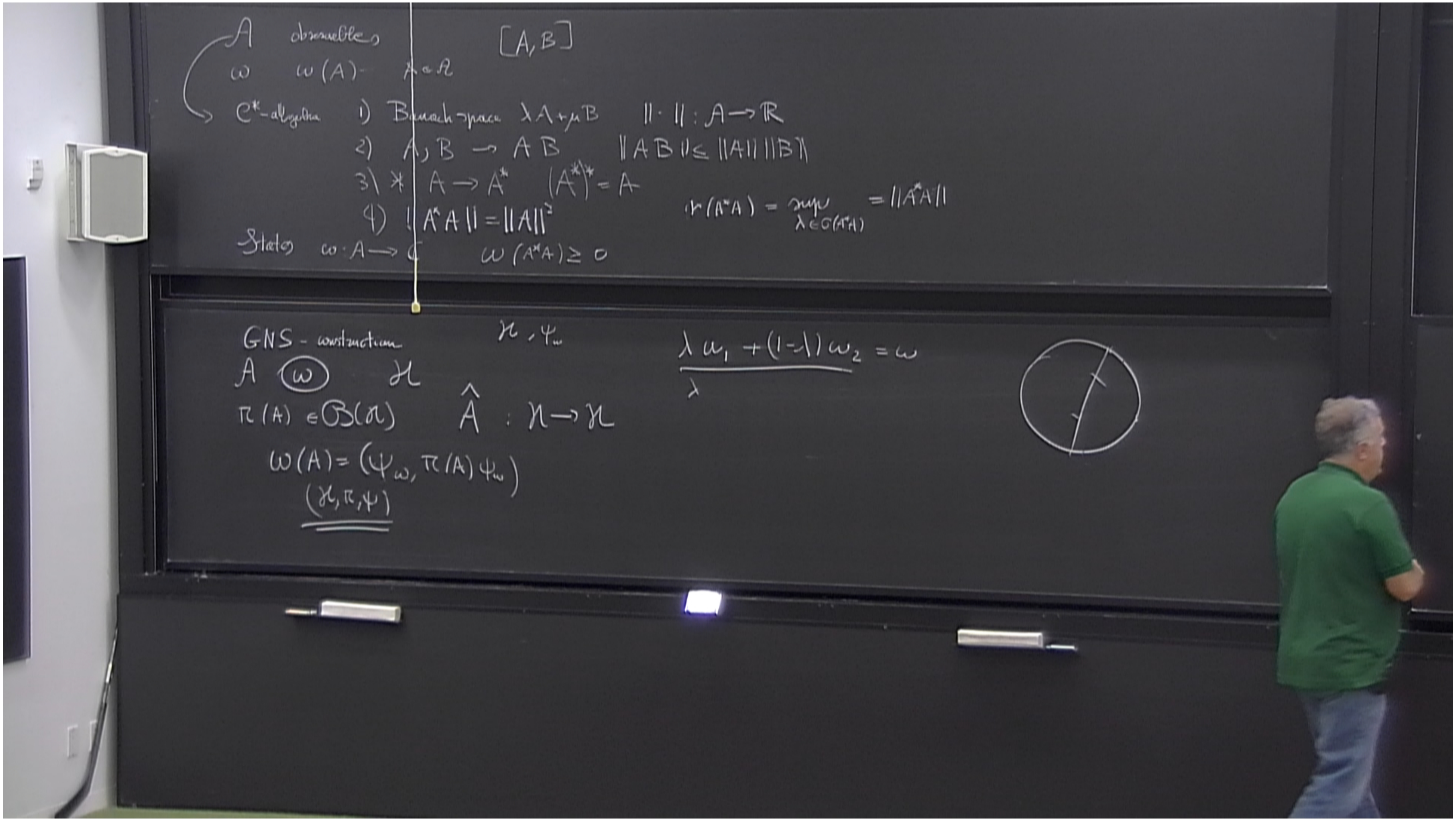
Title: Topics in QFT on Flat and Curved Spacetimes - Lecture 3

Date: Sep 30, 2013 10:00 AM

URL: http://pirsa.org/13090008

Abstract:




