

The Journey from Black-Hole Singularities to a Cyclic Cosmology

Sir Roger Penrose



GRESHAM
COLLEGE

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are switched off**

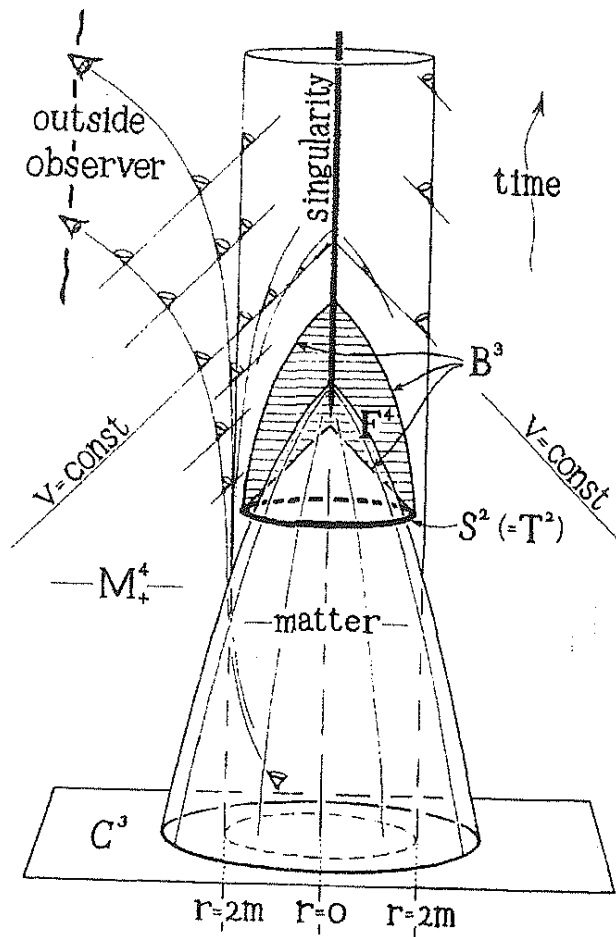
Thank you



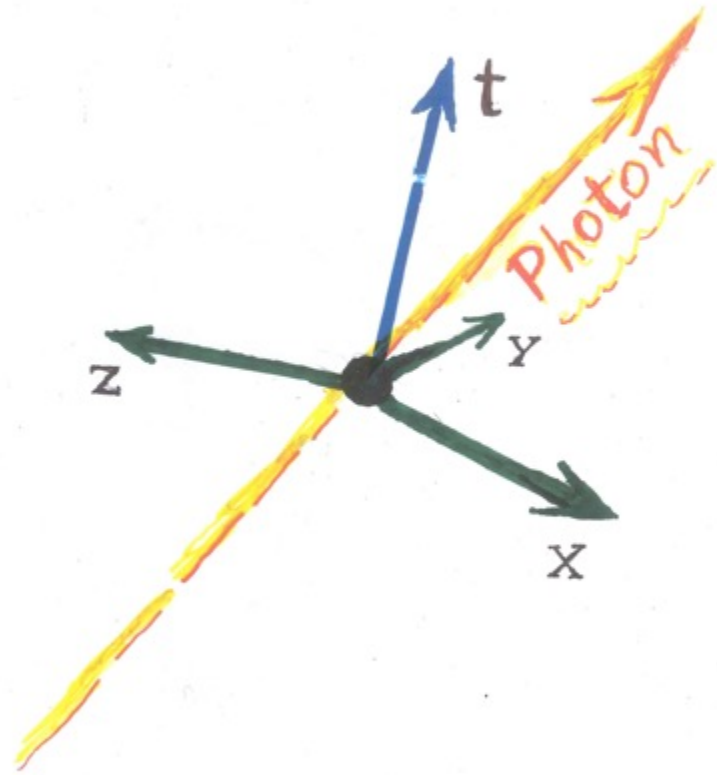
Introductory remarks by Professor Simon Thurley

