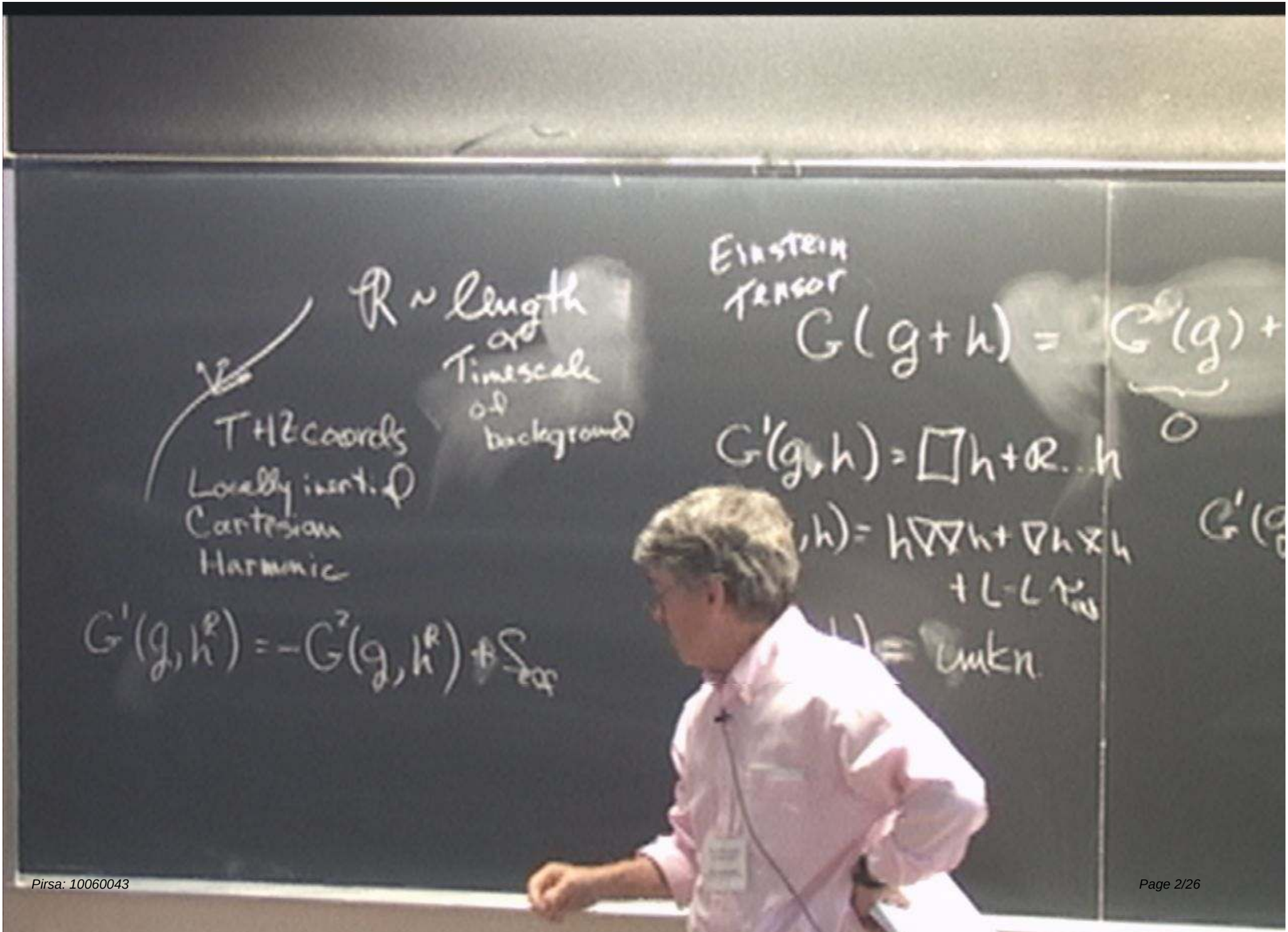
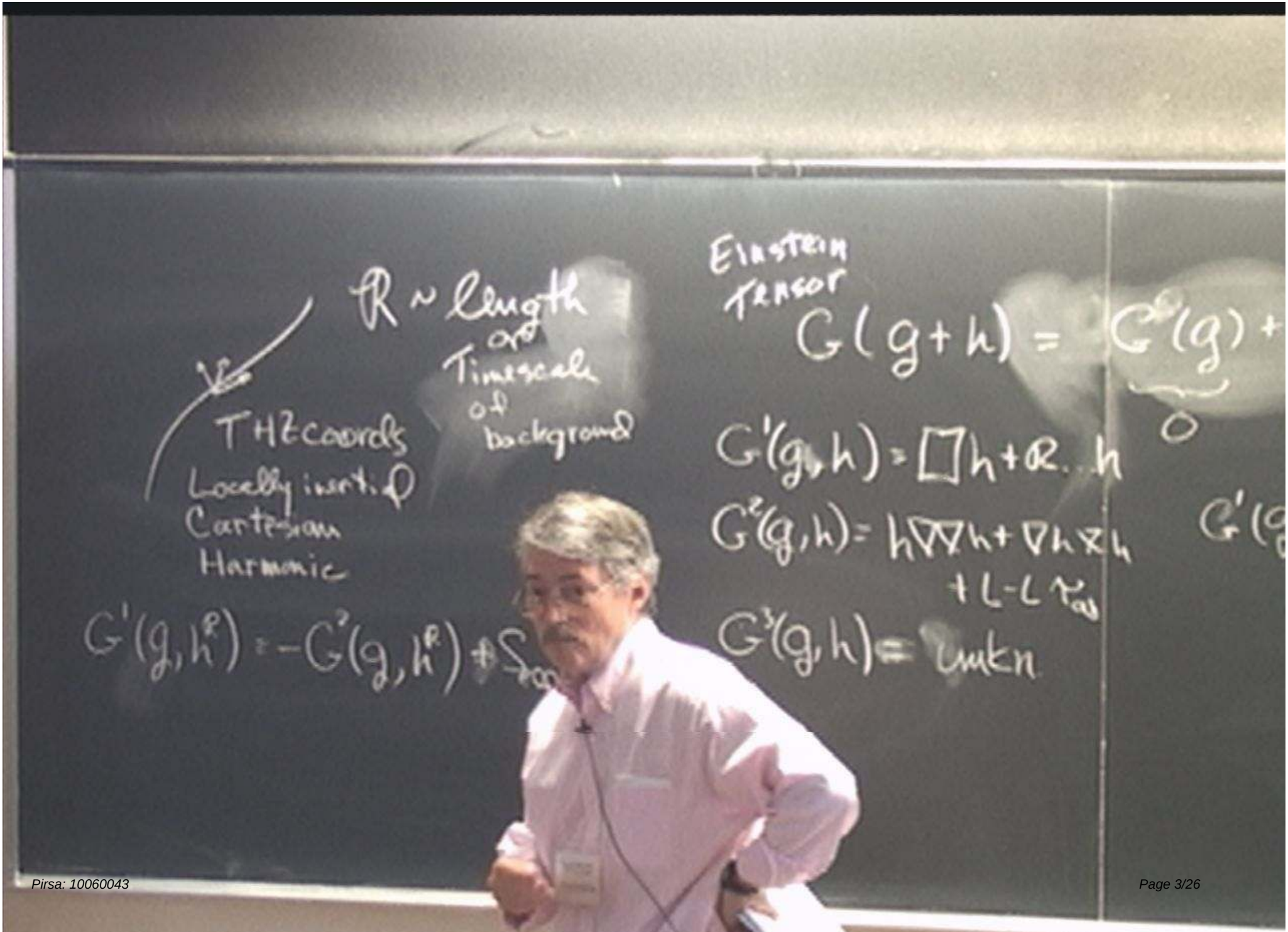
Title: Locally inertial coordinates for self-force calculations

