Title: Introduction to Everpresent Lambda

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Collection: Everpresent Lambda: Theory Meets Observations

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$$\delta\Lambda \sim \frac{1}{\sqrt{V}} \Rightarrow \Lambda_0 \sim \pm 10^{-120} \sim \pm H_0^2$$

nonlocal quantum effect discreteness

Tests

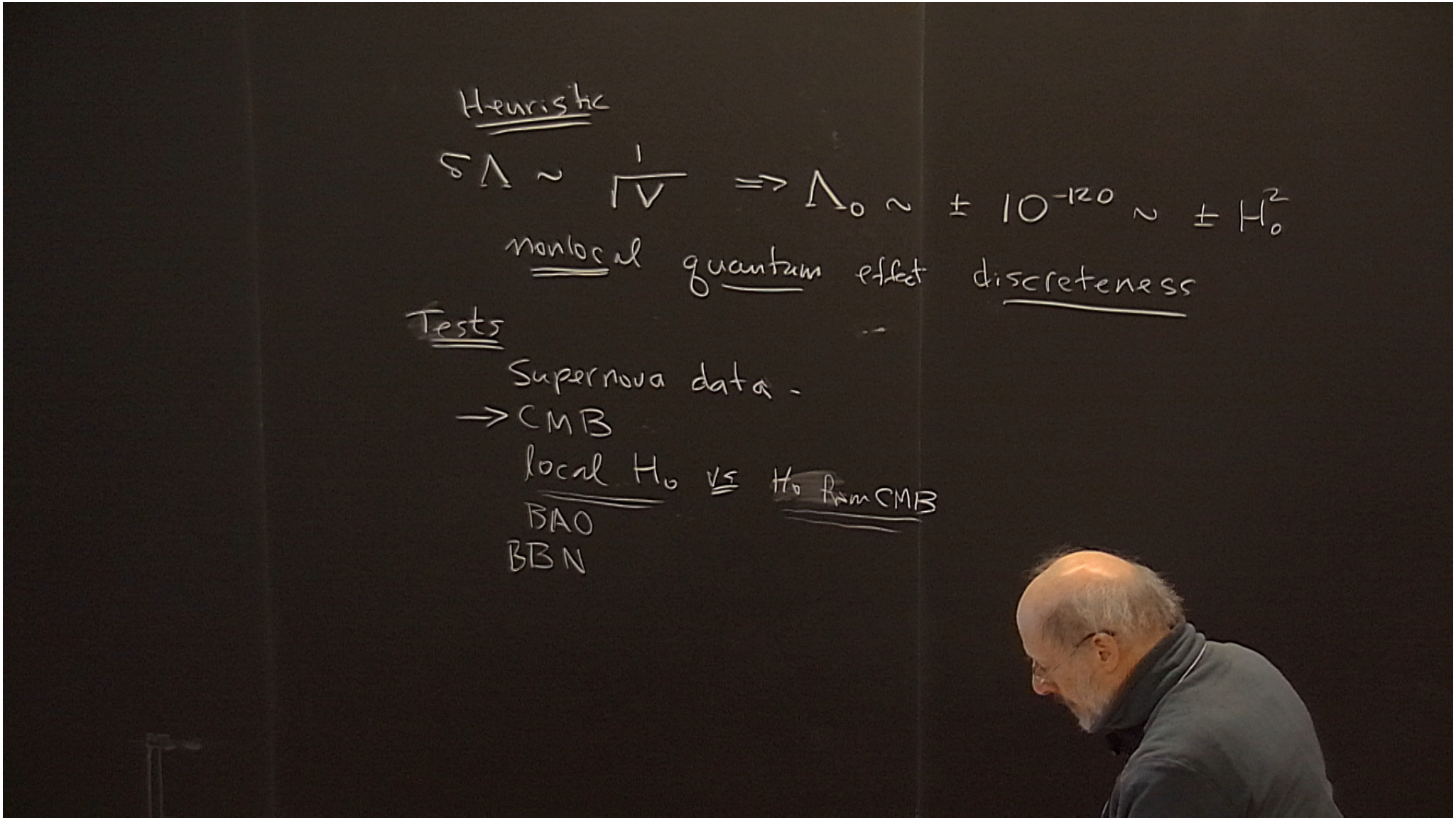
Supernova data.

