$|in\rangle = \sum c_n |n\rangle$

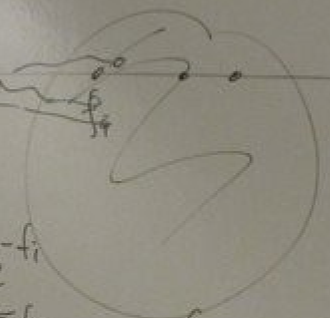
$T|n\rangle = t_n |n\rangle$

$\langle in | T | in \rangle = \sum |c_n|^2 t_n$
$= \langle t \rangle$

$\text{prob}(|in\rangle \to |n\rangle) = (\langle in | T | n\rangle)^2 = (c_n t_n)^2$
$= c_n^2 t_n^2$

$\sigma_{\text{diff.incl.}} \quad \sum_n c_n^2 t_n^2 = \langle t^2 \rangle$

$d\sigma_{\text{diff.exc.}} \sim (\langle t^2\rangle - \langle t\rangle^2) d^2b = V d^2b$



$T \sim f_i$

$S = 1 - T$

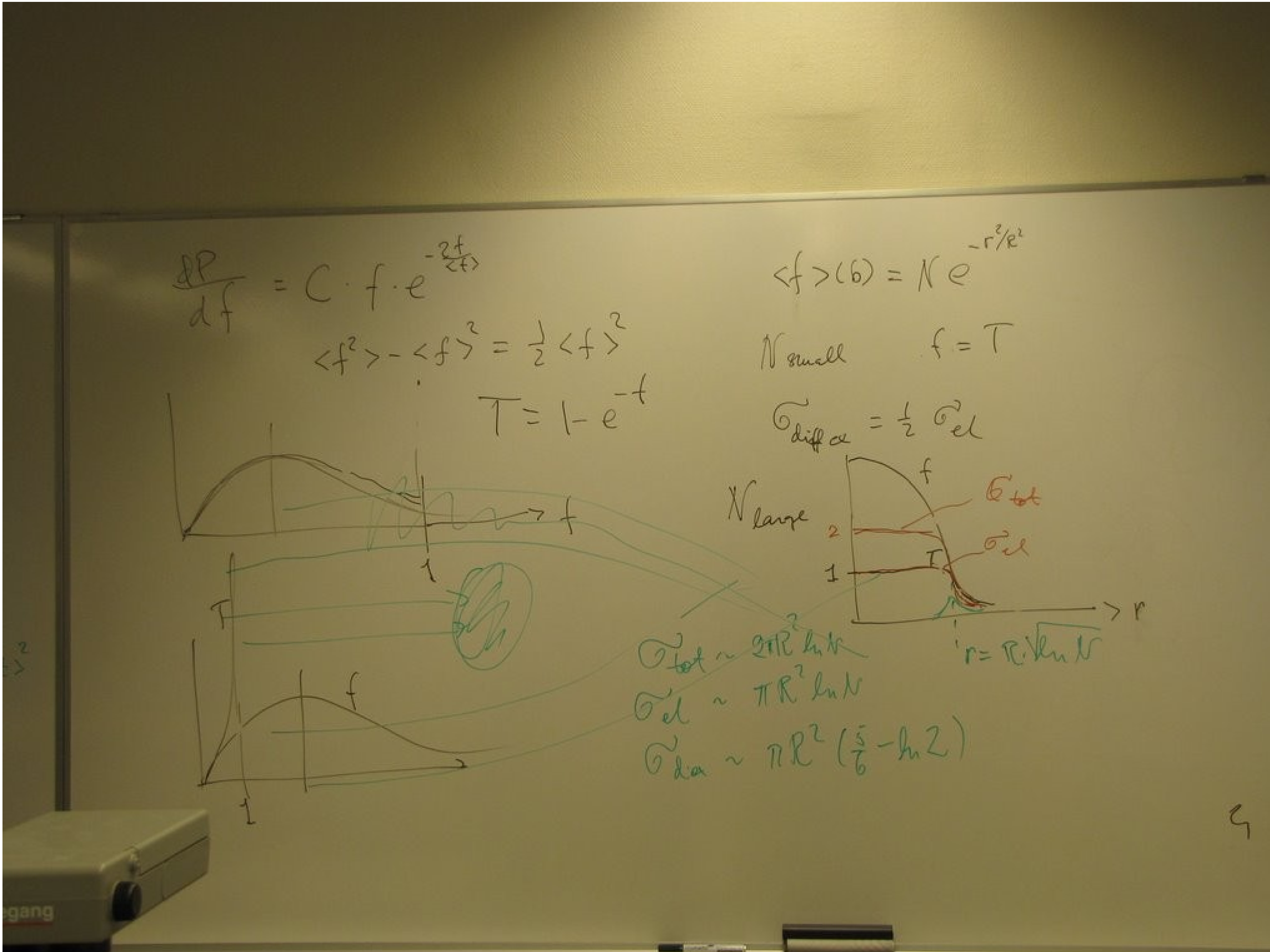
$1 - f_i \approx e^{-f_i}$

$S = e^{-\sum f_i} \equiv e^{-f}$

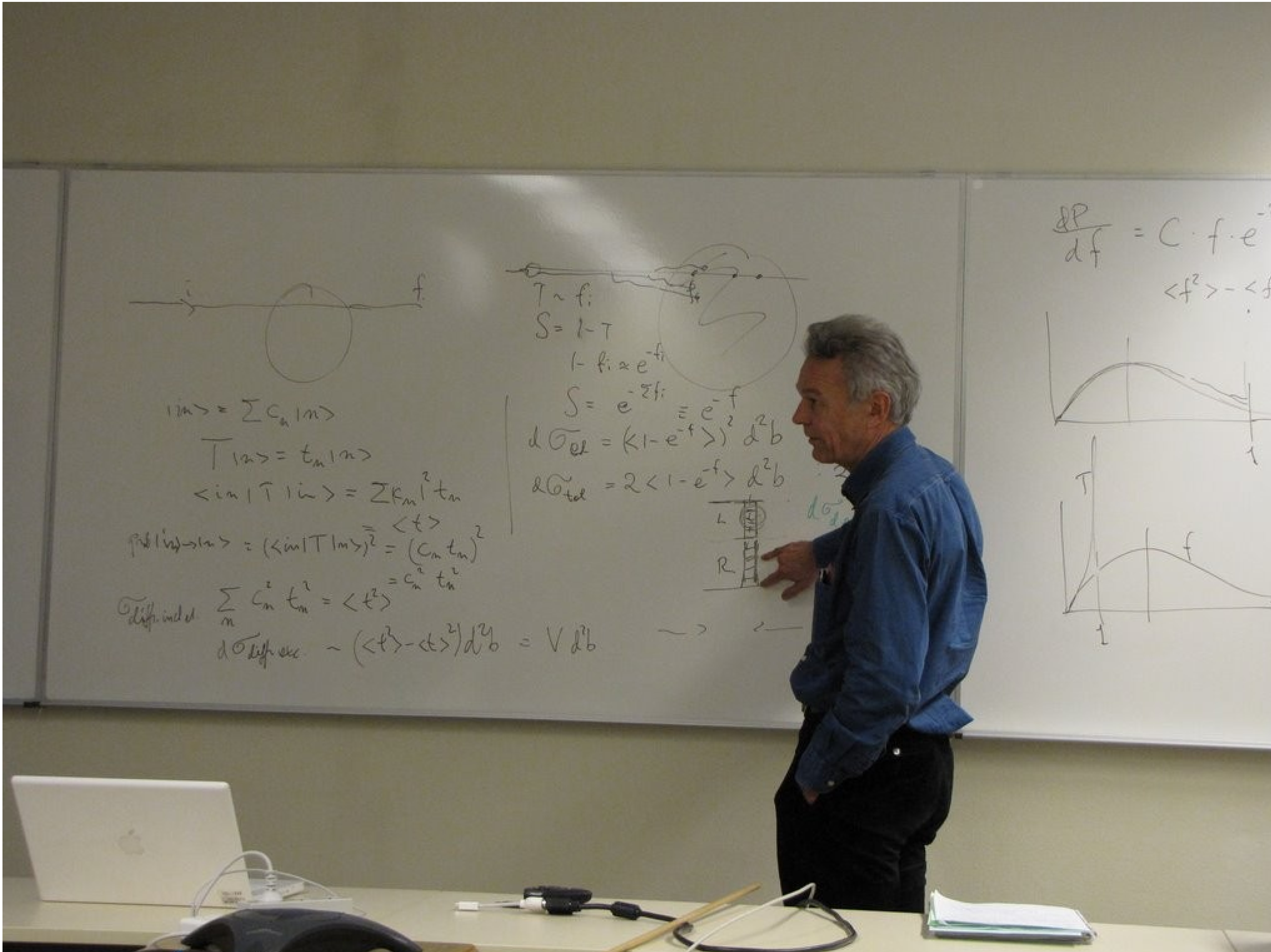
$d\sigma_{el} = (\langle 1 - e^{-f} \rangle)^2 d^2b \quad : (\langle t \rangle)^2$