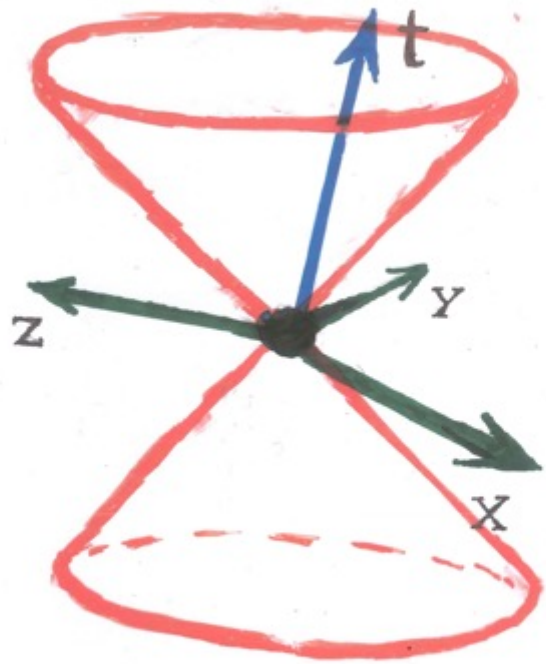
Provost, Gresham College

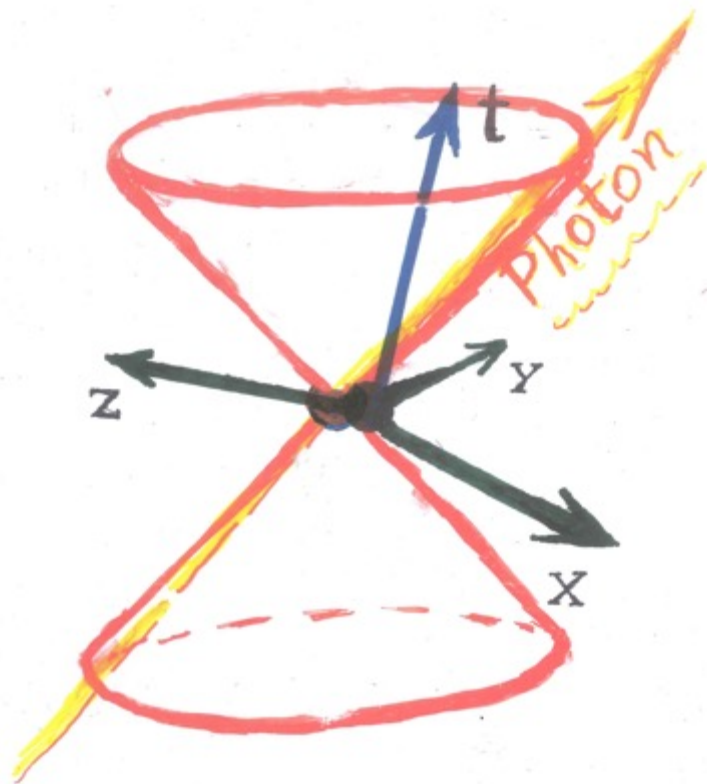