→ CMB

local H_0 vs H_0 from CMB

BAO

BBN


Heuristic
$\delta\Lambda \sim \frac{1}{\sqrt{V}} \Rightarrow \Lambda_0 \sim \pm 10^{-120} \sim \pm H_0^2$
nonlocal quantum effect discreteness
Tests
Supernova data -
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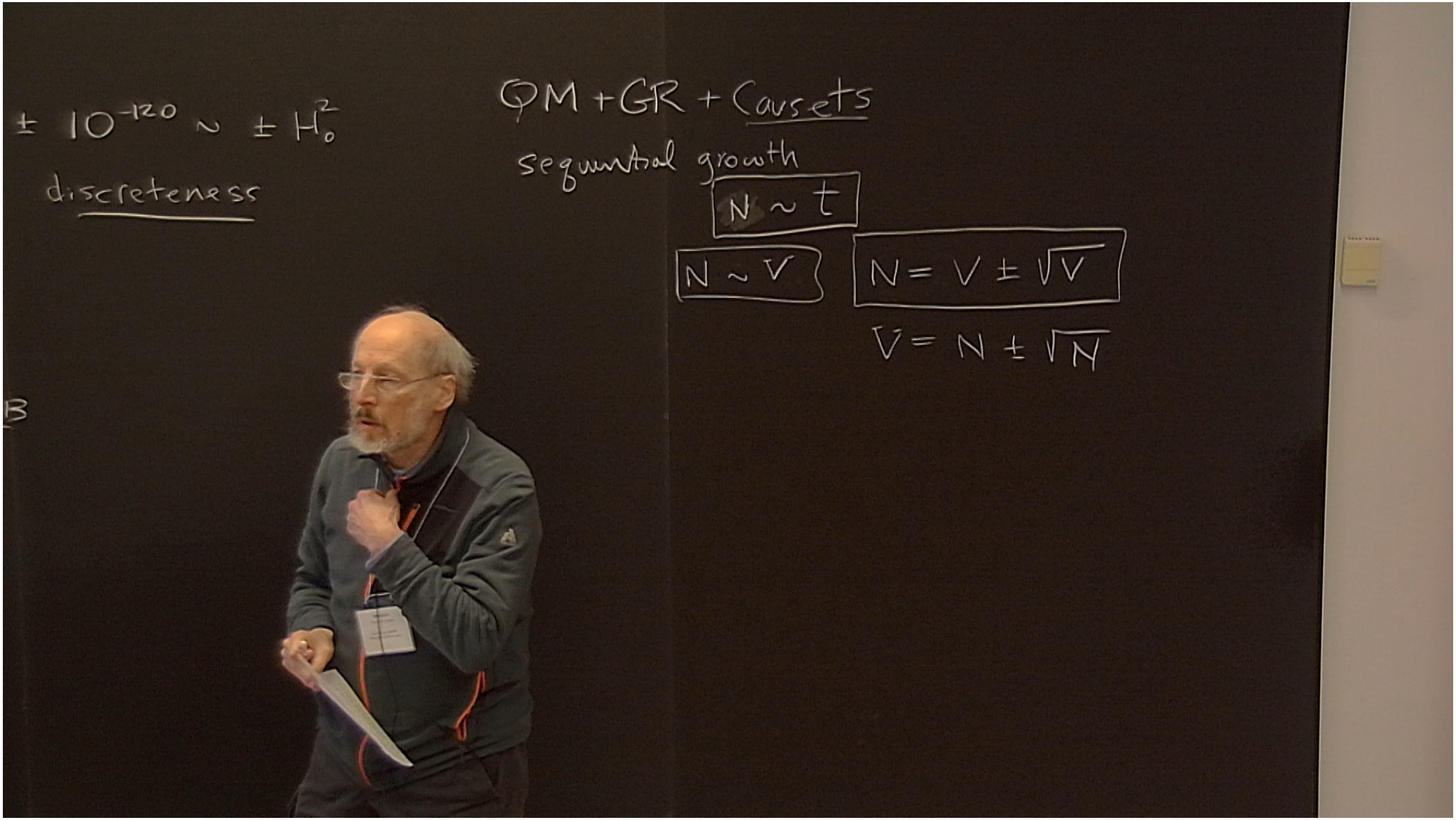
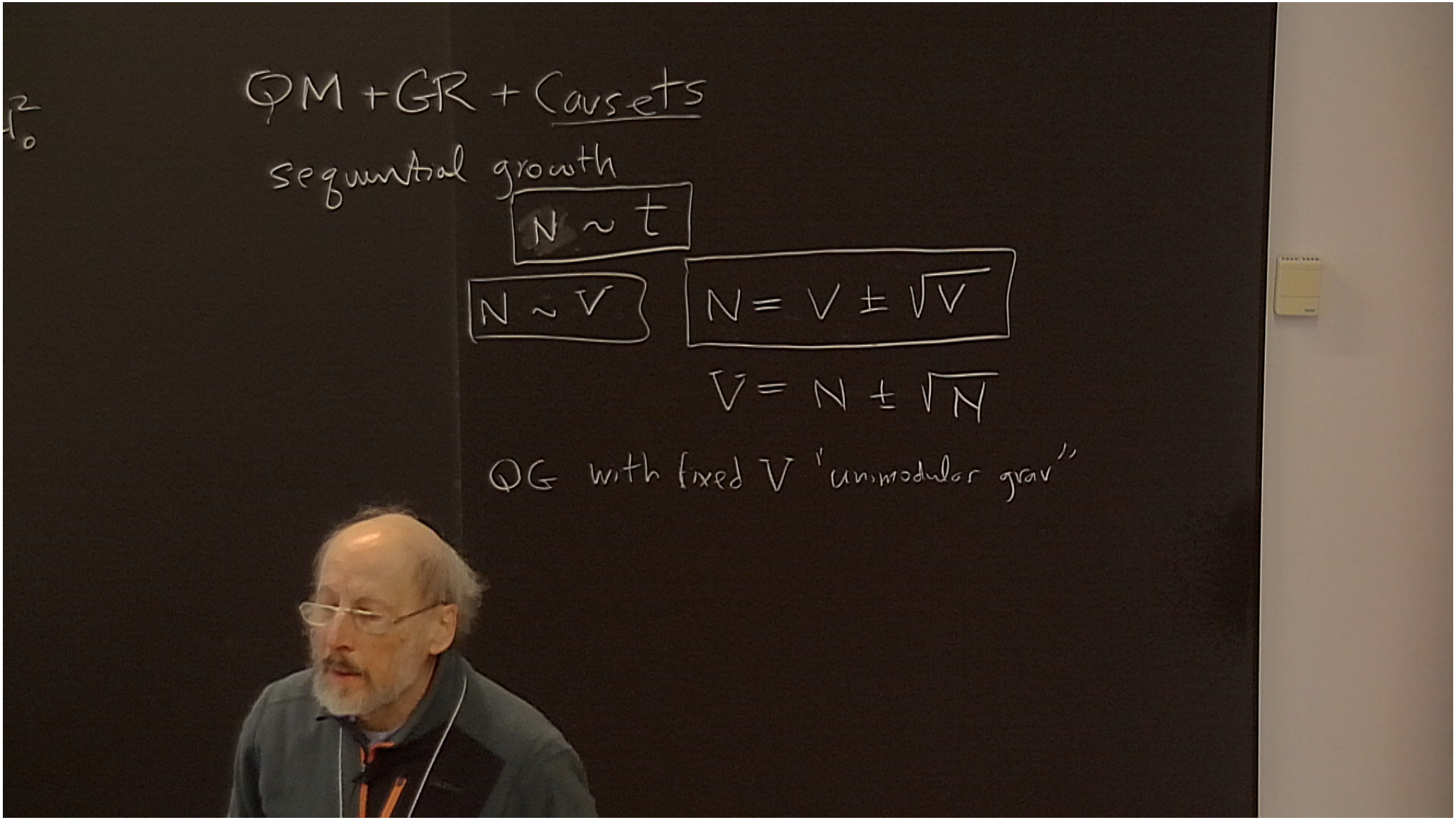
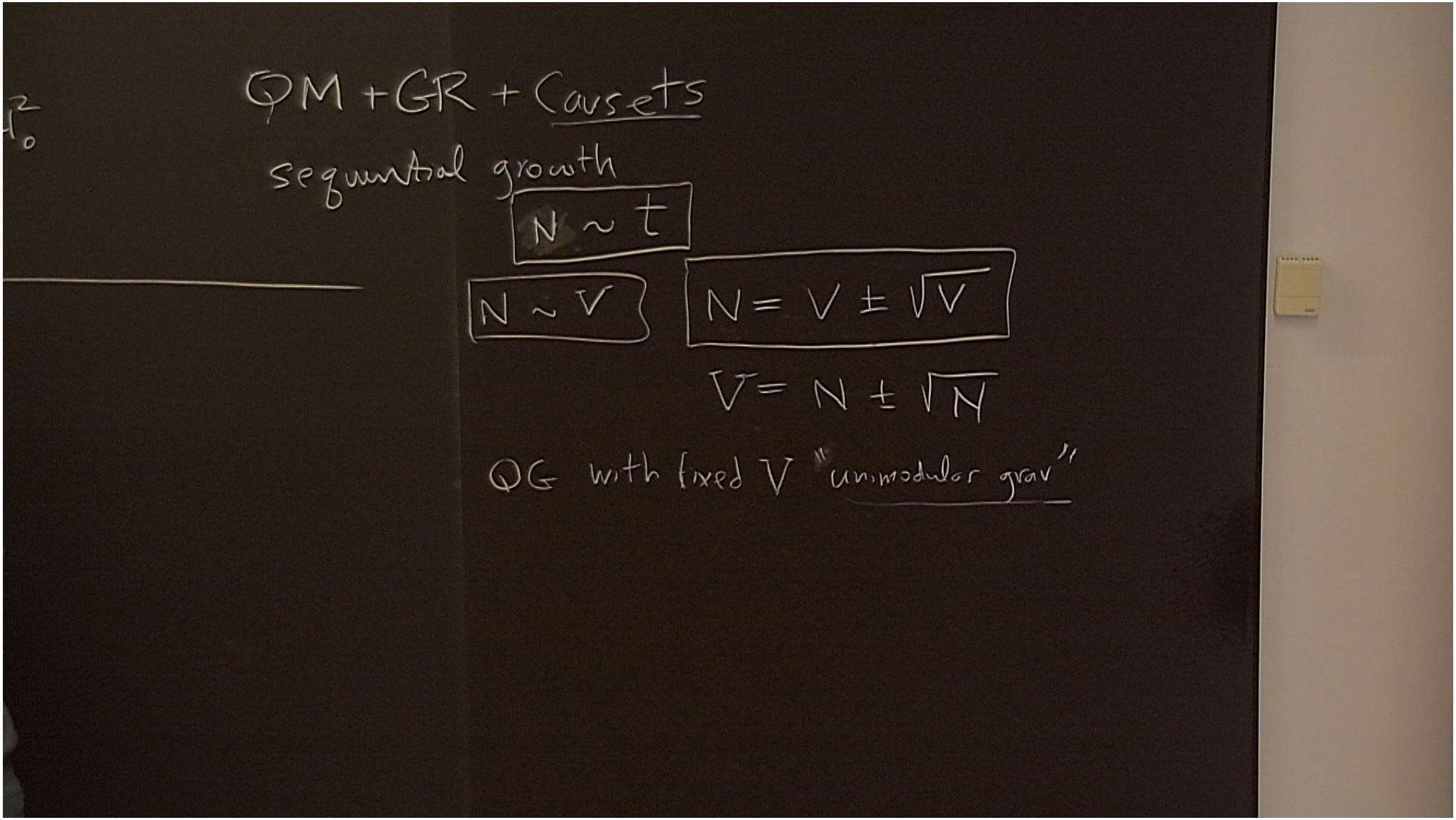