A observables [A,B]
ω ω(A) λ ∈ ℝ
C*-algebra 1) Banach-space λA+μB ||·|| : A → ℝ
2) A, B → AB ||AB|| ≤ ||A|| ||B||
3) * A → A* (A*)* = A
4) ||A*A|| = ||A||²
r(A*A) = sup λ∈σ(A*A) = ||A*A||
States ω : A → ℂ ω(A*A) ≥ 0
GNS - construction
ℋ, Ψω
A ω ℋ
π(A) ∈ B(ℋ) Â : ℋ → ℋ
ω(A) = (Ψω, π(A) Ψω)
(ℋ, π, Ψ)
λω₁ + (1−λ)ω₂ = ω
λ

$\mathcal{A}$ observables $\quad [A,B]$

$\omega \quad \omega(A) \quad A = \mathcal{A}$

C^*-algebra

1) Banach-space $\lambda A + \mu B \quad \|\cdot\| : \mathcal{A} \to \mathbb{R}$

2) $A, B \to AB \quad \|AB\| \leq \|A\| \, \|B\|$

3) $* \quad A \to A^* \quad (A^*)^* = A$

4) $\|A^*A\| = \|A\|^2 \qquad r(A^*A) = \sup_{\lambda \in \sigma(A^*A)} = \|A^*A\|$

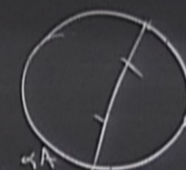
States $\omega : \mathcal{A} \to \mathbb{C} \qquad \omega(A^*A) \geq 0$

GNS - construction $\qquad \mathcal{H}, \Psi_\omega \quad \boxed{F(0) = F(1)} \quad \lambda \omega_1 + (1-\lambda)\omega_2 = \omega$

$\mathcal{A} \quad \omega \quad \mathcal{H}$

$\frac{dF(\alpha)}{d\alpha} = e^{-\alpha B} e^{-\alpha A} e^{\alpha(A+B) + \frac{\alpha^2}{2} C} = 0 \qquad [A, e^{\alpha A}]$

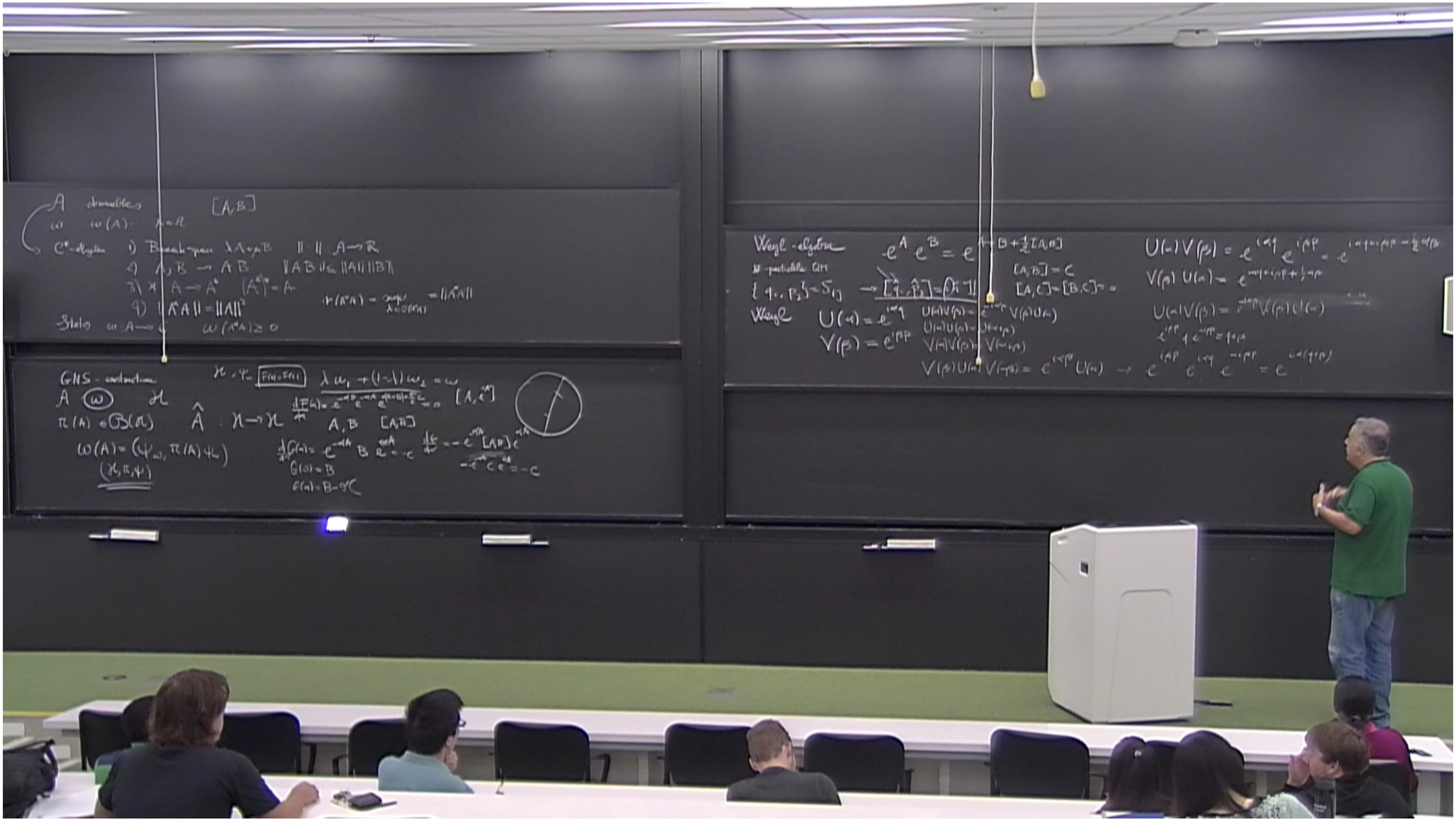
$\pi(A) \in \mathcal{B}(\mathcal{H}) \qquad \hat{A} : \mathcal{H} \to \mathcal{H} \qquad A, B \quad [A,B]$