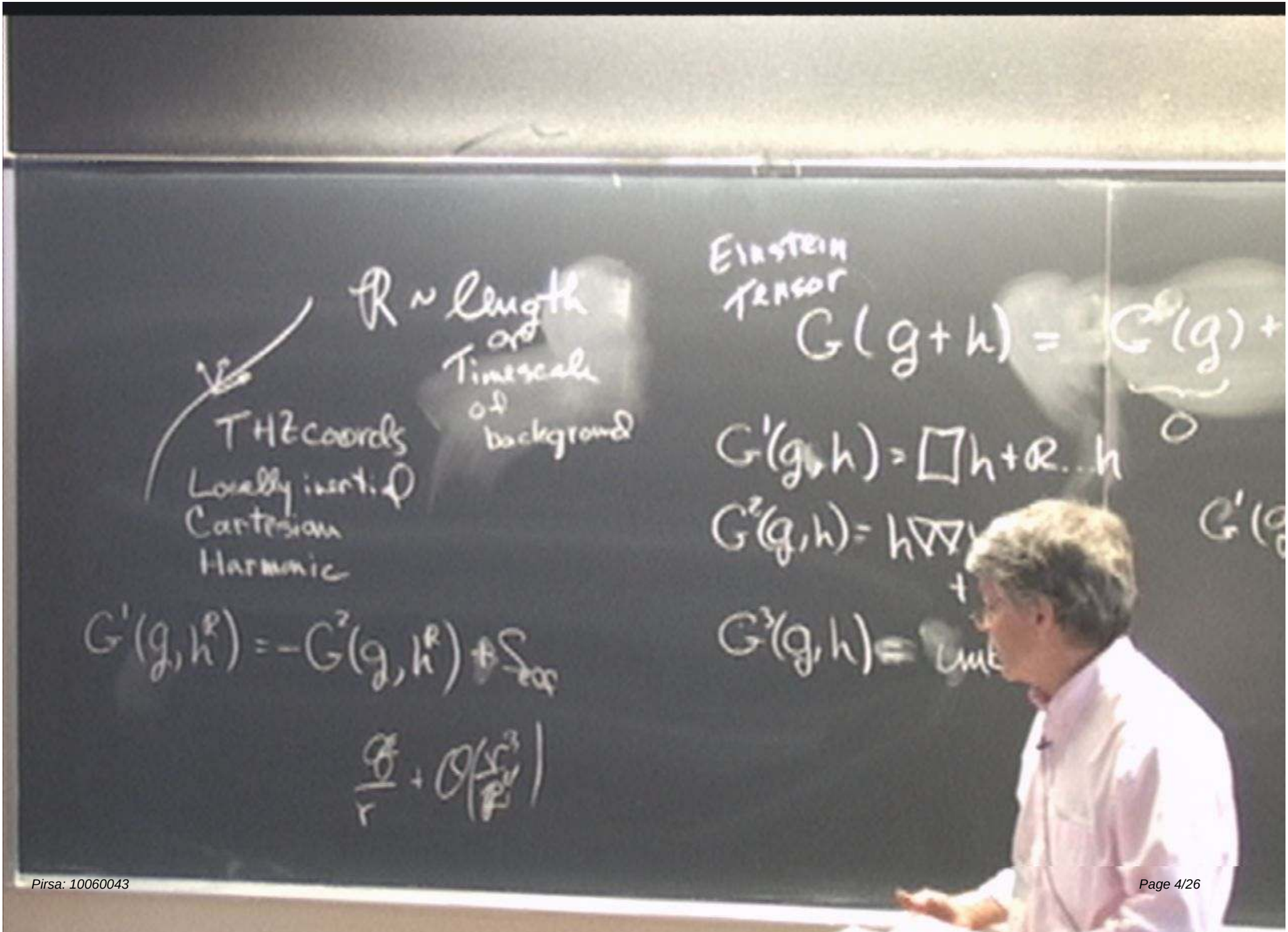
Date: Jun 21, 2010 09:10 AM

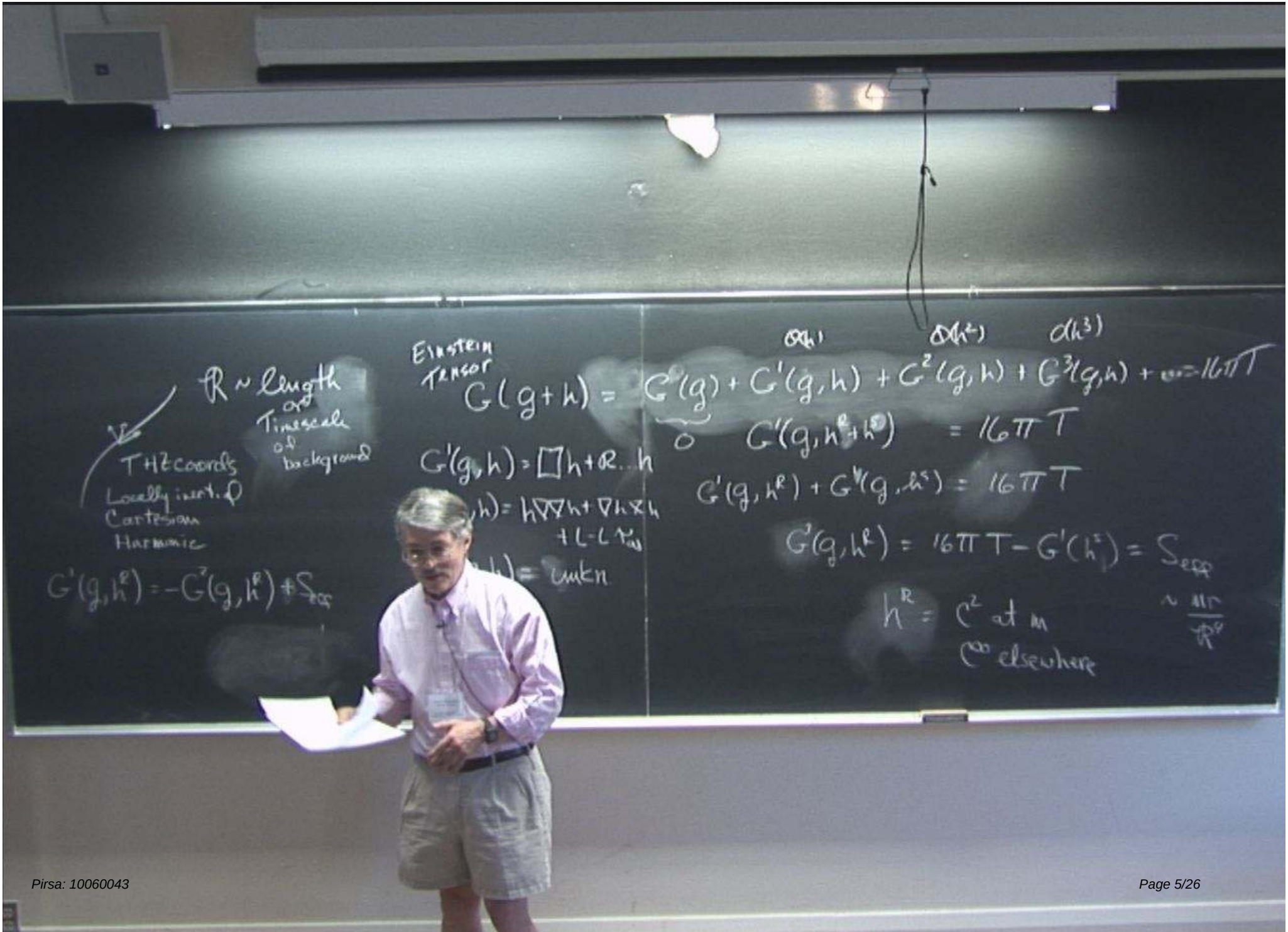
URL: http://pirsa.org/10060043

Abstract: TBA


R ~ length
or
Timescale
of
background
THZ coords
Locally inertial
Cartesian
Harmonic
G'(g, h^R) = -G^2(g, h^R) + S_eff
Einstein
Tensor
G(g+h) = G(g) +
0
G'(g, h) = □h + R...h
+ L-L τ_ab
= unkn


R ~ length or Timescale of background
THz coords
Locally inertial Cartesian Harmonic
Einstein Tensor
G(g+h) =
G'(g,h) = □h + R..h
G²(g,h) = h∇∇h + ∇h×h
+ L-L
G³(g,h) = Lmkn


R ~ length or Timescale of background
THZ coords
Locally inertial Cartesian Harmonic
Einstein Tensor
G(g+h) =
G'(g,h) = □h + R...h
G²(g,h) = h∇∇
G³(g,h) =
G'(g,h^R) = -G²(g,h^R) + S_eff
G/r + O(1/r²)


R ~ length
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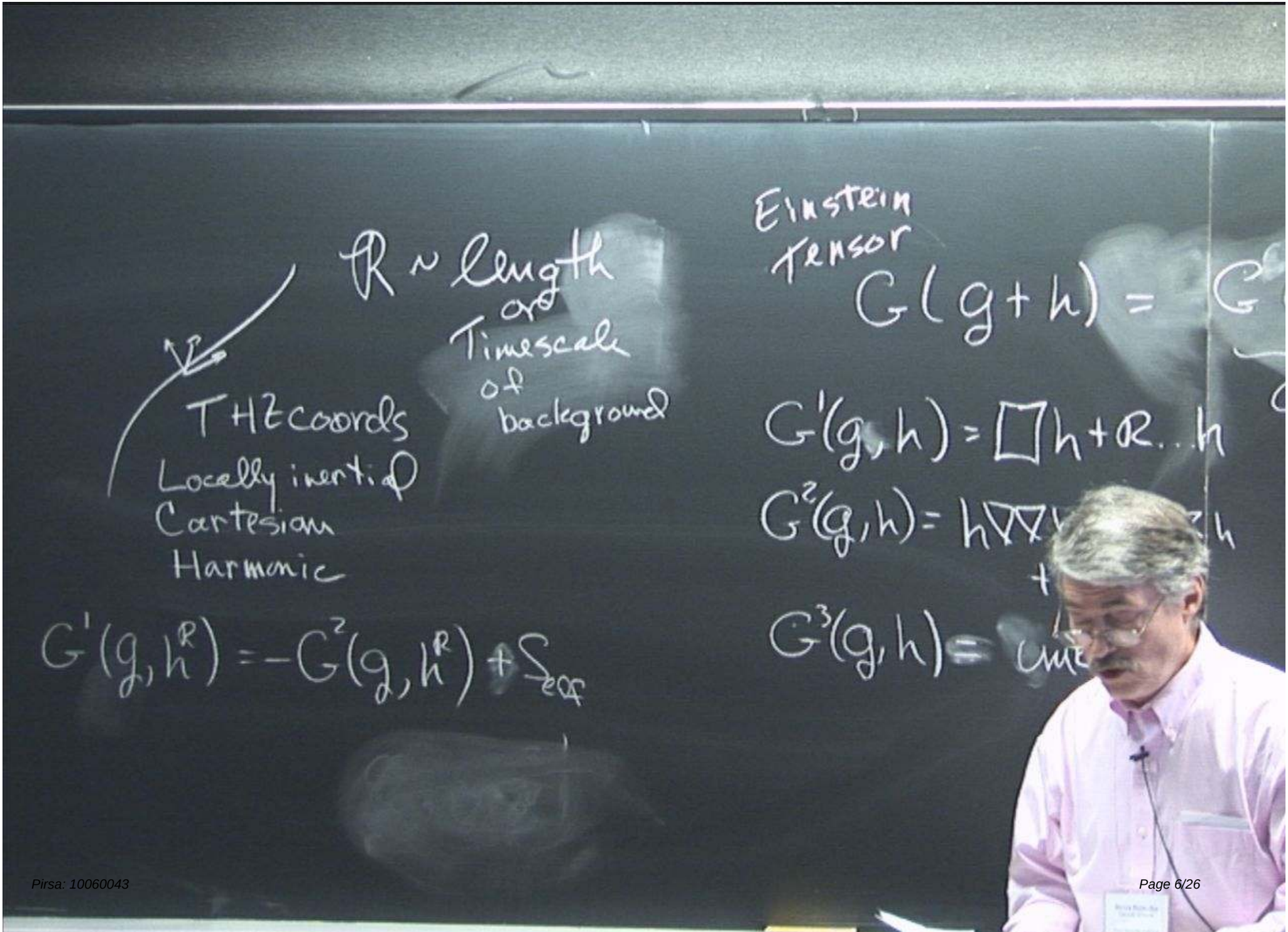
Timescale
of
background
THZ coords
Locally inert. ∂
Cartesian
Harmonic
G'(g,h^R) = -G'(g,h^R) + S_eff
Einstein
Tensor
G(g+h) = G(g) + G'(g,h) + G^2(g,h) + G^3(g,h) + ... = 16πT
O(h^1)
O(h^2)
O(h^3)
G'(g,h^R+h^S) = 16πT
G'(g,h^R) + G'(g,h^S) = 16πT
G'(g,h^R) = 16πT - G'(h^S) = S_eff
h^R = C^2 at m
C^∞ elsewhere