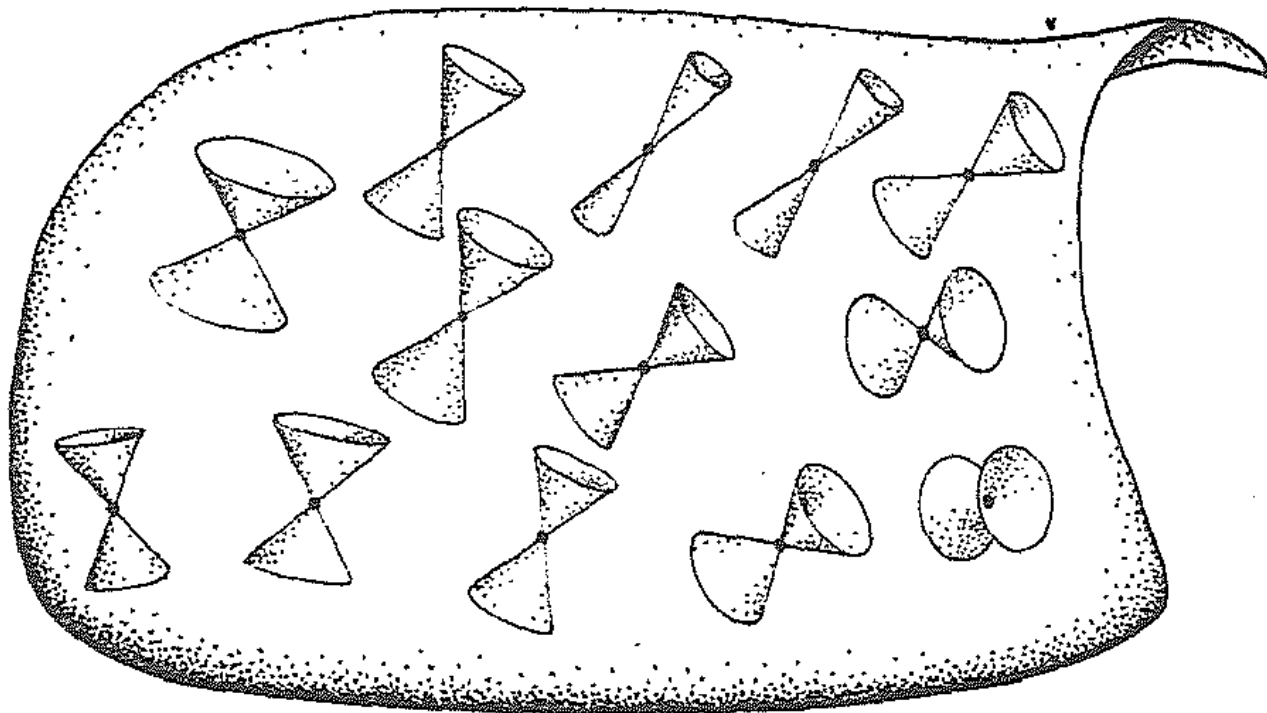


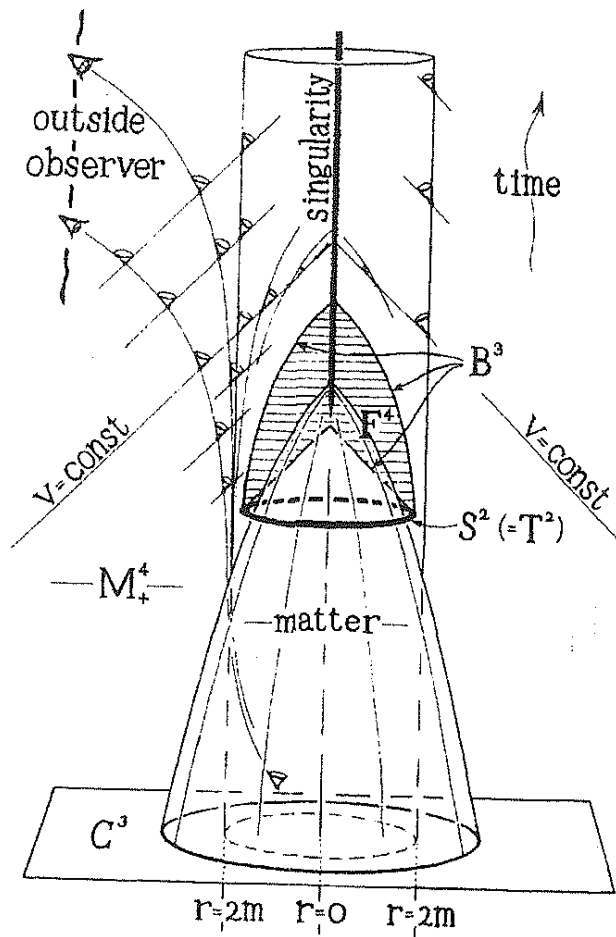