± 10^-120 ~ ± H_0^2
discreteness
QM + GR + Causets
sequential growth
N ~ t
N ~ V
N = V ± √V
V = N ± √N


QM + GR + Causets
sequential growth
N ~ t
N ~ V
N = V ± √V
V = N ± √N
QG with fixed V "unimodular grav"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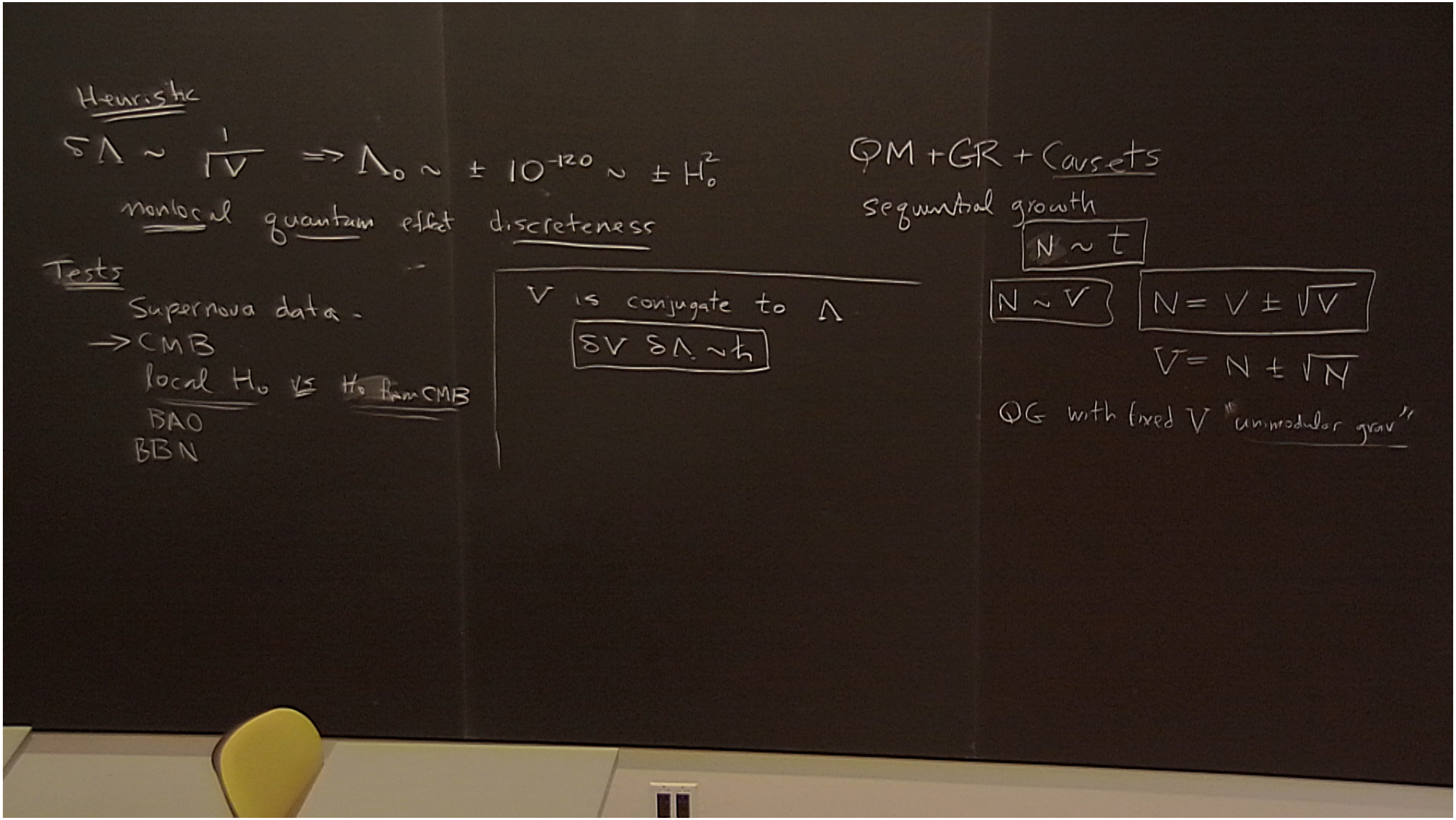
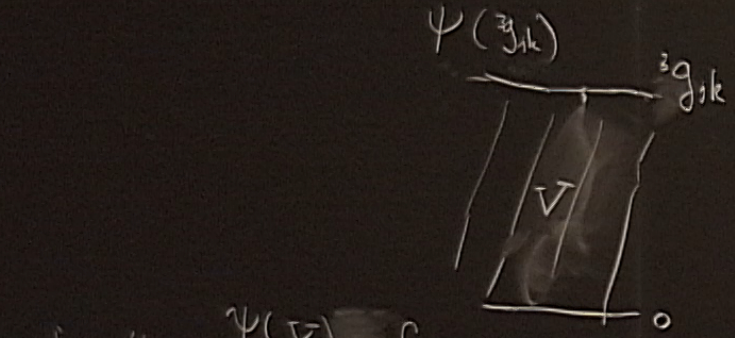