$d\sigma_{tot} = 2\langle 1 - e^{-f}\rangle d^2b \quad : 2\langle t \rangle$

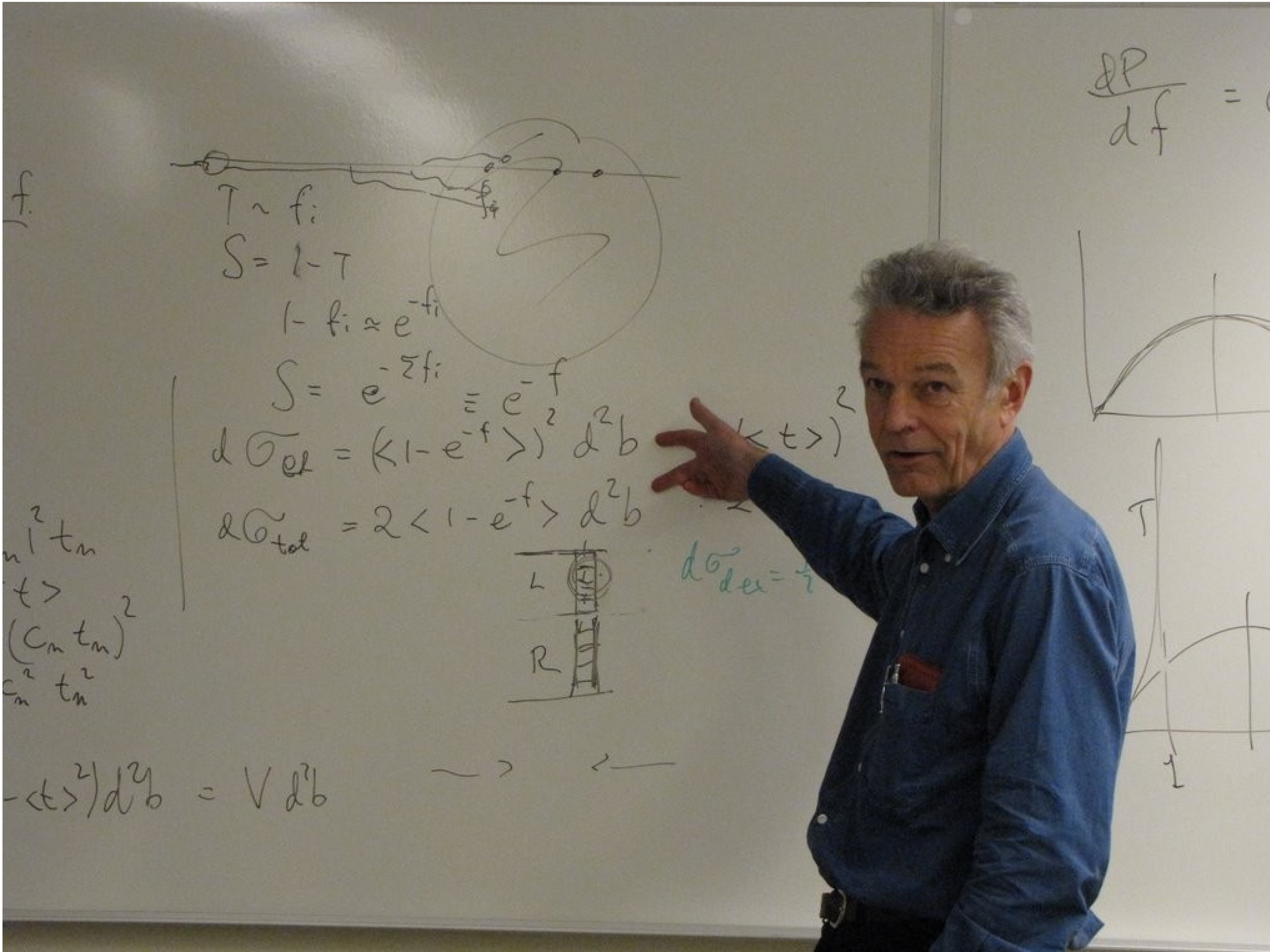
$d\sigma_{dex} = \frac{1}{2}\langle t \rangle^2$