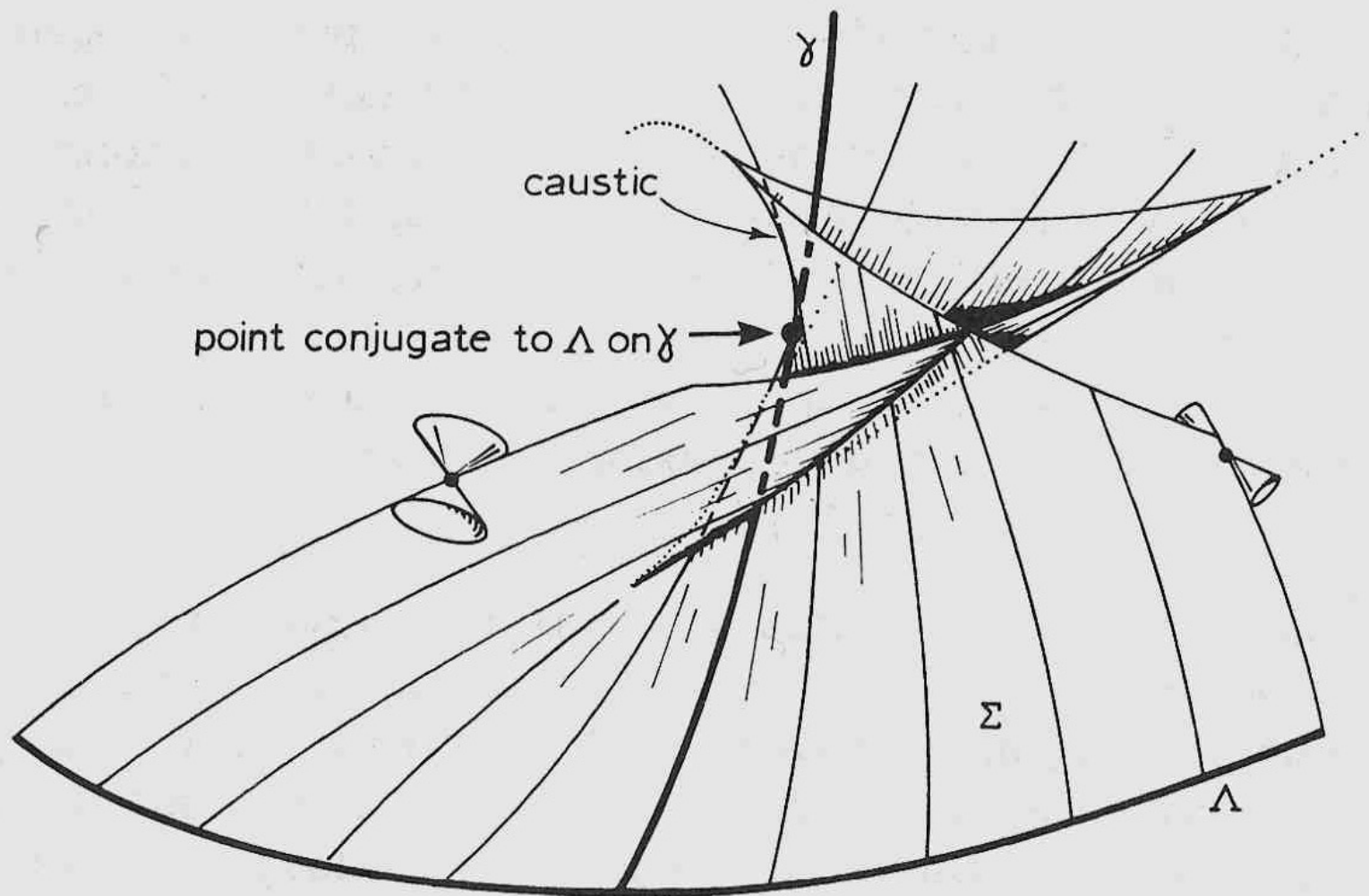
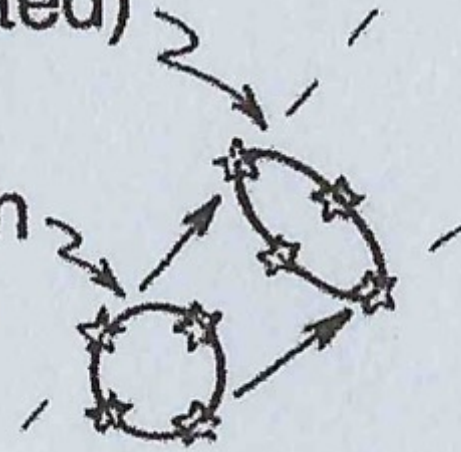
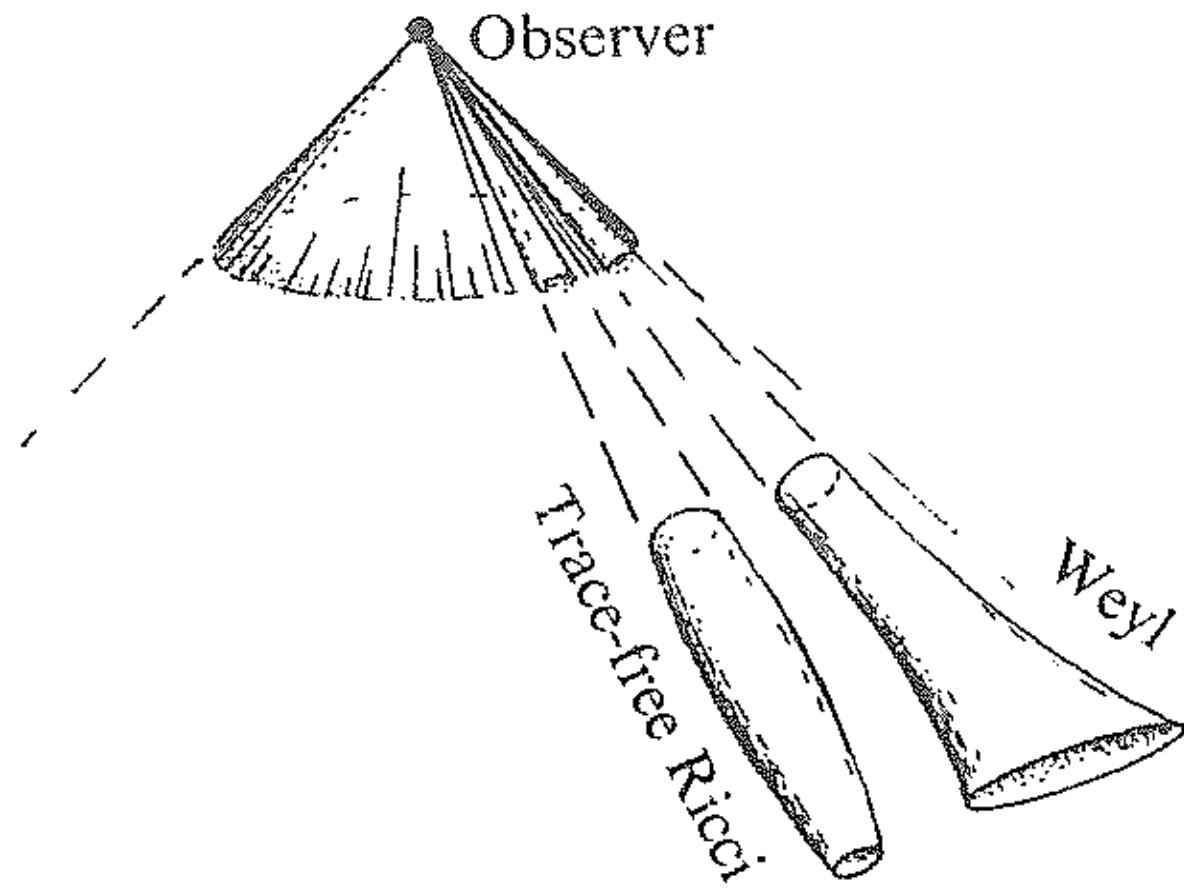