Heuristic
$\delta\Lambda \sim \frac{1}{\sqrt{V}} \Rightarrow \Lambda_0 \sim \pm 10^{-120} \sim \pm H_0^2$
nonlocal quantum effect discreteness
QM + GR + Causets
sequential growth
$N \sim t$
Tests
Supernova data -
→ CMB
local H_0 vs H_0 from CMB
BAO
BBN
V is conjugate to Λ
$\delta V \, \delta\Lambda \sim \hbar$
$N \sim V$
$N = V \pm \sqrt{V}$
$V = N \pm \sqrt{N}$
QG with fixed V "unimodular grav"



$$\Psi(V) = \int e^{iS(g)}\, dg\, \delta\left(\int\sqrt{g} - V\right)$$

$$\mathcal{H} \Rightarrow \int \Psi(V)\, e^{-i\Lambda V}\, dV$$

$$= \int dg\, dV\, \delta\left(\int\sqrt{g} - V\right) e^{i(S - \Lambda V)}$$

$$= \int dg\, e^{i\left(S - \Lambda \int\sqrt{g}\, d^4x\right)}$$

$$\equiv \Psi(\Lambda)$$

Heuristic

$$\delta\Lambda \sim \frac{1}{\sqrt{V}} \Rightarrow \Lambda_0 \sim \pm$$

nonlocal quantum effect di

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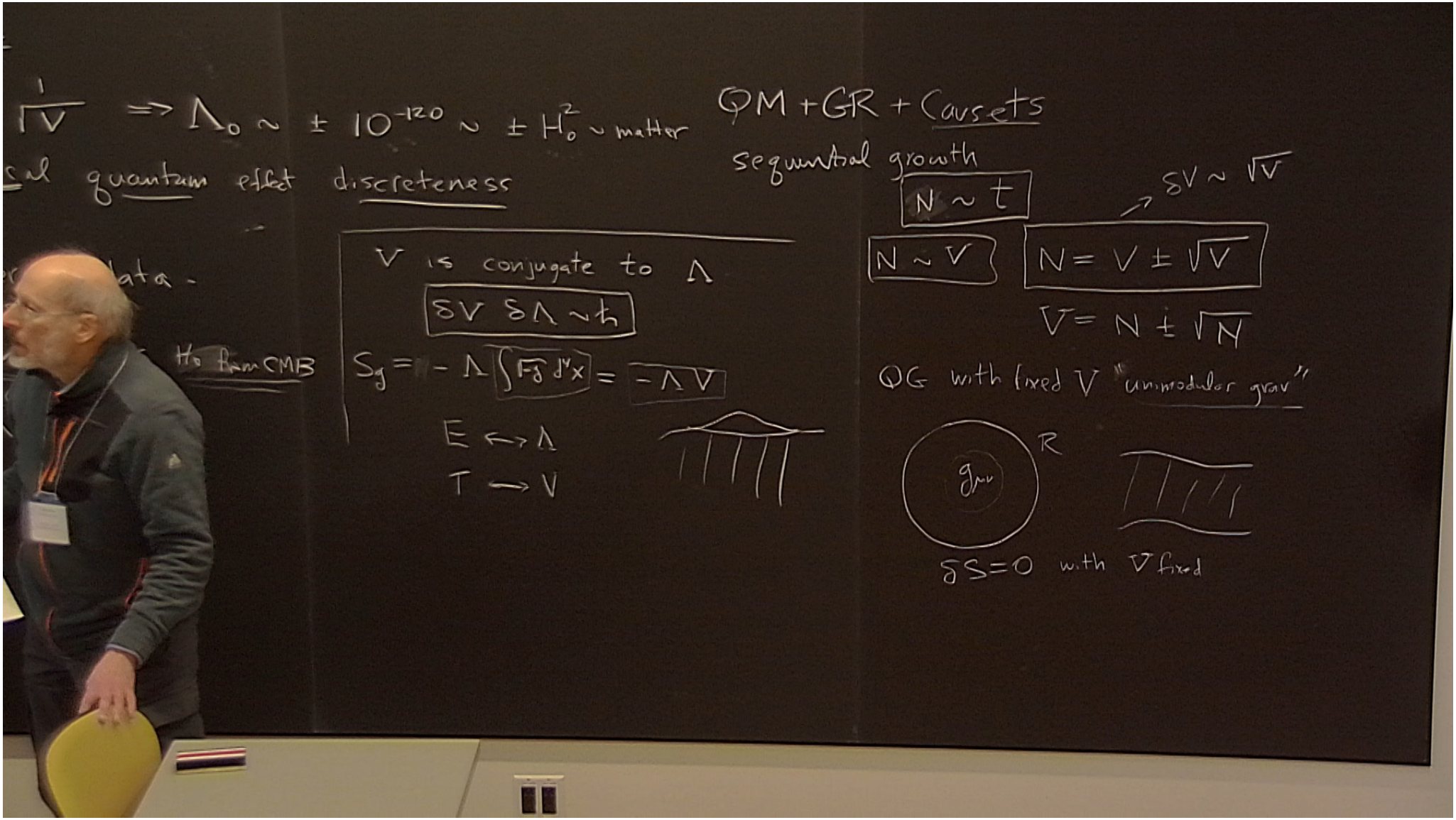
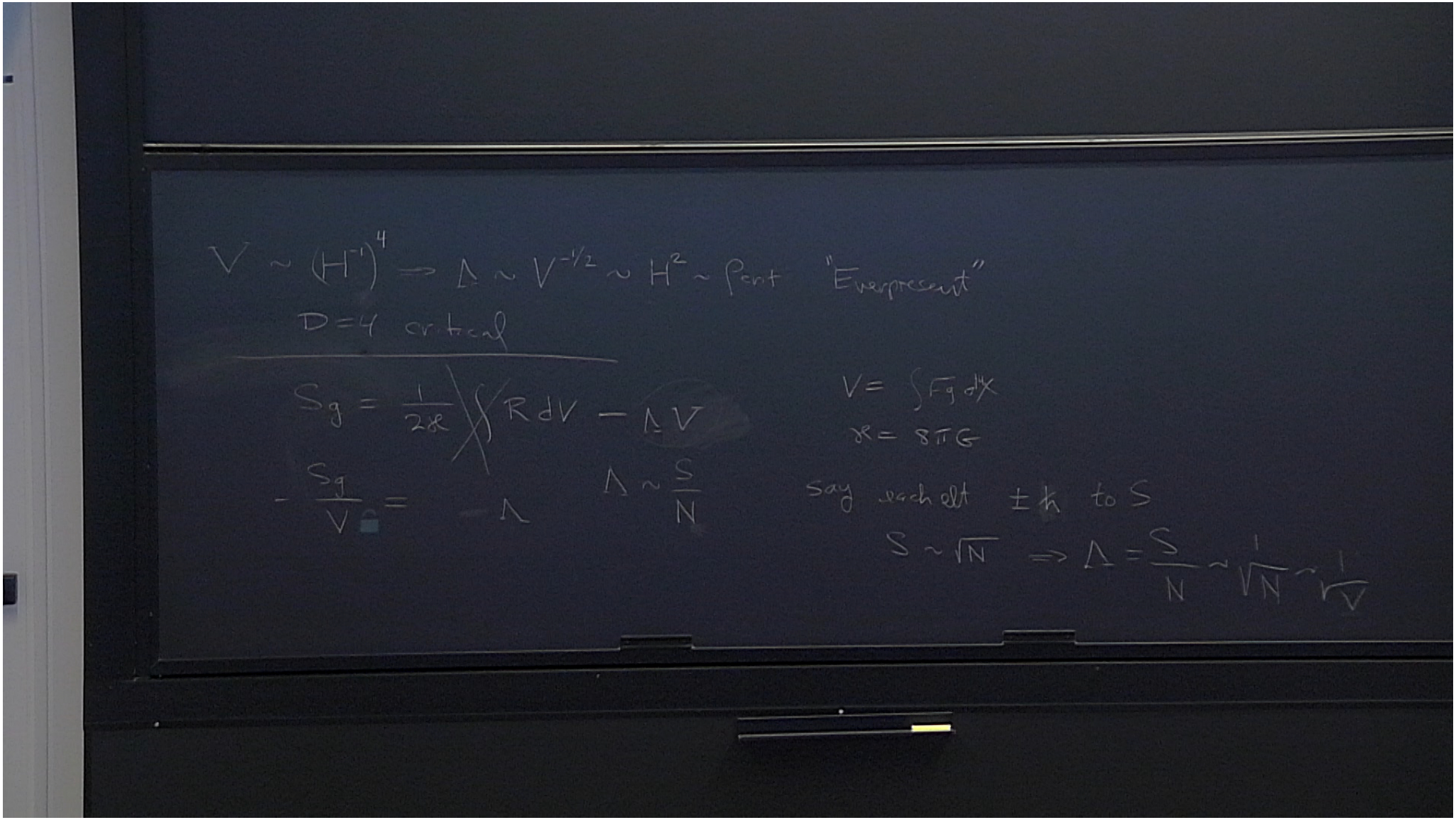