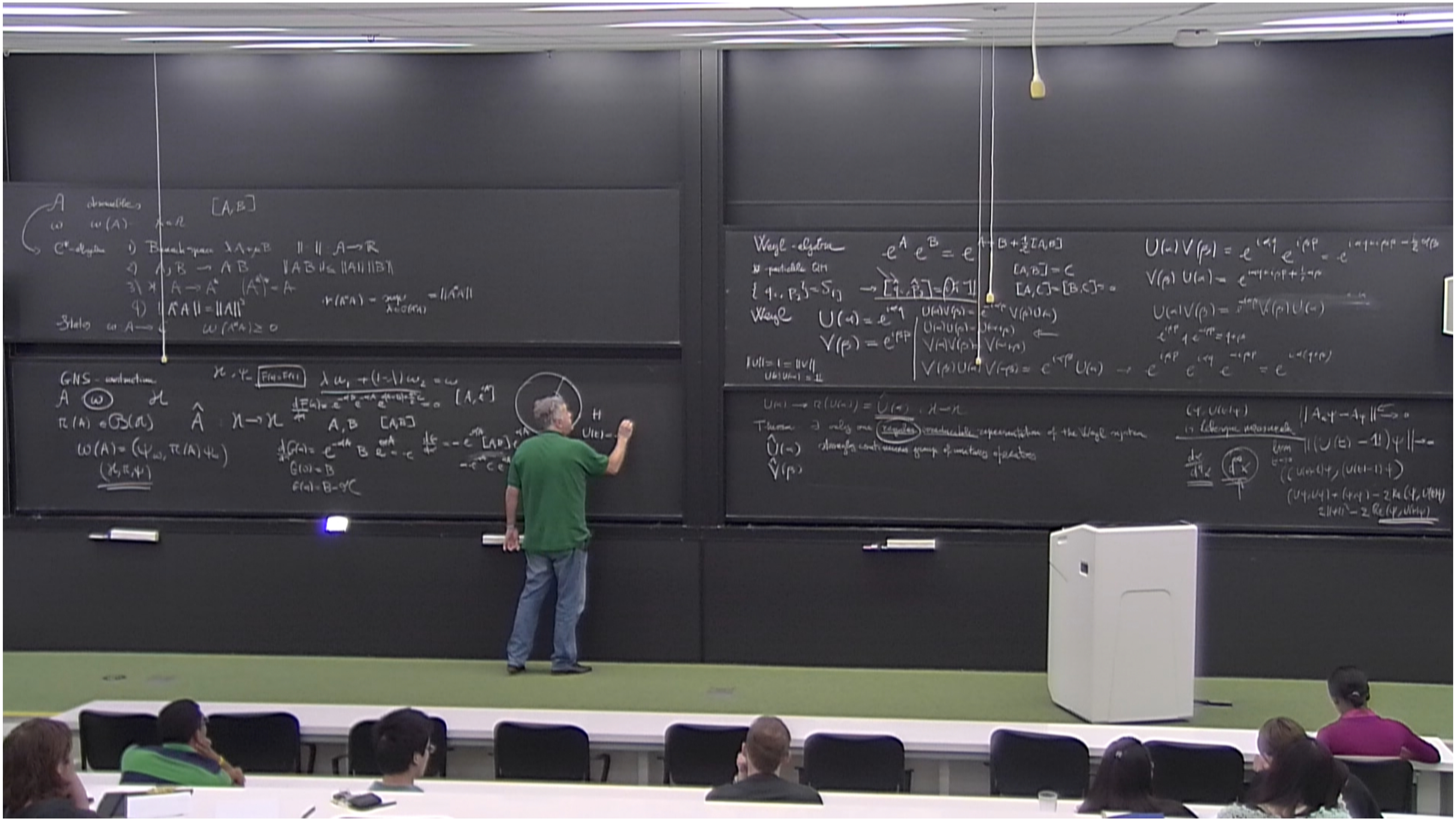


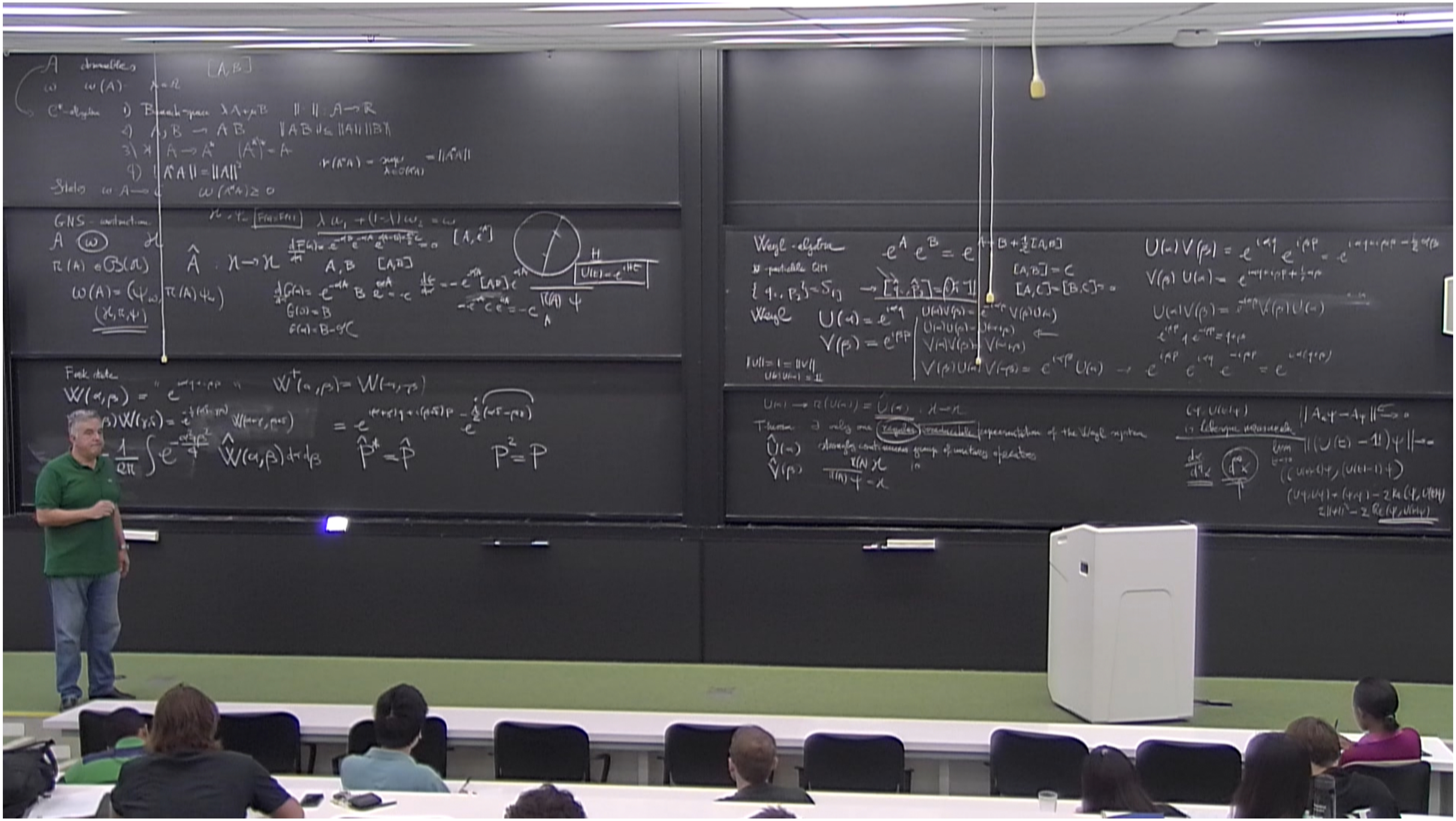
$\omega(A) = (\Psi_\omega, \pi(A) \Psi_\omega) \qquad \frac{d}{d\alpha} G(\alpha) = e^{-\alpha A} B e^{\alpha A} = -C \qquad \frac{dG}{d\alpha} = -e^{-\alpha A}[A,B] e^{\alpha A}$