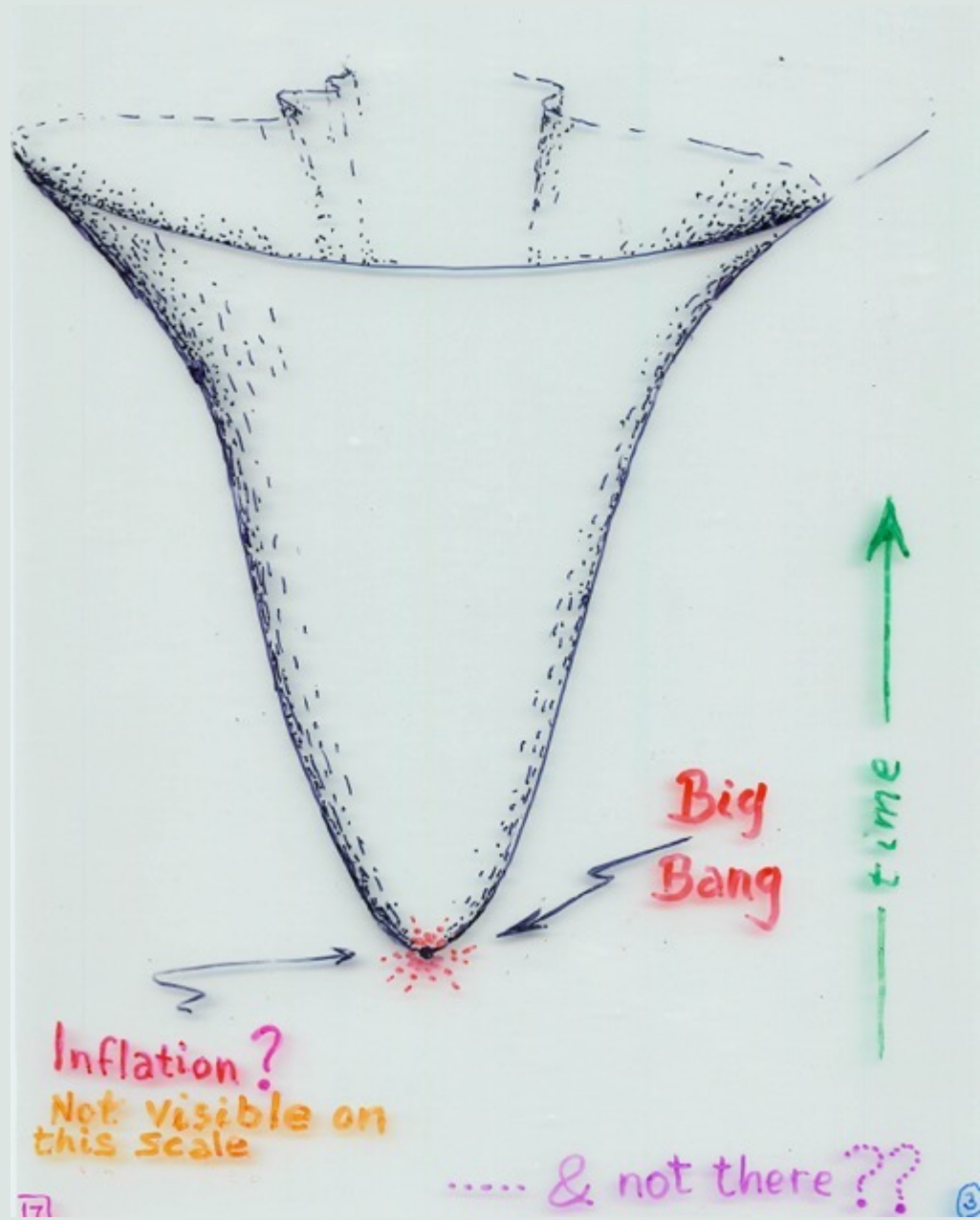
FIG. 111. A surface with a curve γ and a point conjugate to Δ on γ .