$\frac{1}{\sqrt{V}} \Rightarrow \Lambda_0 \sim \pm 10^{-120} \sim \pm H_0^2 \sim$ matter
QM + GR + Causets
sequential growth
quantum effect discreteness
data.
H_0 from CMB
$N \sim t$
$\delta V \sim \sqrt{V}$
$N \sim V$
$N = V \pm \sqrt{V}$
$V = N \pm \sqrt{N}$
V is conjugate to Λ
$\delta V \, \delta\Lambda \sim \hbar$
$S_g = -\Lambda \int \sqrt{g}\, d^4x = -\Lambda V$
QG with fixed V "unimodular grav"
$E \leftrightarrow \Lambda$
$T \rightarrow V$
R
$g_{\mu\nu}$
$\delta S = 0$ with V fixed


$V \sim (H^{-1})^4 \Rightarrow \Lambda \sim V^{-1/2} \sim H^2 \sim$ Pent "Everpresent"
D=4 critical
$S_g = \frac{1}{2\kappa} \int R\,dV - \Lambda V$
$V = \int F_g\, d^4x$
$\kappa = 8\pi G$
$\frac{S_g}{V} = \Lambda$
$\Lambda \sim \frac{S}{N}$
say each elt $\pm \hbar$ to S
$S \sim \sqrt{N} \Rightarrow \Lambda = \frac{S}{N} \sim \frac{1}{\sqrt{N}} \sim \frac{1}{\sqrt{V}}$