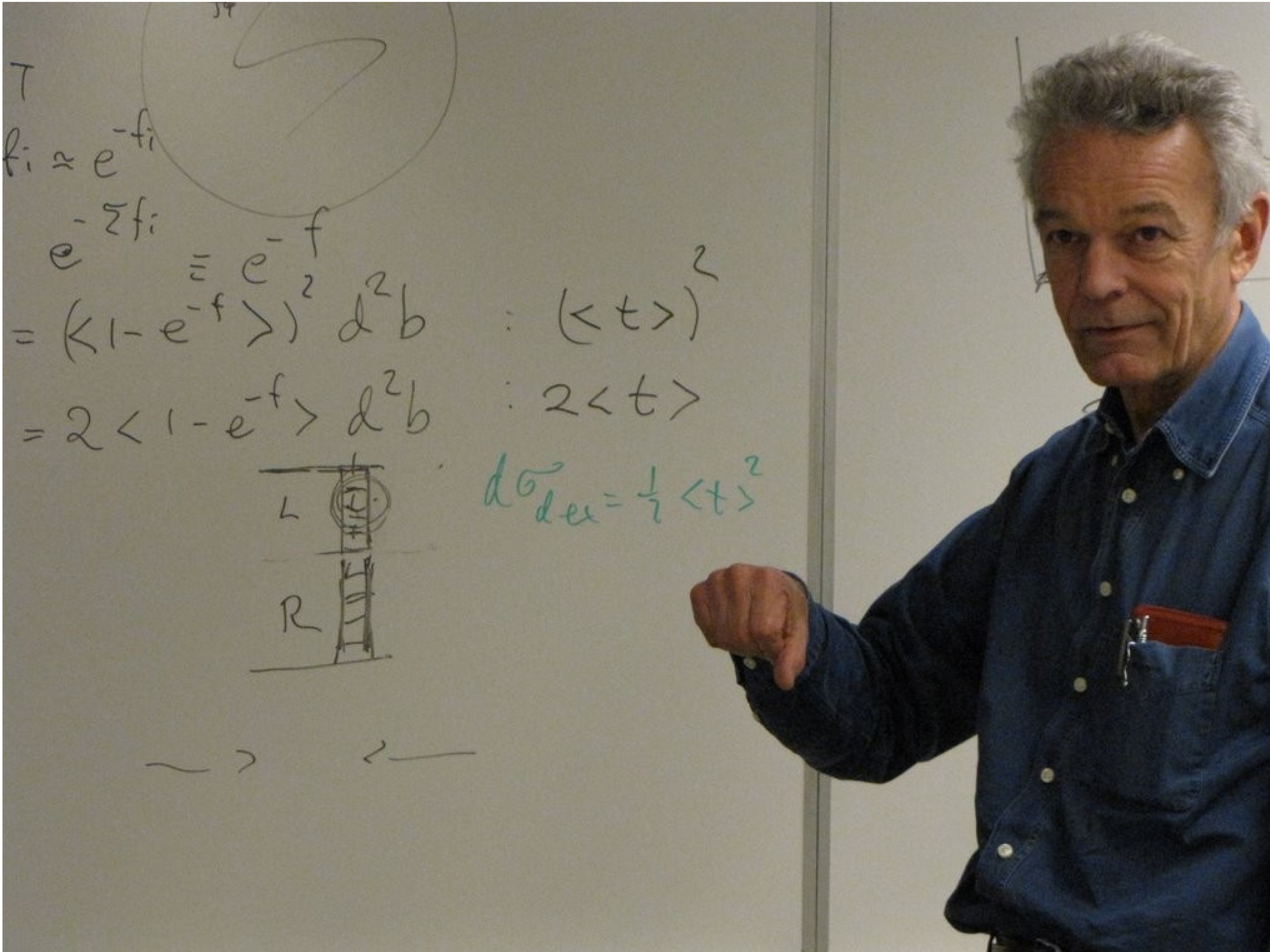
$\frac{dP}{df} = C \cdot f \cdot e^{-\frac{2f}{\langle f \rangle}}$
$\langle f^2 \rangle - \langle f \rangle^2 = \frac{1}{2} \langle f \rangle^2$
$T = 1 - e^{-f}$
$\langle f \rangle (b) = N e^{-r^2/R^2}$
N_{small} $f = T$
$\sigma_{diff\alpha} = \frac{1}{2} \sigma_{el}$
N_{large}
f
σ_{tot}
σ_{el}
T
r
$\sigma_{tot} \sim 2\pi R^2 \ln N$
$\sigma_{el} \sim \pi R^2 \ln N$
$\sigma_{dia} \sim \pi R^2 \left(\frac{5}{6} - \ln 2\right)$
$r = R \sqrt{\ln N}$