R ~ length or Timescale of background
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Cartesian
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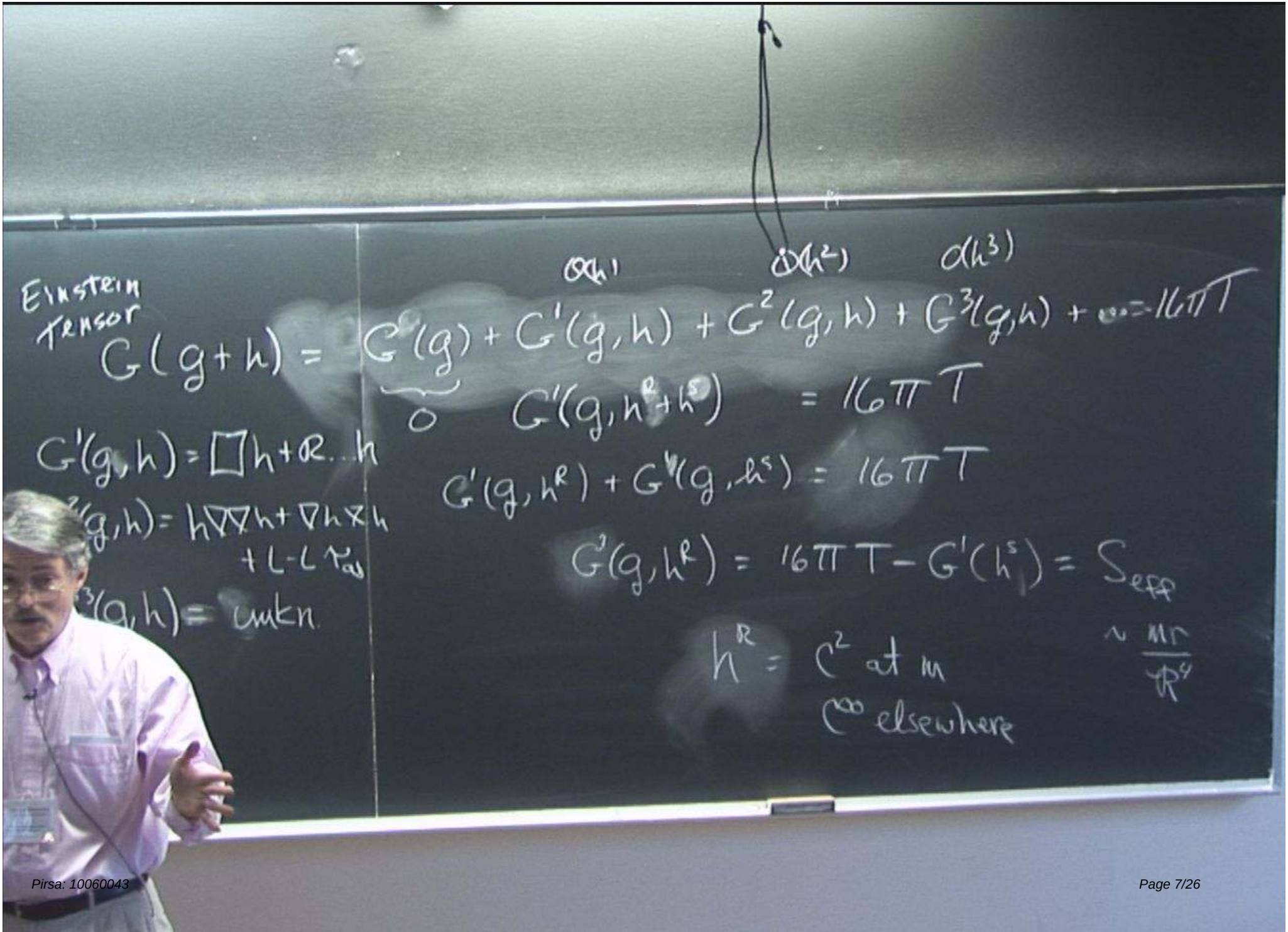
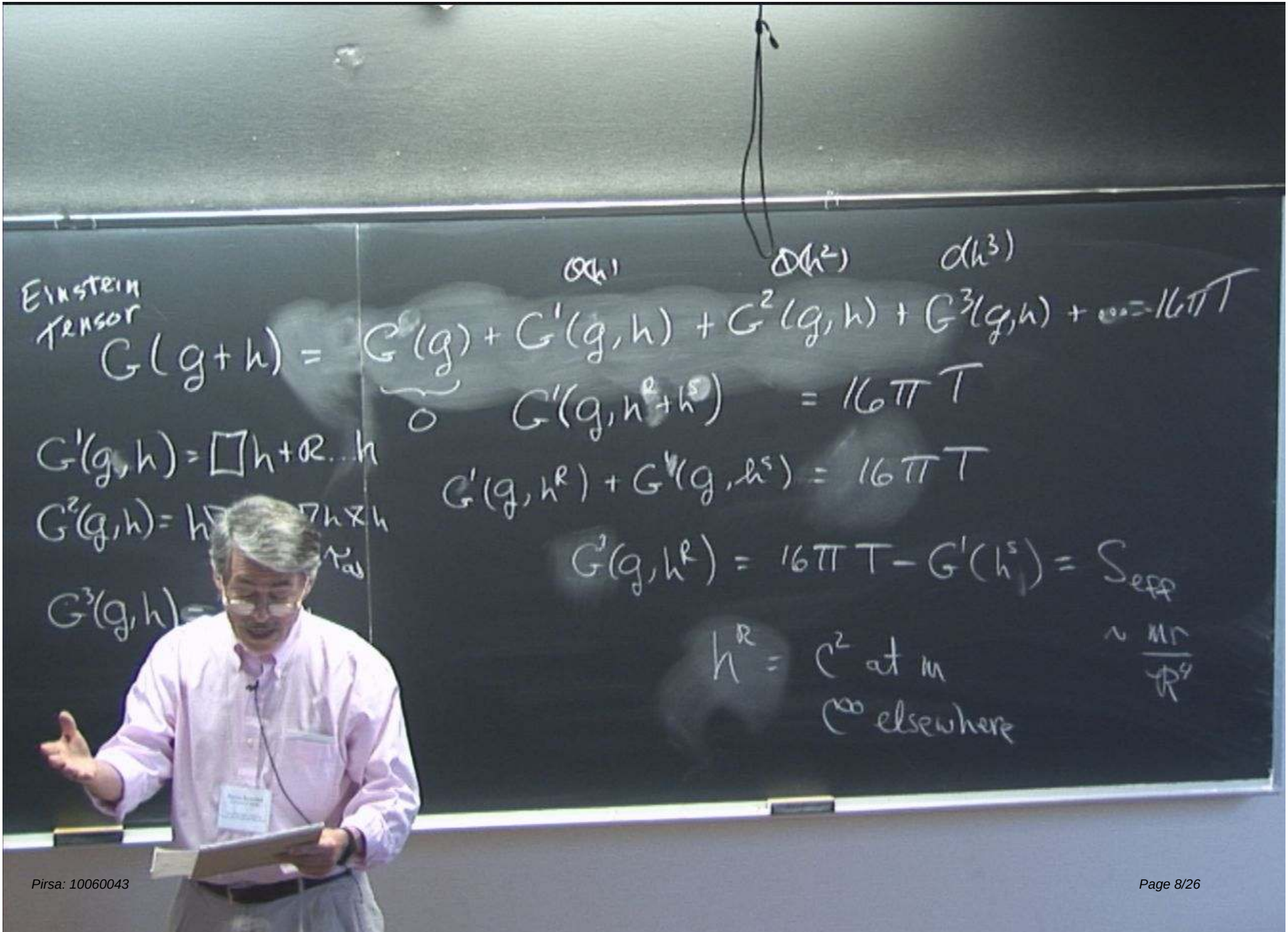
Einstein Tensor
G(g+h) =
G¹(g,h) = □h + R...h
G²(g,h) = h∇∇h
G³(g,h) =
G¹(g,h^R) = −G²(g,h^R) + S_eff


Einstein Tensor
$G(g+h) = \underbrace{G^0(g)}_{0} + G^1(g,h) + G^2(g,h) + G^3(g,h) + \ldots = 16\pi T$
$G^1(g,h) = \Box h + \partial R \ldots h$
$G^2(g,h) = h\nabla\nabla h + \nabla h \times h + L - L\Gamma_{ab}$
$G^3(g,h) = \text{cubic}$
$G^1(g,h^R + h^S) = 16\pi T$
$G^1(g,h^R) + G^1(g,h^S) = 16\pi T$
$G^1(g,h^R) = 16\pi T - G^1(h^S) = S_{eff}$
$\sim \frac{m}{r^3}$
$h^R = C^2$ at m
C^∞ elsewhere


Einstein Tensor
$G(g+h) = \underbrace{G^0(g)}_{0} + G^1(g,h) + G^2(g,h) + G^3(g,h) + \cdots = 16\pi T$
$O(h^1)$ $O(h^2)$ $O(h^3)$
$G^1(g,h) = \Box h + \partial R \ldots h$
$G^2(g,h) = h \ldots \nabla h \times h$
$G^3(g,h) = \ldots$
$G^1(g,h^R) = 16\pi T$
$G^1(g,h^R) + G^1(g,h^S) = 16\pi T$
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$\sim \frac{M}{r^3}$
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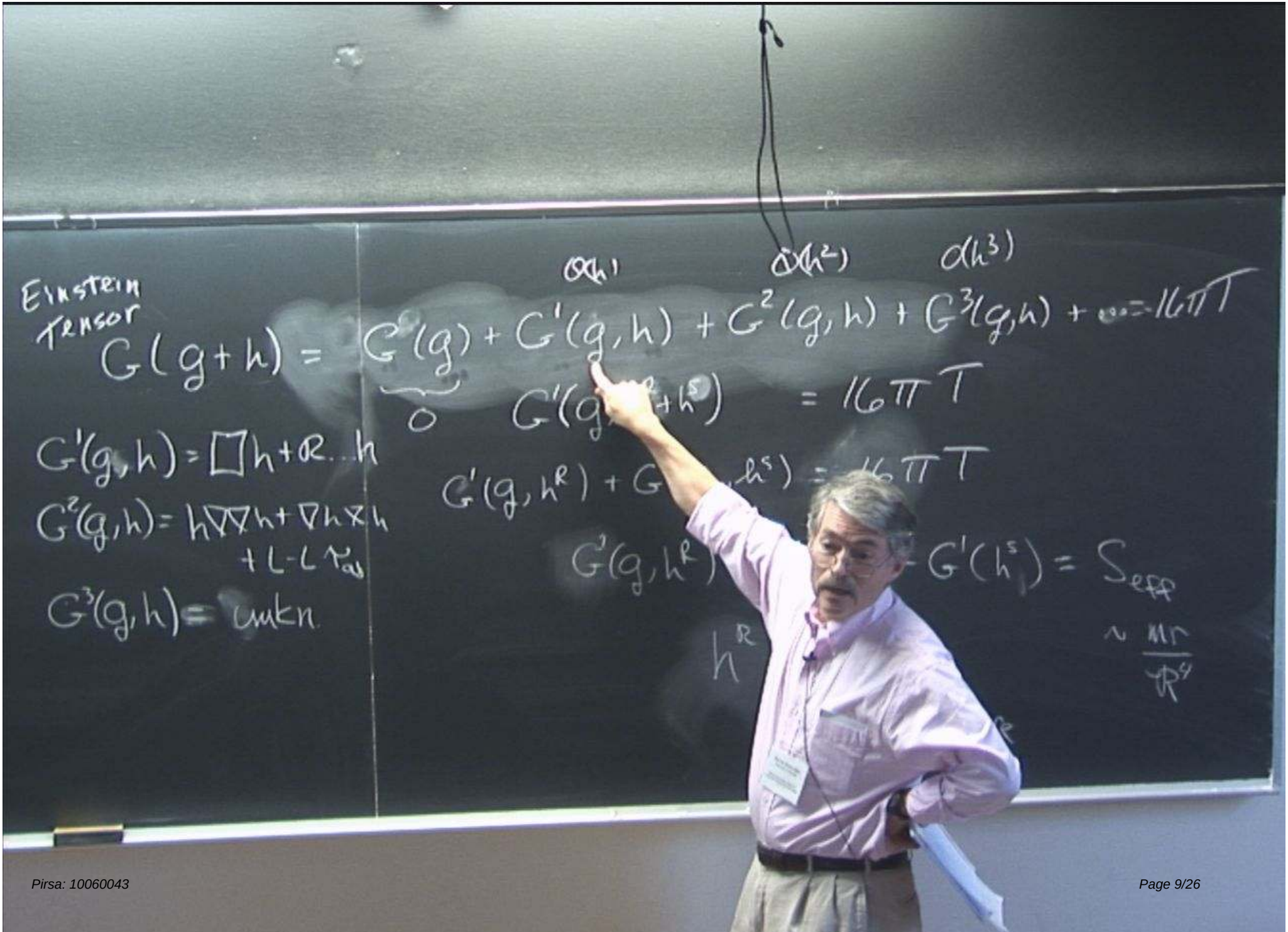
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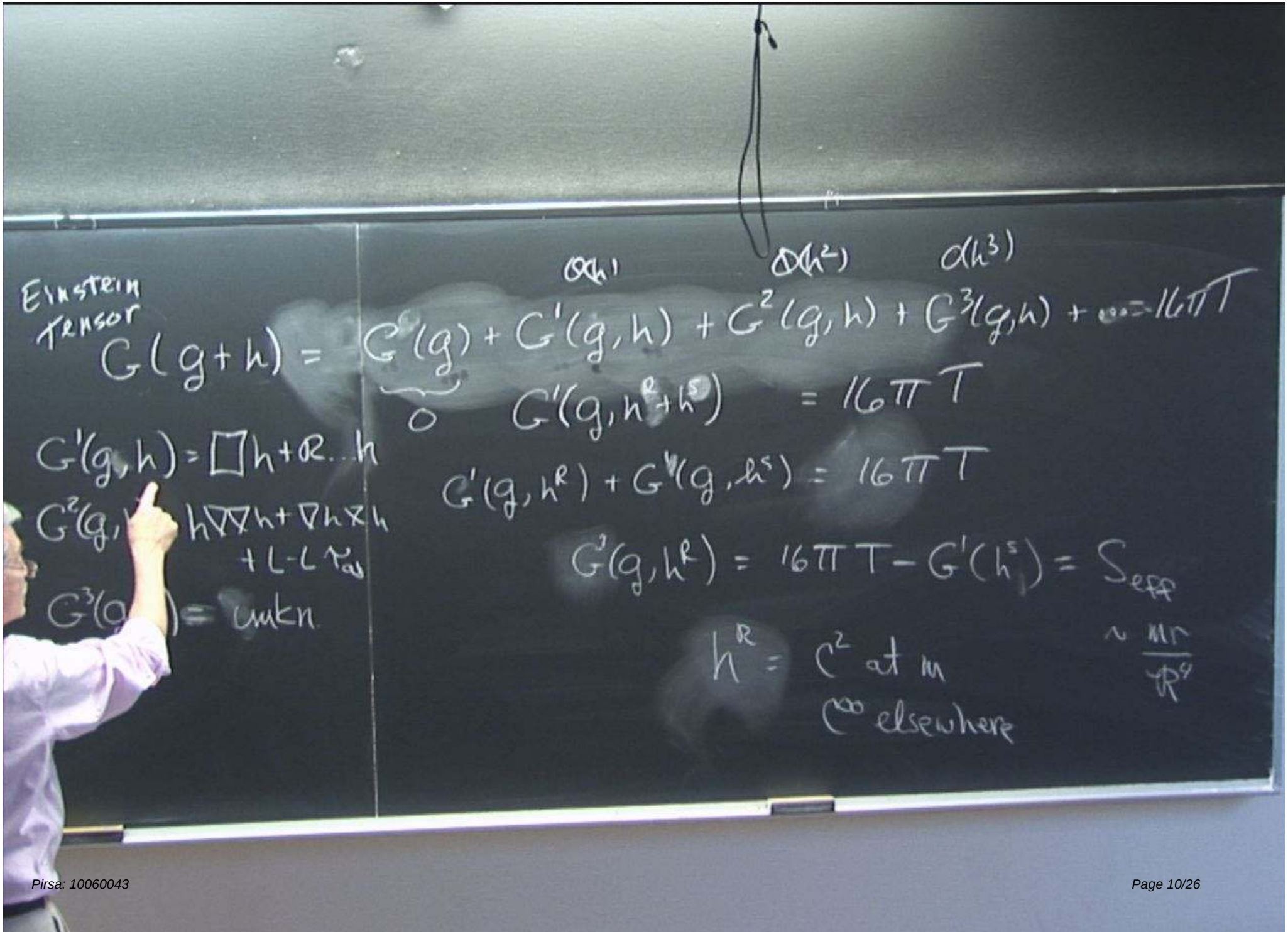
$G^1(g,h) = \Box h + \partial R \ldots h$
$G^2(g,h) = h\nabla\nabla h + \nabla h \times h + \Gamma - \Gamma\Gamma_{av}$
$G^3(g,h) = \ldots$
$G^1(g, h^R + h^S) = 16\pi T$
$G^1(g, h^R) + G^1(h^S) = S_{eff}$
h^R
$\sim \frac{Mr}{R^4}$