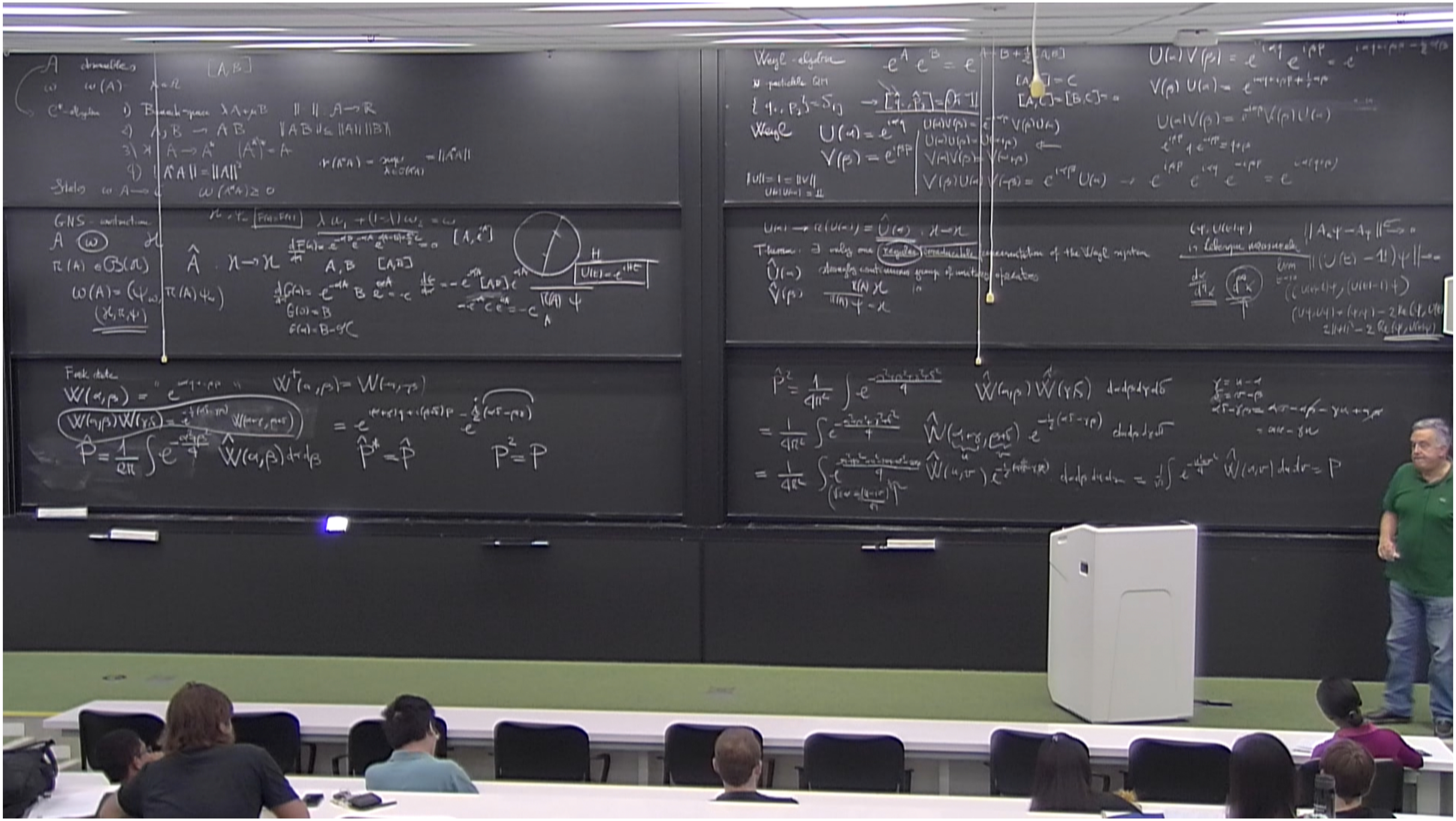
$(\mathcal{H}, \pi, \Psi) \qquad G(0) = B \qquad -e^{-\alpha A} C e^{\alpha A} = -C$