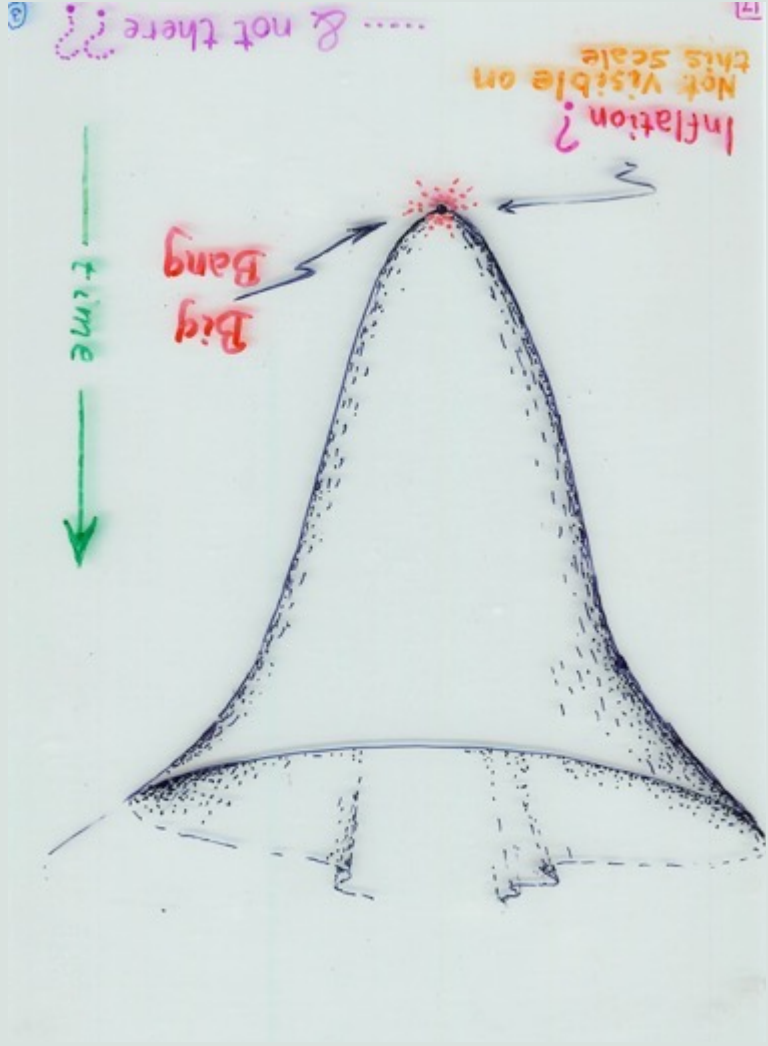
Apparent (distorted)
star field

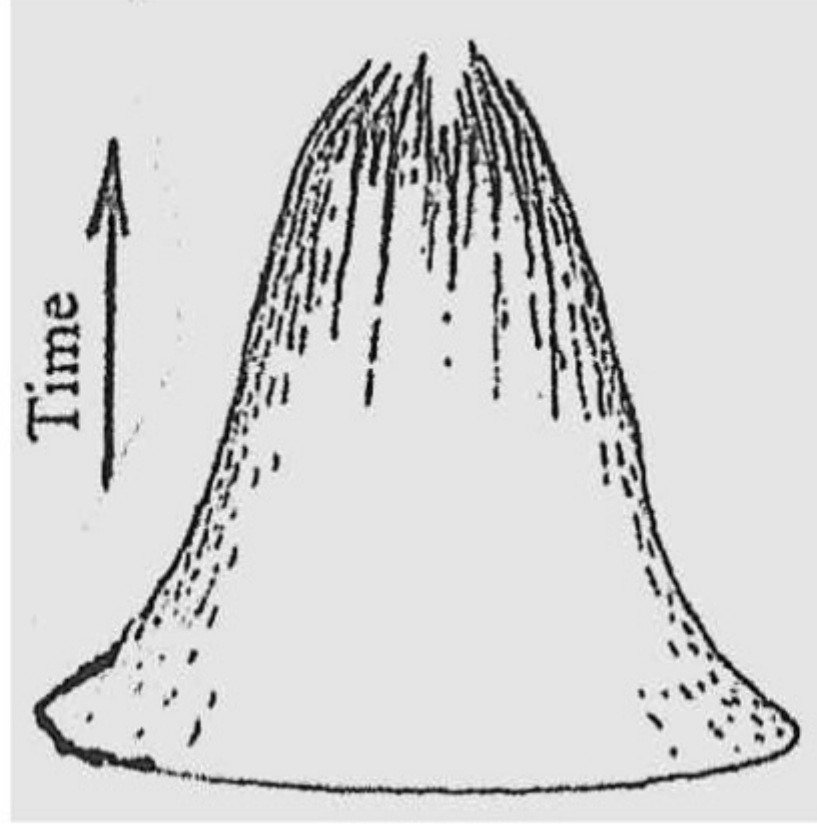
Star field if sun
were absent

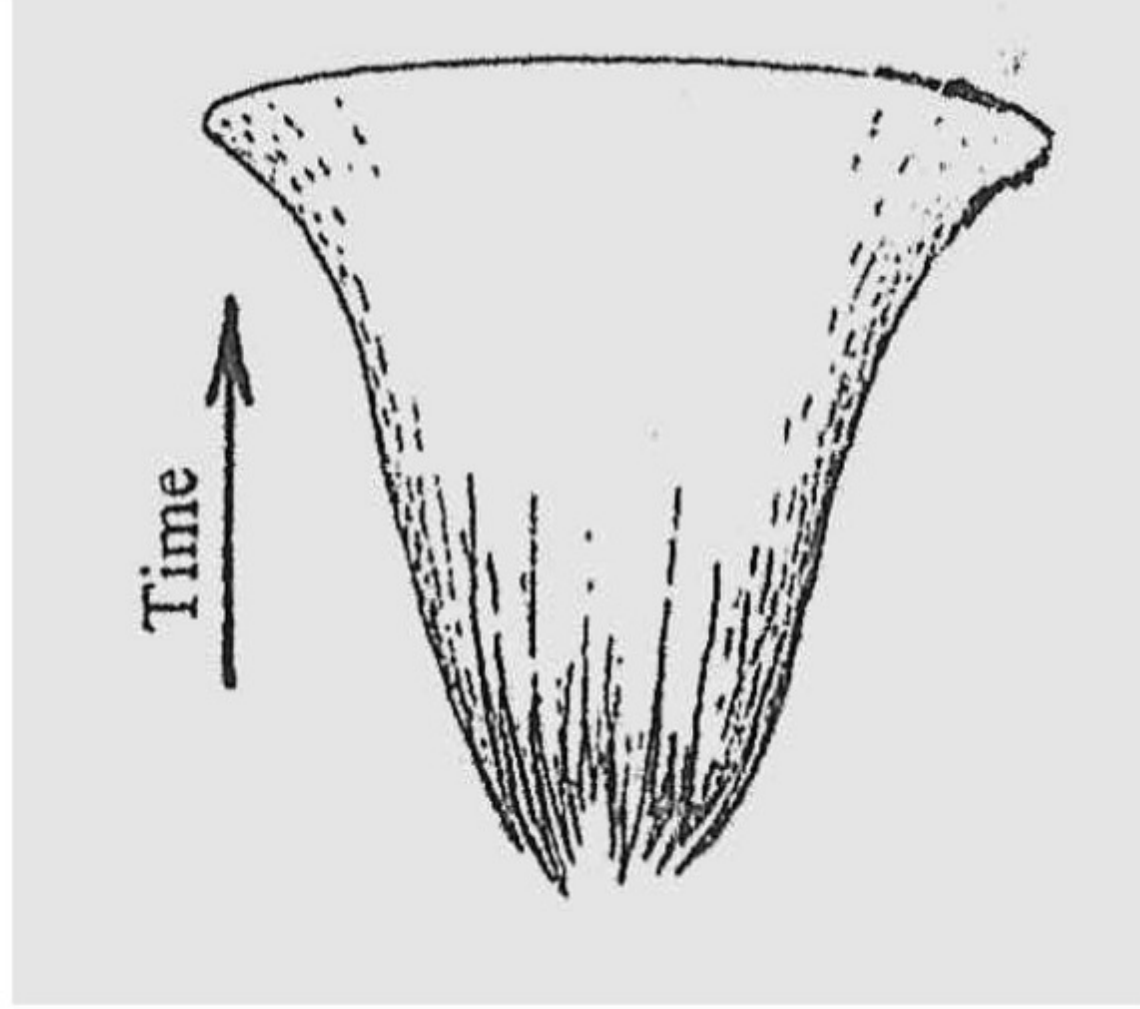


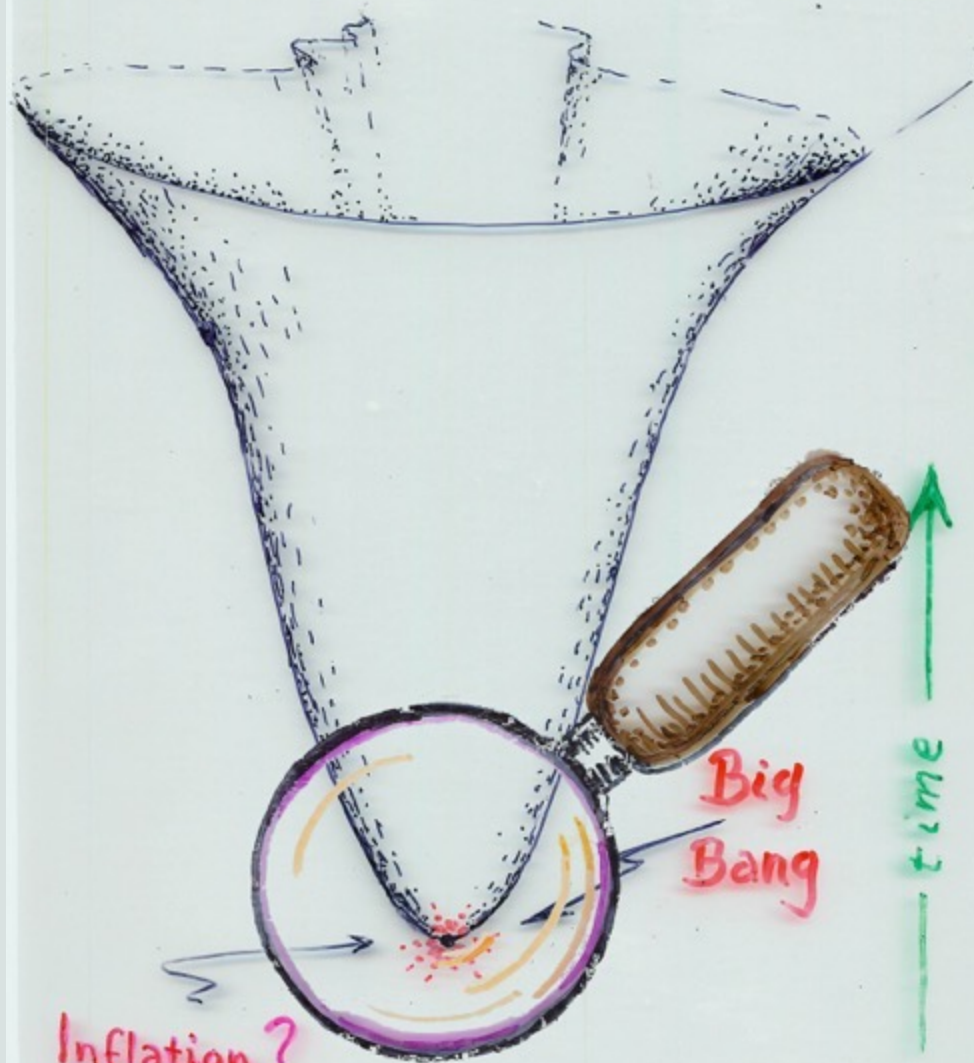












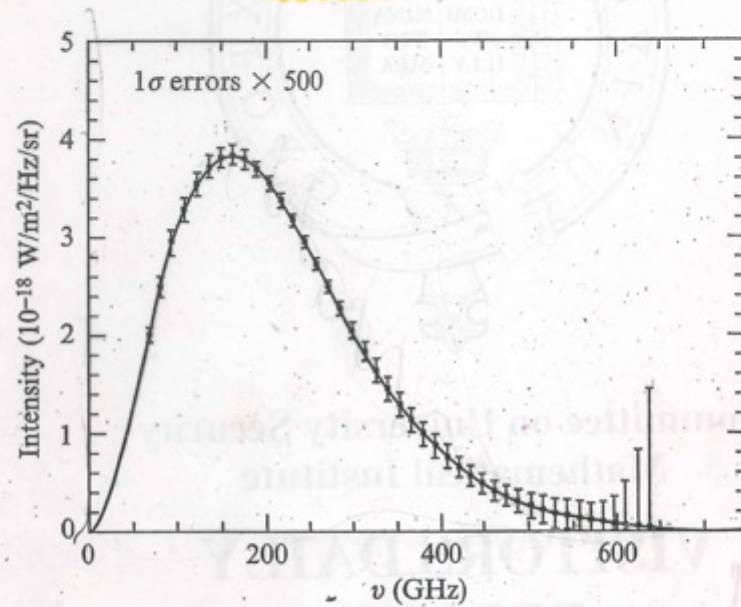
Inflation?
Not visible on
this scale

..... & not there??



Spectrum of the Cosmic Microwave Background