Einstein tensor
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$G^1(g,h) = \Box h + R \dots h$
$G^2(g,h) = h\nabla\nabla h + \nabla h \nabla h + L - L\tau_{ab}$
$G^3(g,h) =$ unkn
$G^1(g, h^R + h^S) = 16\pi T$
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$G^1(g,h^R) = 16\pi T - G^1(h^S) = S_{eff}$
$\sim \frac{mr}{R^4}$
$h^R = C^2$ at m
C^∞ elsewhere

Einstein tensor

$$G(g+h) = \underbrace{G(g)}_{0} + \overset{O(h)}{G^1(g,h)} + \overset{O(h^2)}{G^2(g,h)} + \overset{O(h^3)}{G^3(g,h)} + \dots = 16\pi T$$

$$G^1(g,h) = \Box h + R \dots h$$

$$G^2(g,h) = h\nabla\nabla h + \nabla h \times h + L - L\,\tau_{ab}$$

$$G^3(g,h) = \text{unkn}$$

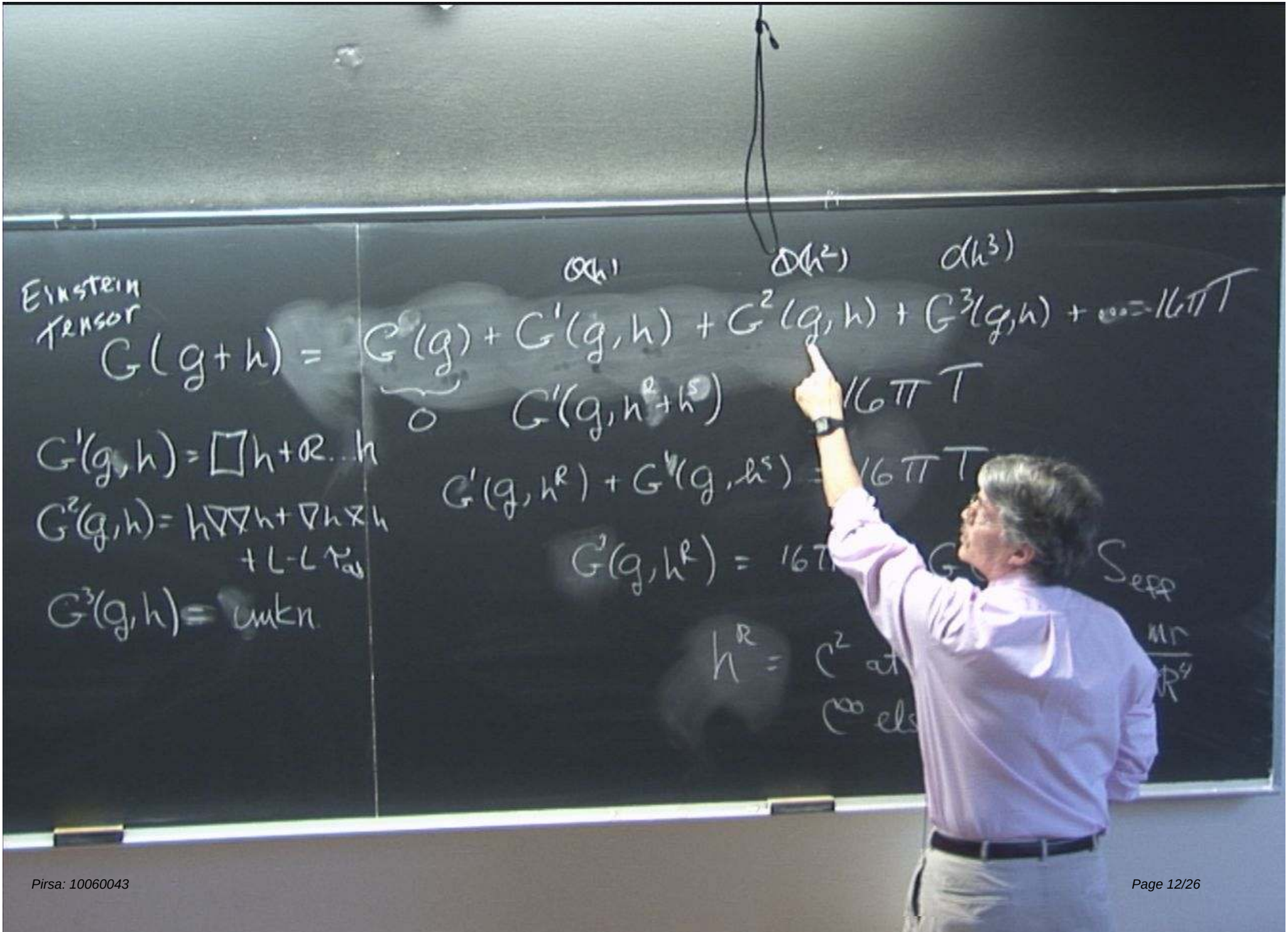
$$G^1(g, h^R + h^S) = 16\pi T$$

$$G^1(g,h^R) + G^1(g,h^S) = 16\pi T$$

$$G^1(g,h^R) = 16\pi T - G^1(h^S) = S_{eff} \sim \frac{mr}{R^4}$$

$h^R = C^2$ at m

C^∞ elsewhere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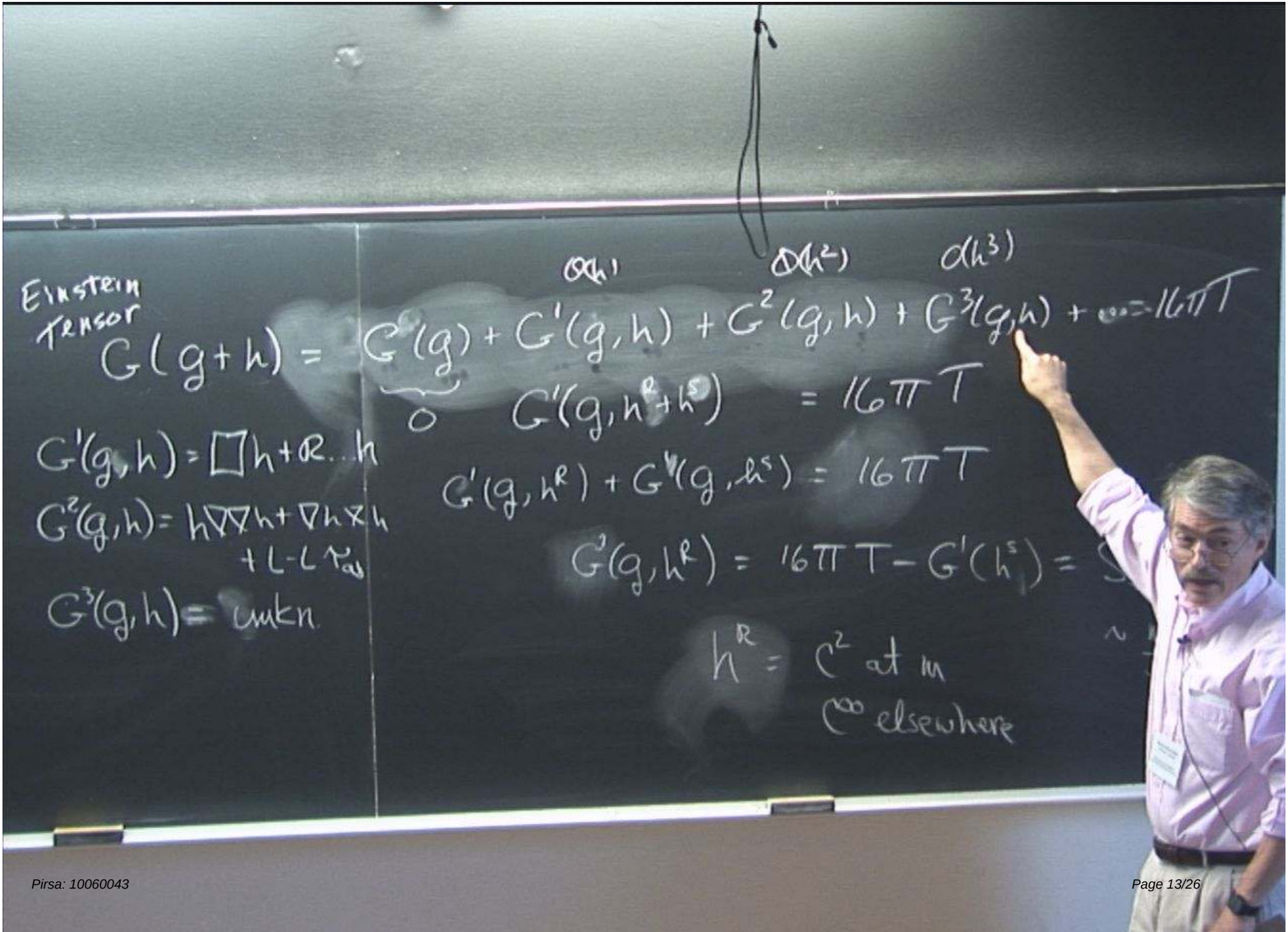
$O(h^1)$ $O(h^2)$ $O(h^3)$
$G^1(g,h) = \Box h + R \ldots h$
$G^2(g,h) = h\nabla\nabla h + \nabla h \times h + L\text{-}C\,\Gamma_{ab}$
$G^3(g,h) = \ldots$
$G^1(g,h^R+h^S)$
$16\pi T$
$G^1(g,h^R) + G^1(g,h^S) = 16\pi T$
$G^1(g,h^R) = 16\pi$
$h^R = C^2$ at
C^∞ el
S_{eff}
$\frac{Mr}{R^3}$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$G^1(g, h^R + h^S) = 16\pi T$
$G^1(g,h^R) + G^1(g,h^S) = 16\pi T$
$G^1(g,h^R) = 16\pi T - G^1(h^S) =$
$h^R = C^2$ at m
C^∞ elsewhere