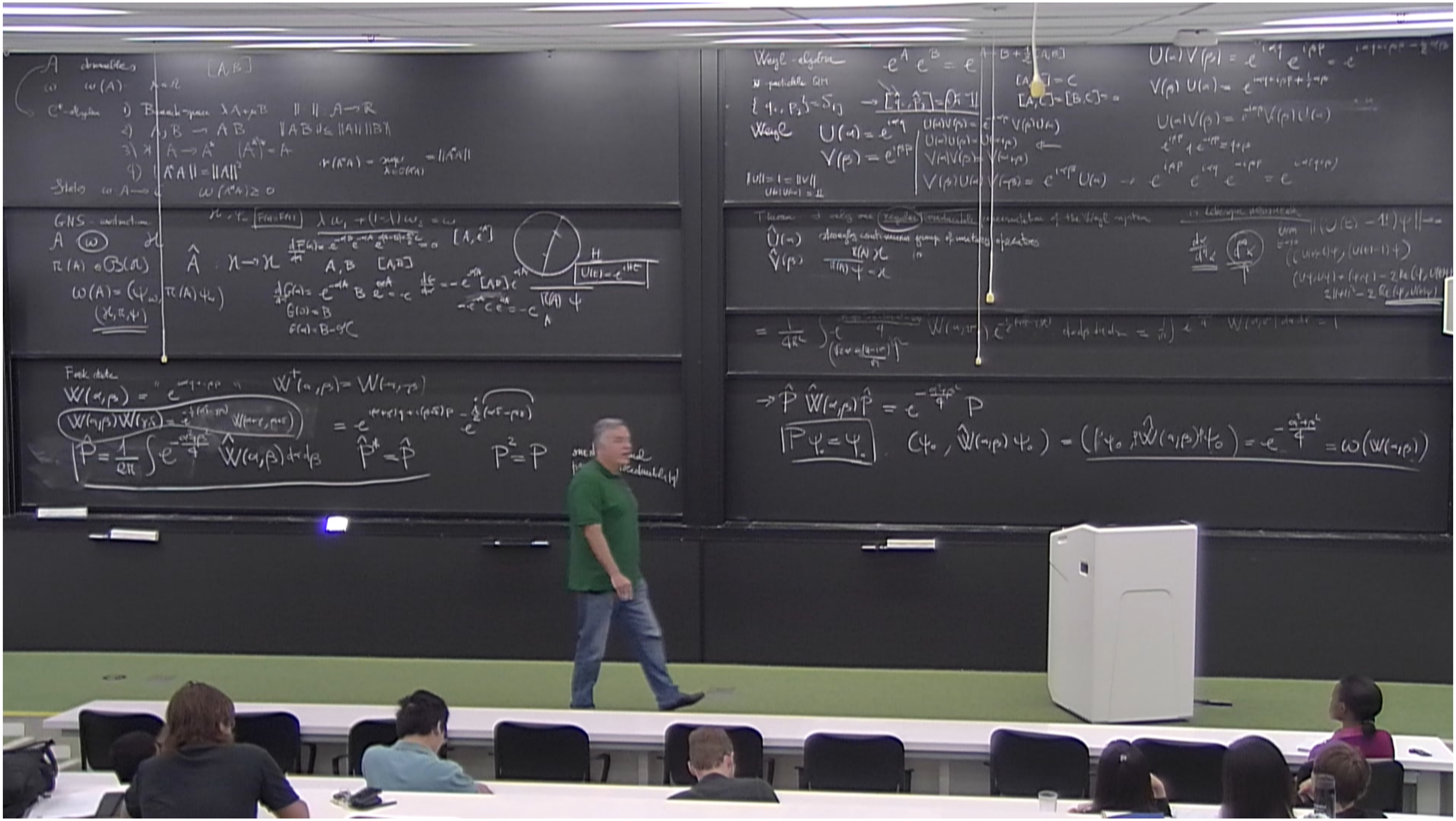
$G(\alpha) = B - \alpha C$

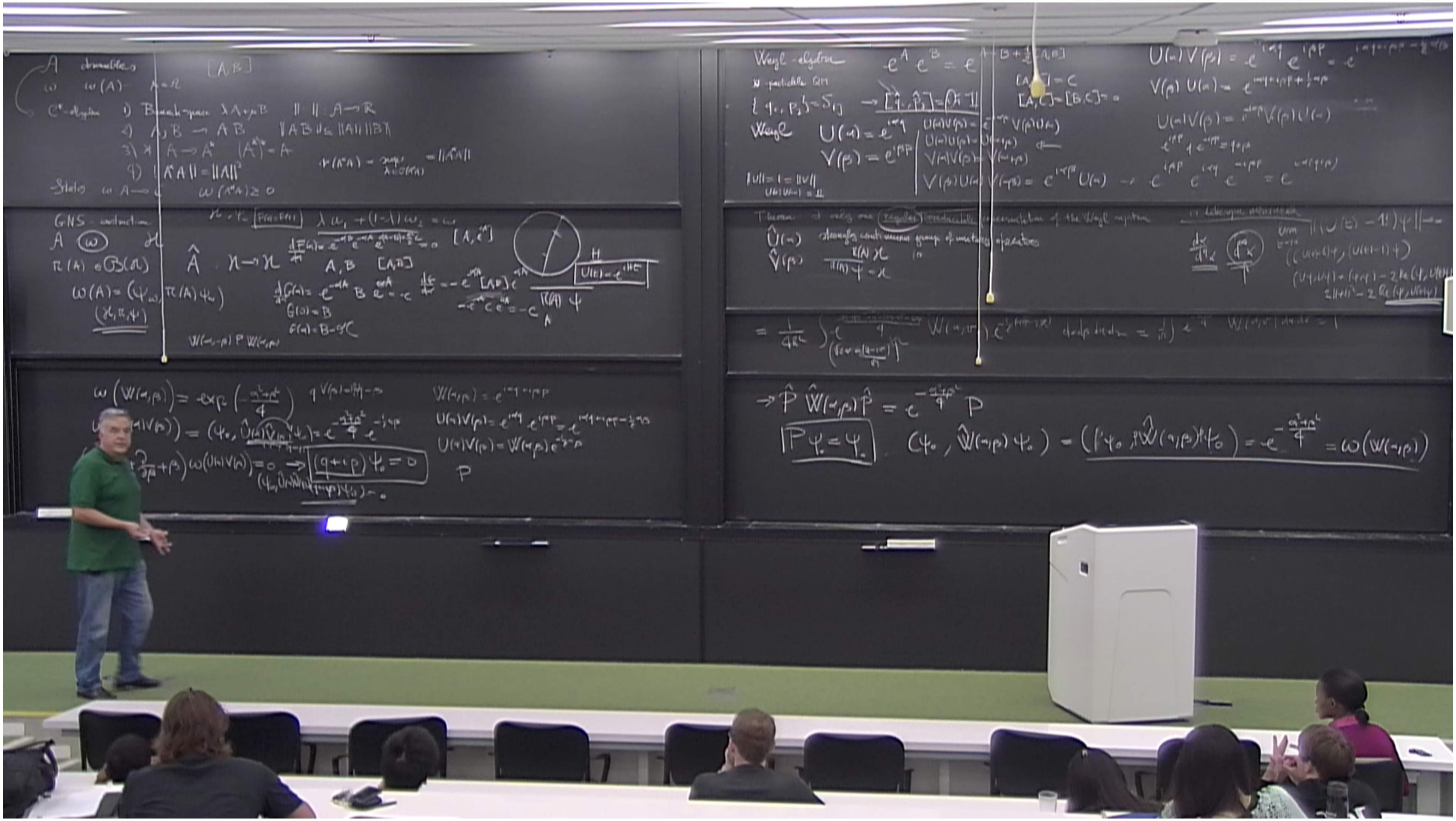

Weyl - algebra
GNS - construction
$U(\alpha) = e^{i\alpha q}$
$V(\beta) = e^{i\beta p}$