i
f
T ~ fi
S = 1 - T
1 - fi ≈ e^-fi
S = e^-Σfi = e^-f
|in> = Σ cn |n>
T |n> = tn |n>
<in | T | in> = Σ |cn|² tn = <t>
dσel = <1 - e^-f>² d²b
dσtot = 2 <1 - e^-f> d²b
L
R
prob |in> → |n> = (<in | T | n>)² = (cn tn)² = cn² tn²
σdiff.incl. Σ cn² tn² = <t²>
dσdiff.exc. ~ (<t²> - <t>²) d²b = V d²b
dP/df = C · f · e
<f²> - <f
T
f
1



T ~ f_i
S = 1 - T
1 - f_i ≈ e^{-f_i}
S = e^{-Σf_i} ≡ e^{-f}
dσ_el = (<1 - e^{-f}>)^2 d^2b
dσ_tot = 2 <1 - e^{-f}> d^2b
dP/df =



$f_i \approx e^{-f_i}$
$e^{-\Sigma f_i} \equiv e^{-f}$
$= (\langle 1-e^{-f} \rangle)^2 d^2b \;:\; (\langle t \rangle)^2$
$= 2\langle 1-e^{-f} \rangle d^2b \;:\; 2\langle t \rangle$
$d\sigma_{del} = \frac{1}{2}\langle t \rangle^2$
L
R