Einstein Tensor

$G(g+h) = \underbrace{G^0(g)}_{0} + G^1(g,h) + G^2(g,h) + G^3(g,h) + \dots = 16\pi T$

$O(h^1)$ $O(h^2)$ $O(h^3)$

$G^1(g,h) = \Box h + \partial R \dots h$

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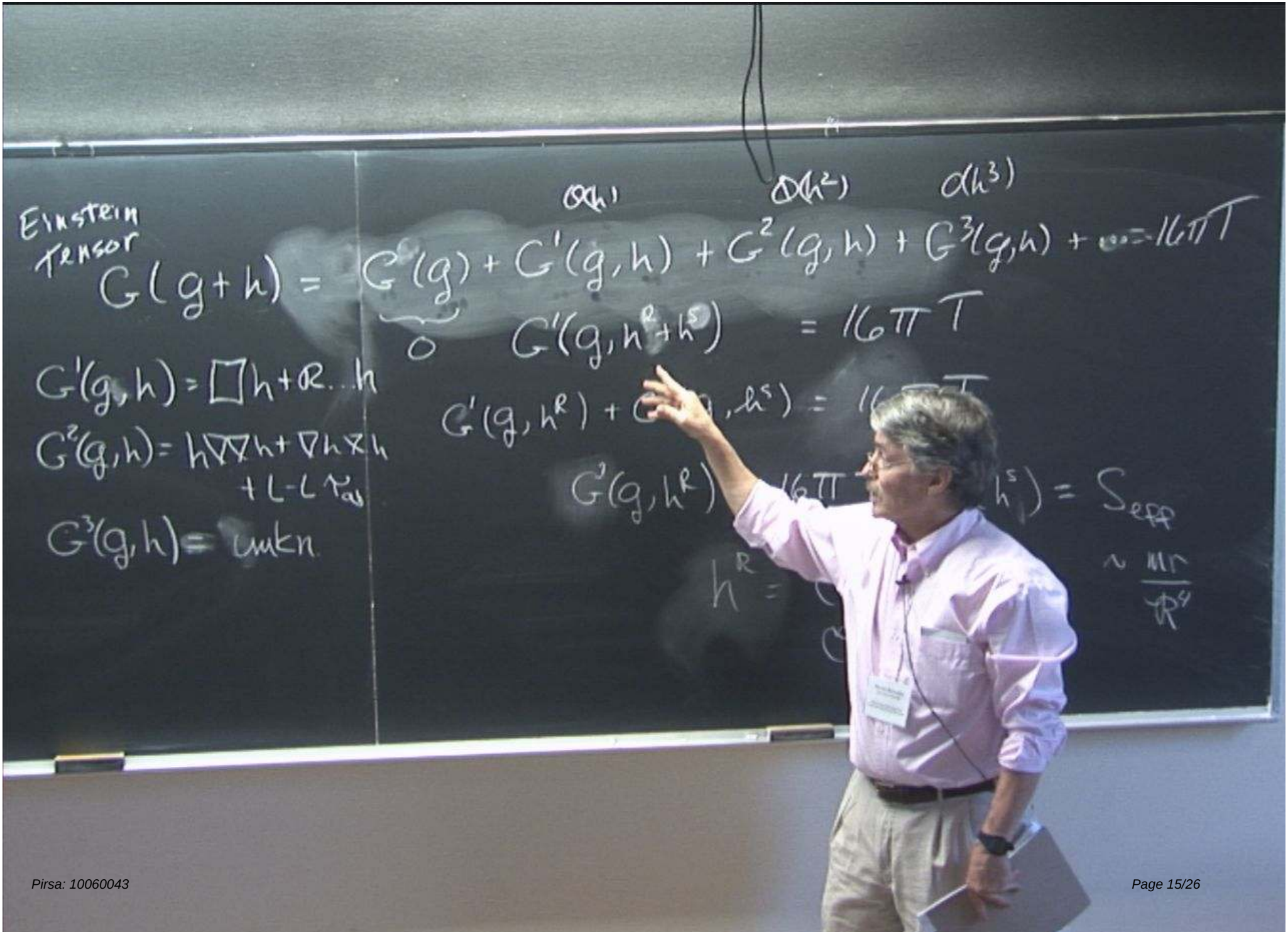
$G^1(g,h^R) = 16\pi T - G^1(h^S) = S_{eff} \sim \frac{Mr}{R^9}$

$h^R = C^2$ at m

C^∞ elsewhere


Einstein Tensor
G(g+h) = G(g) + G¹(g,h) + G²(g,h) + G³(g,h) + ... = 16πT
O(h)
O(h²)
O(h³)
G¹(g,h) = □h + R...h
G²(g,h) = h∇∇h + ∇h∇h + L-L τ_ab
G³(g,h) = unkn
G¹(g,h^R+h^S) = 16πT
G¹(g,h^R) + G(g,h^S) = 16πT
G¹(g,h^R) 16π h^S) = S_eff
~ mr/R⁴
h^R =

Einstein tensor

$$G(g+h) = \underbrace{G(g)}_{0} + \overset{O(h)}{G^1(g,h)} + \overset{O(h^2)}{G^2(g,h)} + \overset{O(h^3)}{G^3(g,h)} + \dots = 16\pi T$$

$$G^1(g,h) = \Box h + R \dots h$$

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Einstein Tensor

$$G(g+h) = \underbrace{G^0(g)}_{0} + G^1(g,h) + G^2(g,h) + G^3(g,h) + \cdots = 16\pi T$$