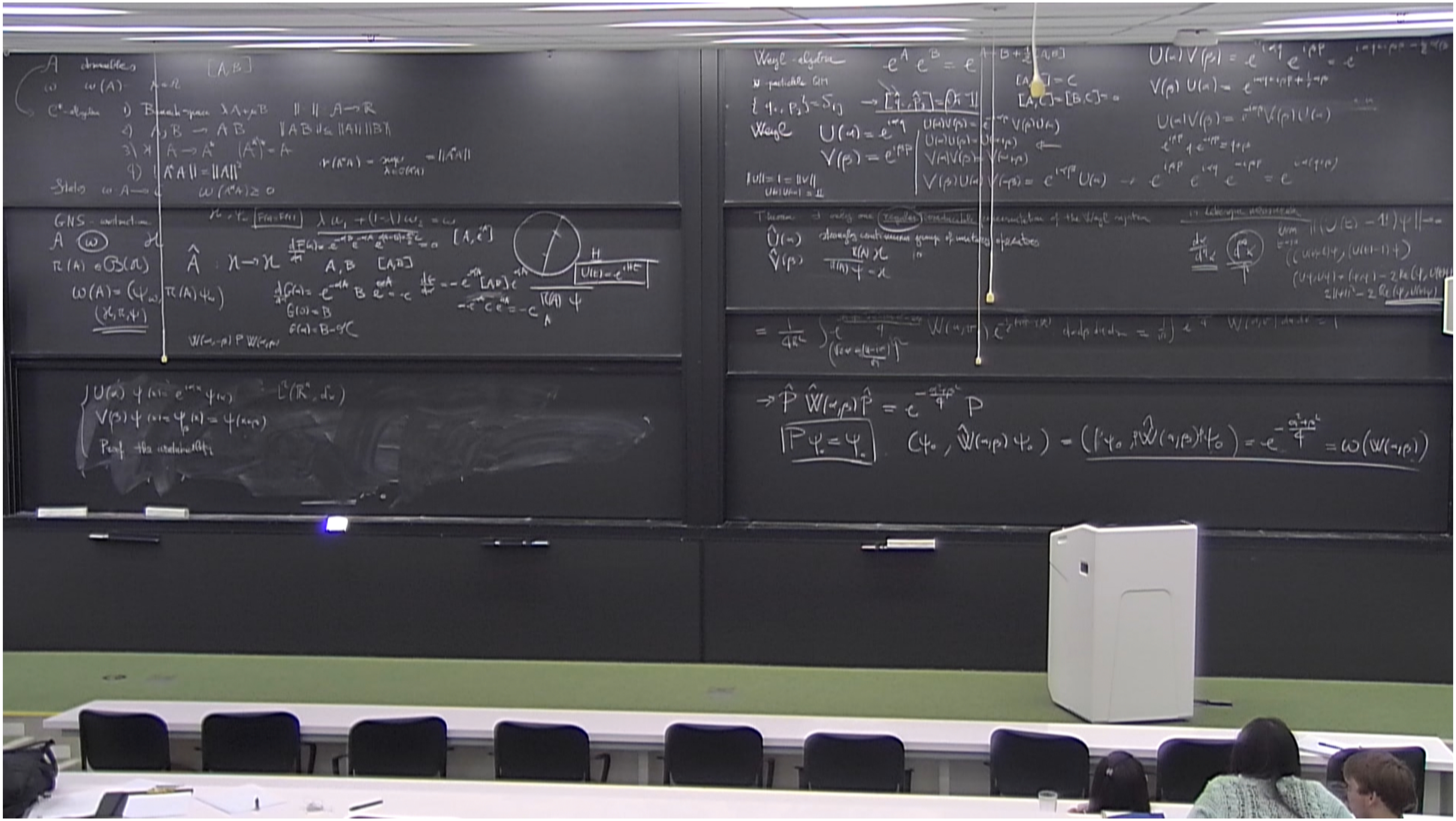

GNS - construction
Weyl - algebra


GNS - construction
Weyl - algebra
Weyl
Fock state
Theorem


Weyl-algebra
GNS-construction
Fock state


Weyl - algebra
GNS - construction
Fock state
States




observables
States
GNS - construction
Weyl - algebra
Weyl
Theorem