$O(h^1)$ $O(h^2)$ $O(h^3)$

$$G^1(g,h) = \Box h + R \cdots h$$

$$G^2(g,h) = h\nabla\nabla h + \nabla h \times h + L - L\Gamma_{ab}$$

$$G^3(g,h) = \text{unkn.}$$

$$G^1(g, h^R + h^S) = 16\pi T$$

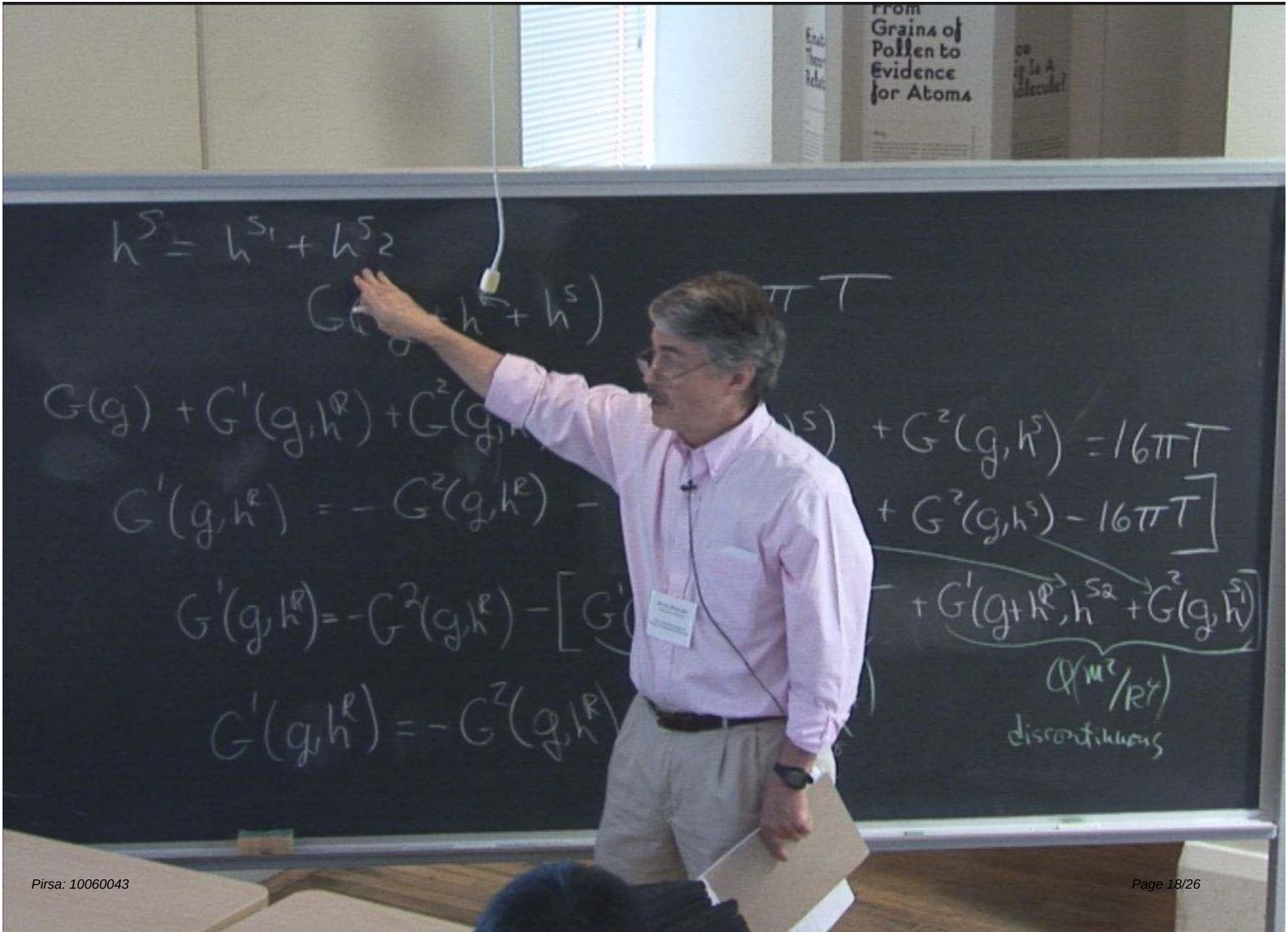
$$G^1(g, h^R) + G^1(g, h^S) = 16\pi T$$

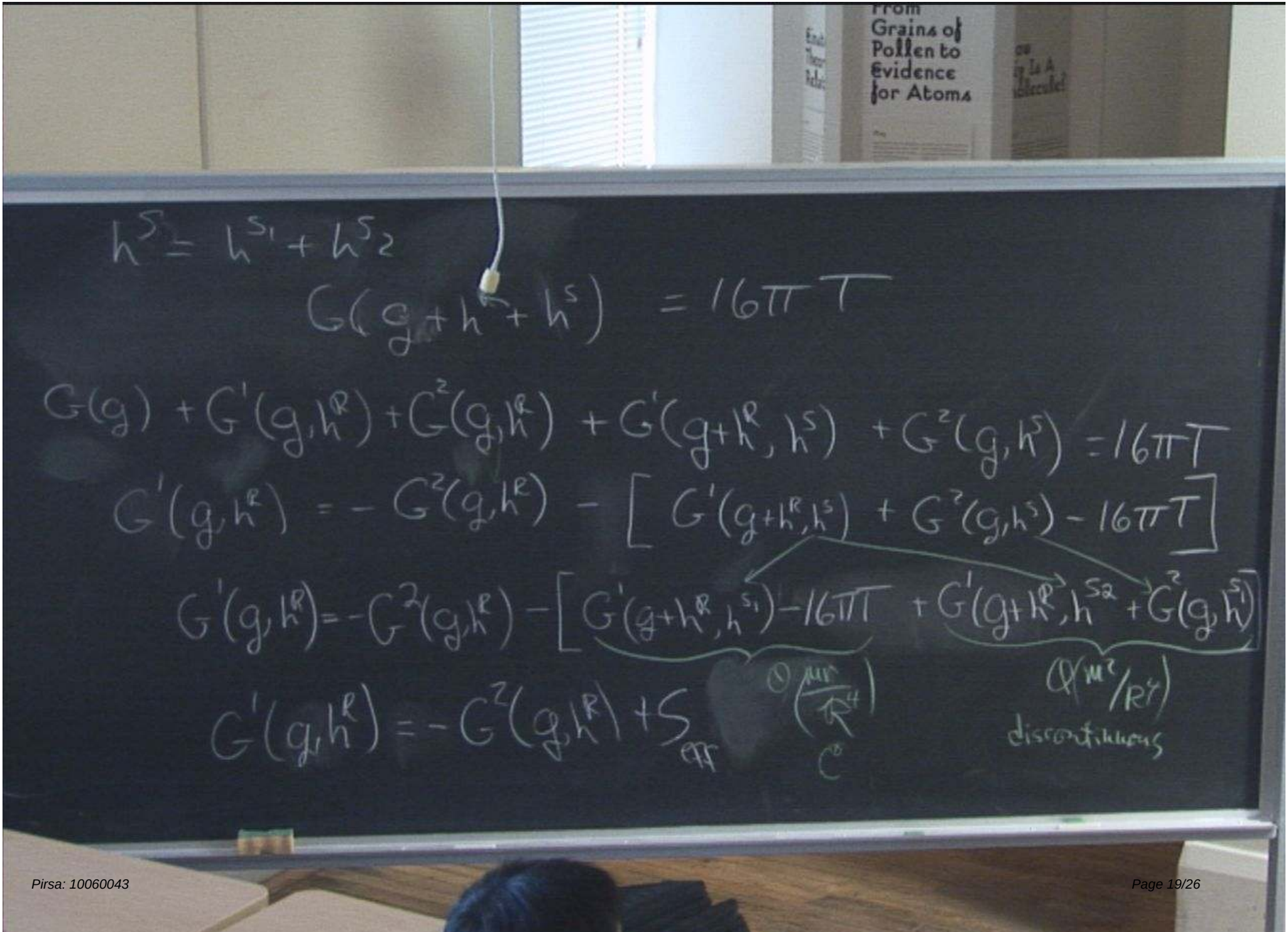
$$G^1(g, h^R) = 16\pi T - G^1(h^S) = S_{eff}$$

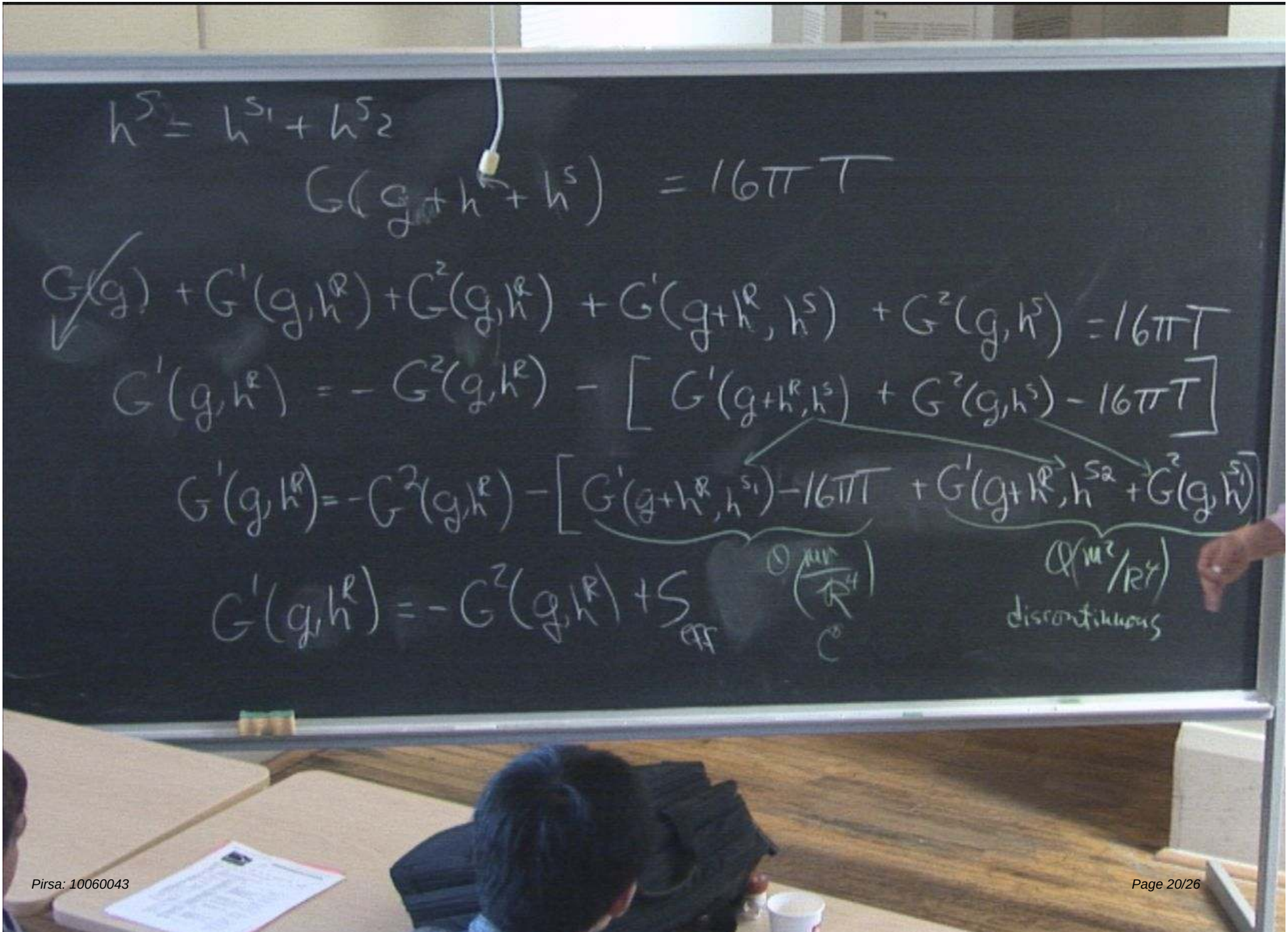
$$\sim \frac{Mr}{R^4}$$

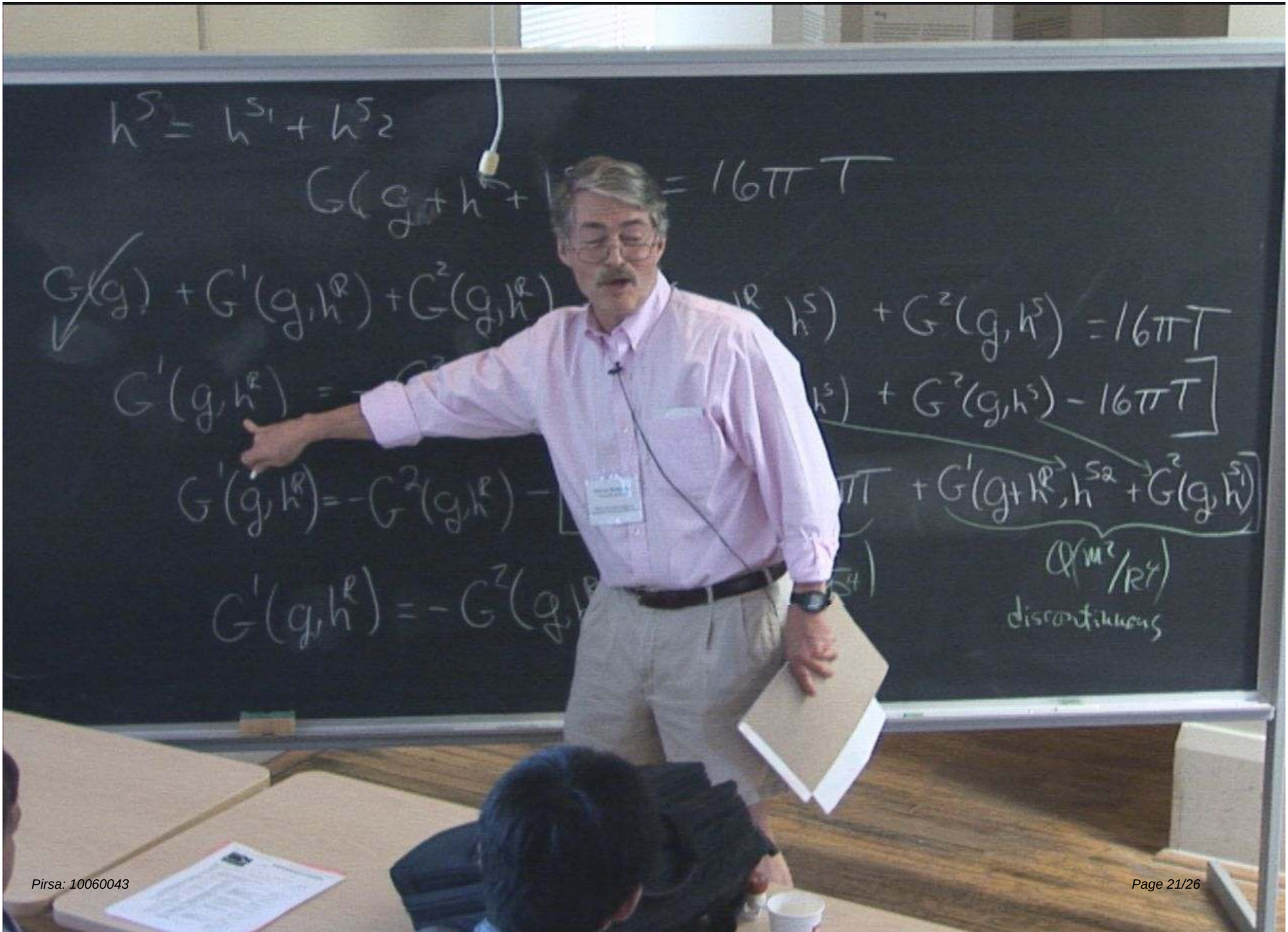
h^R = C^2 at m

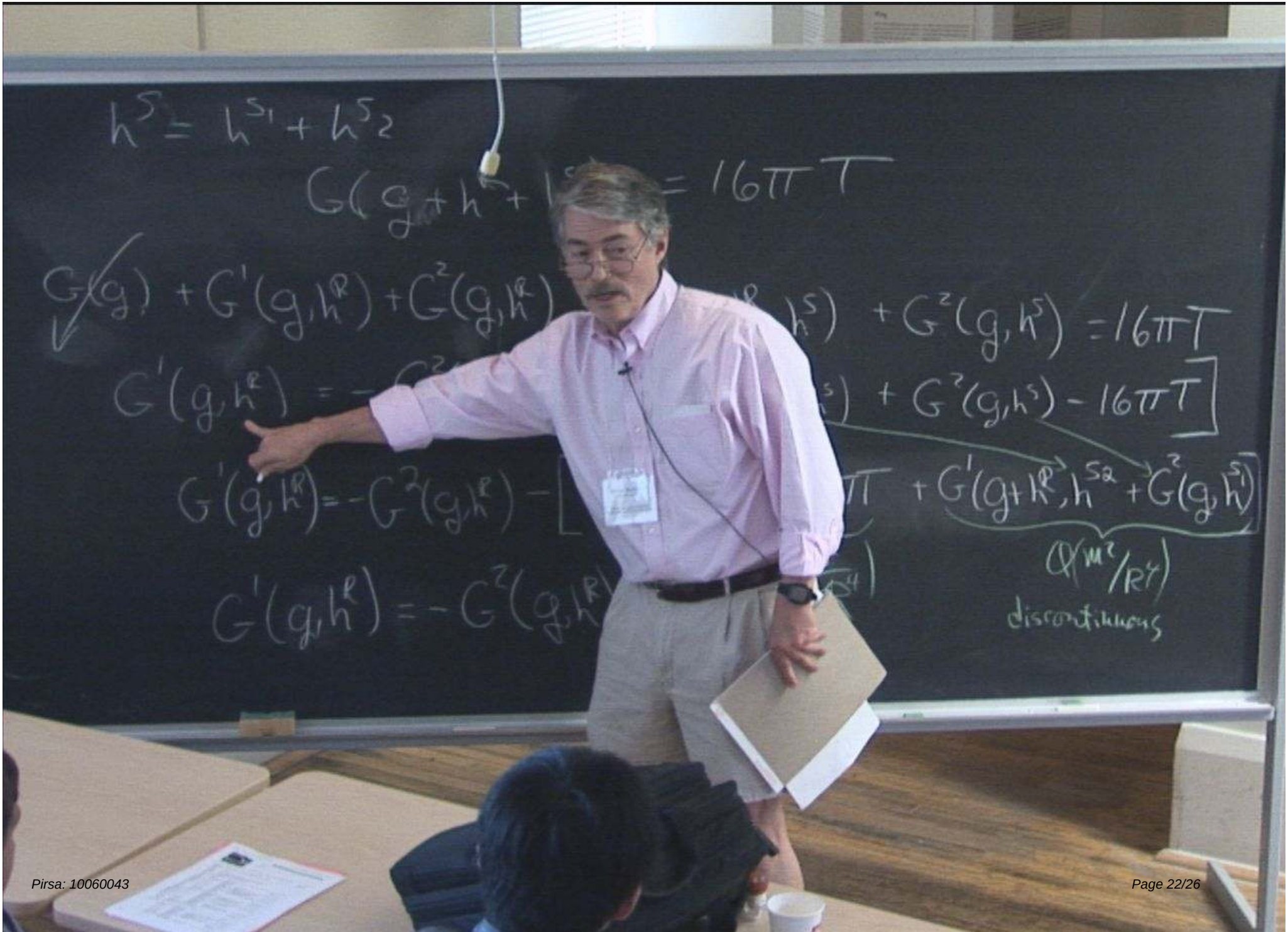
C^∞ elsewhere

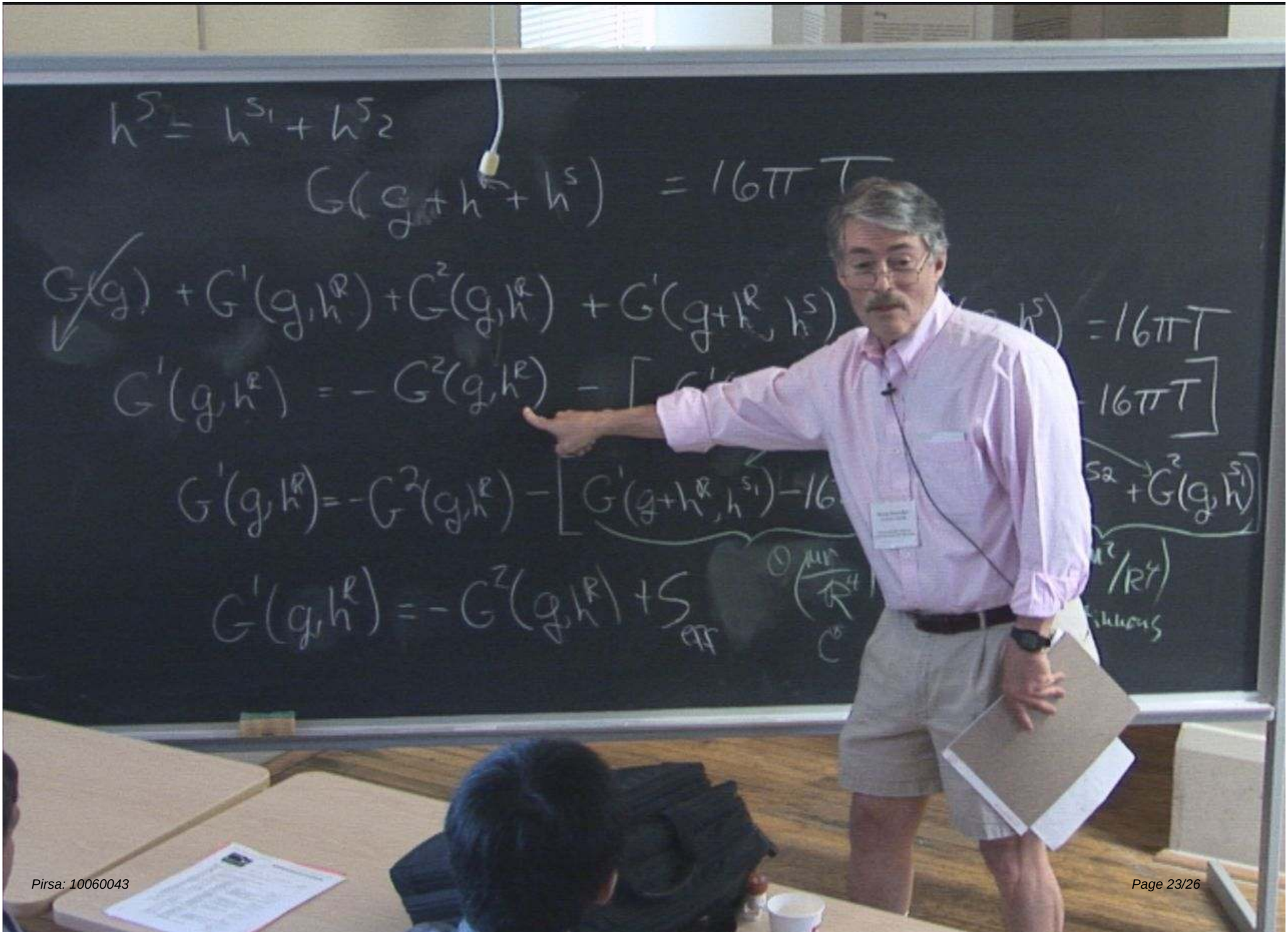

From Grains of Pollen to Evidence for Atoms
$h^S = h^{S_1} + h^{S_2}$
$G(g) + G^1(g, h^R) + G^2(g,$
$G^1(g, h^R) = - G^2(g, h^R) -$
$G^1(g, h^R) = - G^2(g, h^R) - [G^1($
$G^1(g, h^R) = - G^2(g, h^R)$
$+ G^2(g, h^S) = 16\pi T$
$+ G^2(g, h^S) - 16\pi T]$
$+ G^1(g + h^R, h^{S_2}) + G^2(g, h^{S_1})$
$O(M^2/R^4)$
discontinuous


From Grains of Pollen to Evidence for Atoms
$h^S = h^{S_1} + h^{S_2}$
$G(g + h^R + h^S) = 16\pi T$
$G(g) + G^1(g, h^R) + G^2(g, h^R) + G^1(g + h^R, h^S) + G^2(g, h^S) = 16\pi T$
$G^1(g, h^R) = -G^2(g, h^R) - [G^1(g + h^R, h^S) + G^2(g, h^S) - 16\pi T]$
$G^1(g, h^R) = -G^2(g, h^R) - [G^1(g + h^R, h^{S_1}) - 16\pi T + G^1(g + h^R, h^{S_2}) + G^2(g, h^{S_1})]$
$G^1(g, h^R) = -G^2(g, h^R) + S_{eff}$
$\mathcal{O}\left(\frac{Mr}{R^4}\right)$
C^0
$\mathcal{O}(M^2/R^4)$
discontinuous


$h^S = h^{S_1} + h^{S_2}$
$G(g_{\mu\nu} + h^R + h^S) = 16\pi T$
$G(g) + G^1(g, h^R) + G^2(g, h^R) + G^1(g + h^R, h^S) + G^2(g, h^S) = 16\pi T$
$G^1(g, h^R) = -G^2(g, h^R) - [G^1(g + h^R, h^S) + G^2(g, h^S) - 16\pi T]$
$G^1(g, h^R) = -G^2(g, h^R) - [G^1(g + h^R, h^{S_1}) - 16\pi T + G^1(g + h^R, h^{S_2}) + G^2(g, h^{S_1})]$
$G^1(g, h^R) = -G^2(g, h^R) + S_{eff}$
$\mathcal{O}\left(\frac{M^4}{R^4}\right)$
C^0
$\mathcal{O}(M^2/R^4)$
discontinuous


$h^S = h^{S1} + h^{S2}$
$= 16\pi T$
$G^1(g, h^R) + G^2(g, h^S) = 16\pi T$
$G^1(g, h^R) + G^2(g, h^S) - 16\pi T$
$G^1(g+h^R, h^{S2}) + G^2(g, h^{S1})$
$O(M^2/R^4)$
discontinuous


$h^S = h^{S1} + h^{S2}$
$= 16\pi T$
$G^1(g, h^R) + G^2(g, h^R)$
$+ G^2(g, h^S) = 16\pi T$
$G^1(g, h^R) = -G^2(g, h^R) - [$
$+ G^2(g, h^S) - 16\pi T]$
$+ G^1(g+h^R, h^{S2}) + G^2(g, h^{S1})$
$O(M^2/R^4)$
discontinuous
$G^1(g, h^R) = -G^2(g, h^R)$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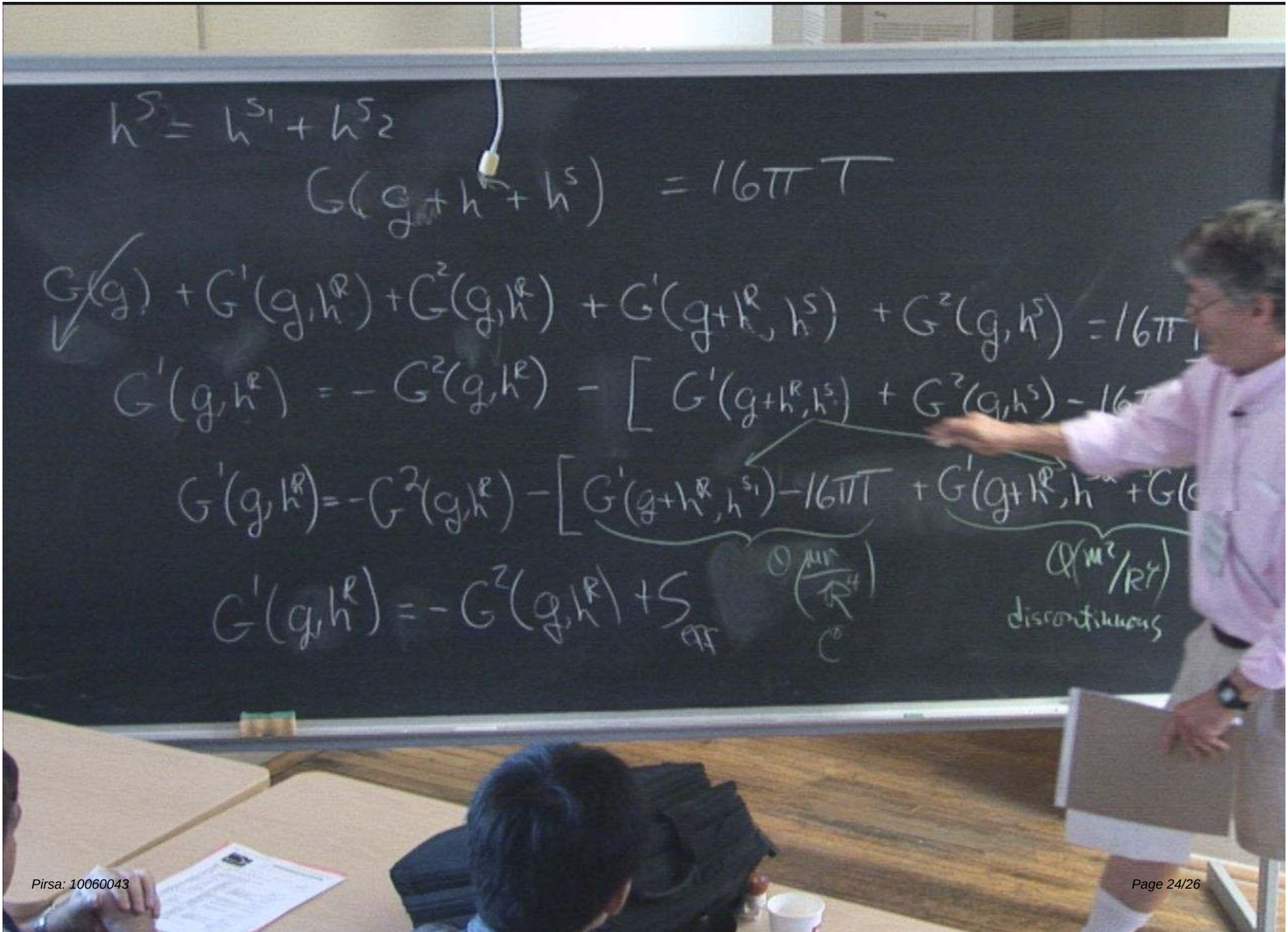
$G(g+h^R+h^S) = 16\pi T$
$G(g) + G^1(g,h^R) + G^2(g,h^R) + G^1(g+h^R,h^S)$
$= 16\pi T$
$G^1(g,h^R) = -G^2(g,h^R) - [$
$- 16\pi T]$
$G^1(g,h^R) = -G^2(g,h^R) - [G^1(g+h^R,h^{S_1}) - 16$
$+ G^2(g,h^{S_1})$
$G^1(g,h^R) = -G^2(g,h^R) + S_{eff}$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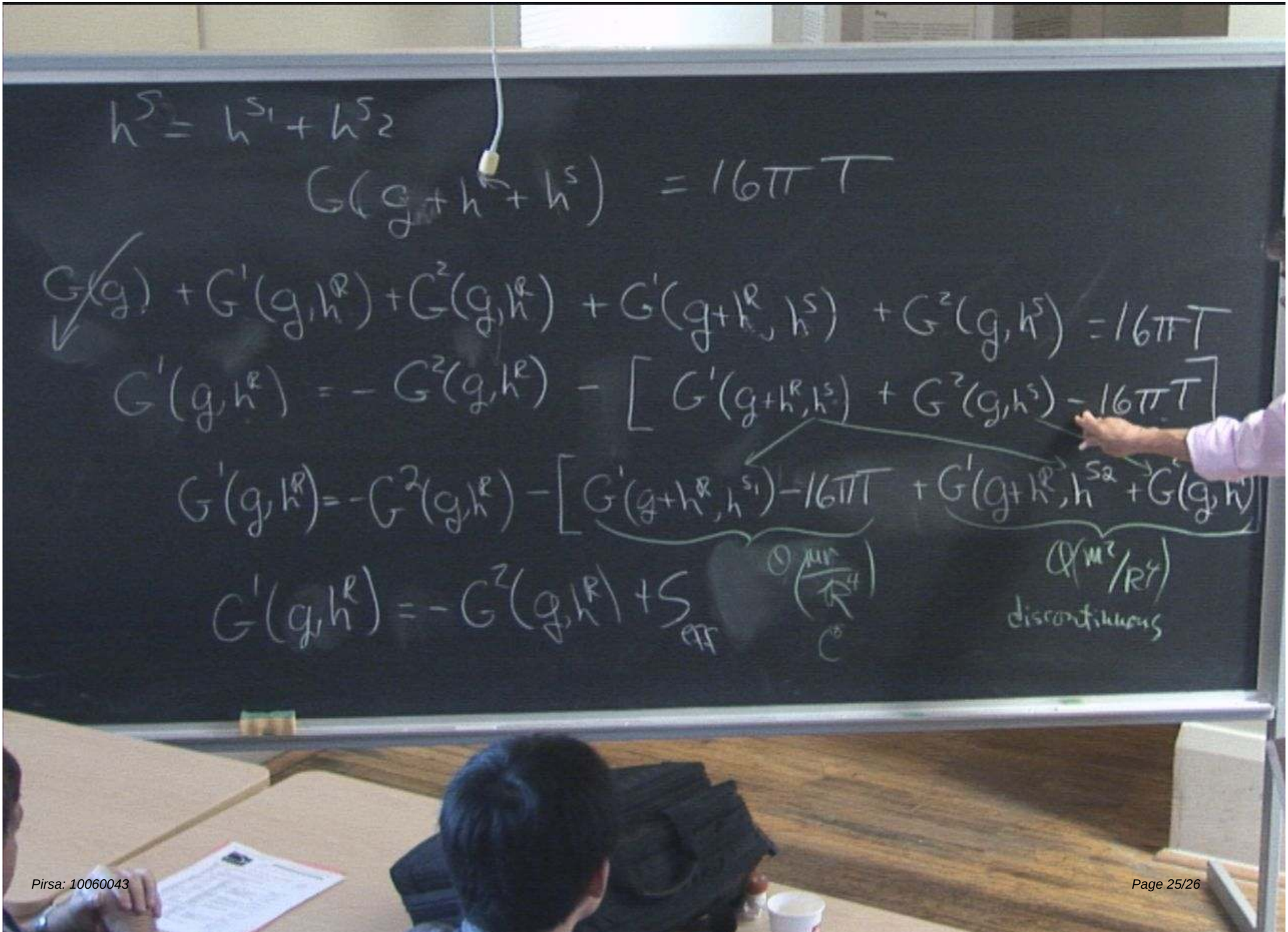
$G(g + h^R + h^S) = 16\pi T$
$G(g) + G^1(g, h^R) + G^2(g, h^R) + G^1(g + h^R, h^S) + G^2(g, h^S) = 16\pi$
$G^1(g, h^R) = -G^2(g, h^R) - [G^1(g + h^R, h^S) + G^2(g, h^S) - 16$
$G^1(g, h^R) = -G^2(g, h^R) - [G^1(g + h^R, h^{S_1}) - 16\pi T + G^1(g + h^R, h$
$G^1(g, h^R) = -G^2(g, h^R) + S_{eff}$
$\mathcal{O}\left(\frac{M^2}{R^4}\right)$
C^0
$\mathcal{O}(M^2/R^4)$
discontinuous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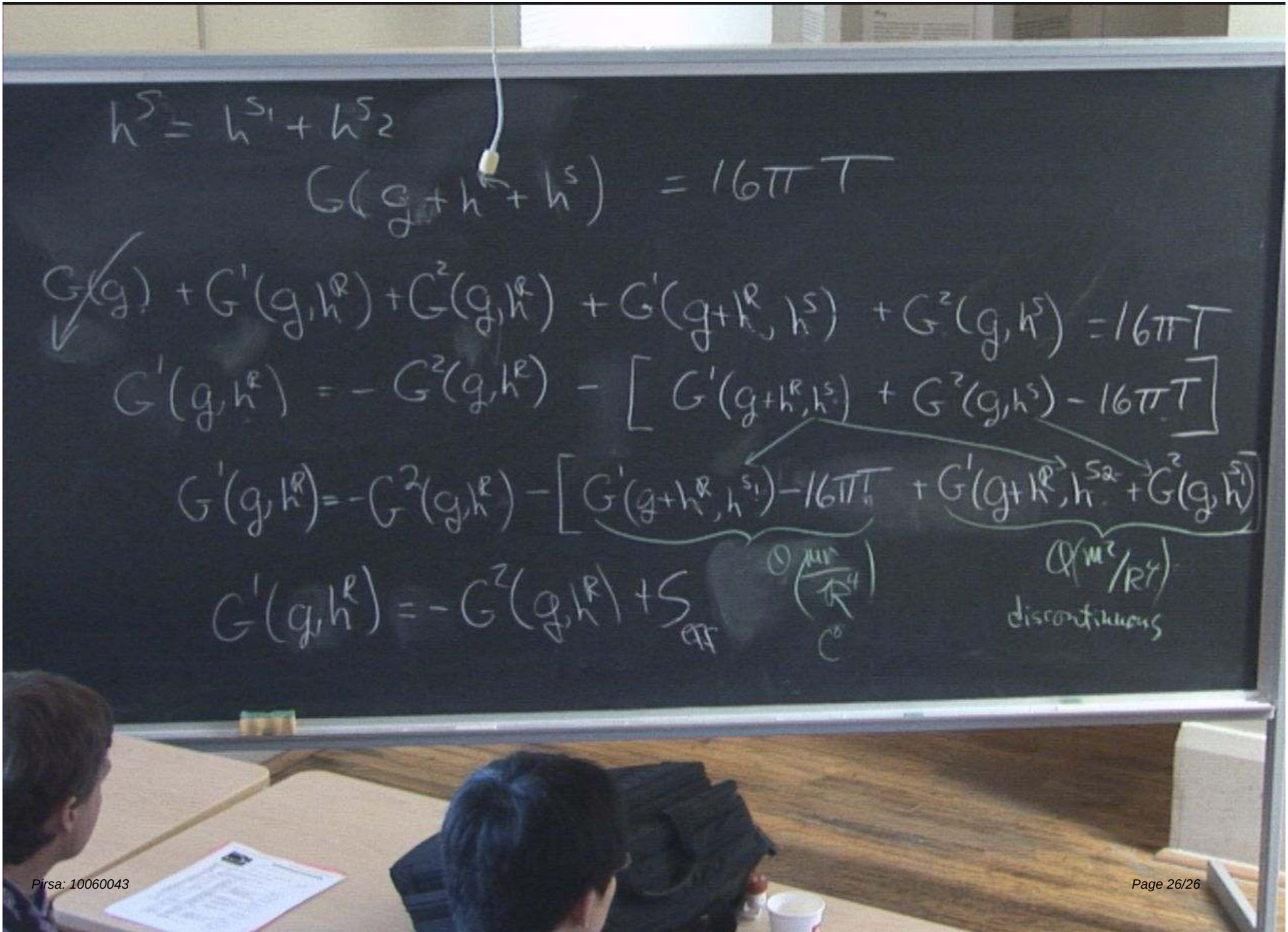
$G(g) + G^1(g, h^R) + G^2(g, h^R) + G^1(g + h^R, h^S) + G^2(g, h^S) = 16\pi T$
$G^1(g, h^R) = -G^2(g, h^R) - [G^1(g + h^R, h^S) + G^2(g, h^S) - 16\pi T]$
$G^1(g, h^R) = -G^2(g, h^R) - [G^1(g + h^R, h^{S_1}) - 16\pi T + G^1(g + h^R, h^{S_2}) + G^2(g, h^S)]$
$G^1(g, h^R) = -G^2(g, h^R) + S_{eff}$
$O\left(\frac{M^2}{R^4}\right)$
C^0
$O(M^2/R^4)$
discontinuous


$h^S = h^{S_1} + h^{S_2}$
$G(g + h^R + h^S) = 16\pi T$
$G(g) + G^1(g, h^R) + G^2(g, h^R) + G^1(g + h^R, h^S) + G^2(g, h^S) = 16\pi T$
$G^1(g, h^R) = -G^2(g, h^R) - [G^1(g + h^R, h^S) + G^2(g, h^S) - 16\pi T]$
$G^1(g, h^R) = -G^2(g, h^R) - [G^1(g + h^R, h^{S_1}) - 16\pi T + G^1(g + h^R, h^{S_2}) + G^2(g, h^{S_1})]$
$G^1(g, h^R) = -G^2(g, h^R) + S_{EH}$
$O\left(\frac{M^2}{R^4}\right)$
C^0
$O(M^2/R^4)$
discontinuous