CMB



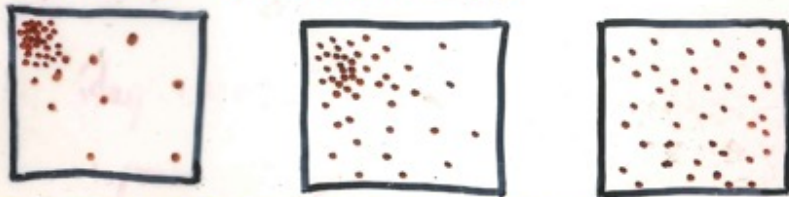
Note: error bars are exaggerated by a factor of 500.

The solid curve displays the Planck black body spectrum of thermal equilibrium.

2nd Law of Thermodynamics

Entropy increases with time
↳ "disorder" (roughly speaking)

Gas in a box



time increases →
entropy increases →

Gravitating bodies



Maximum entropy:
BLACK HOLE



Energy: conserved

As much energy goes back into space from the earth as comes in from the sun

Entropy: can keep it down
by absorbing few high-energy photons
& emitting many low-energy photons

Sun is hot spot in dark sky
From GRAVITATIONAL clumping

Space-time Singularities

Cannot be a purely quantum-gravity problem. because:

∴ Time-asymmetric theory!

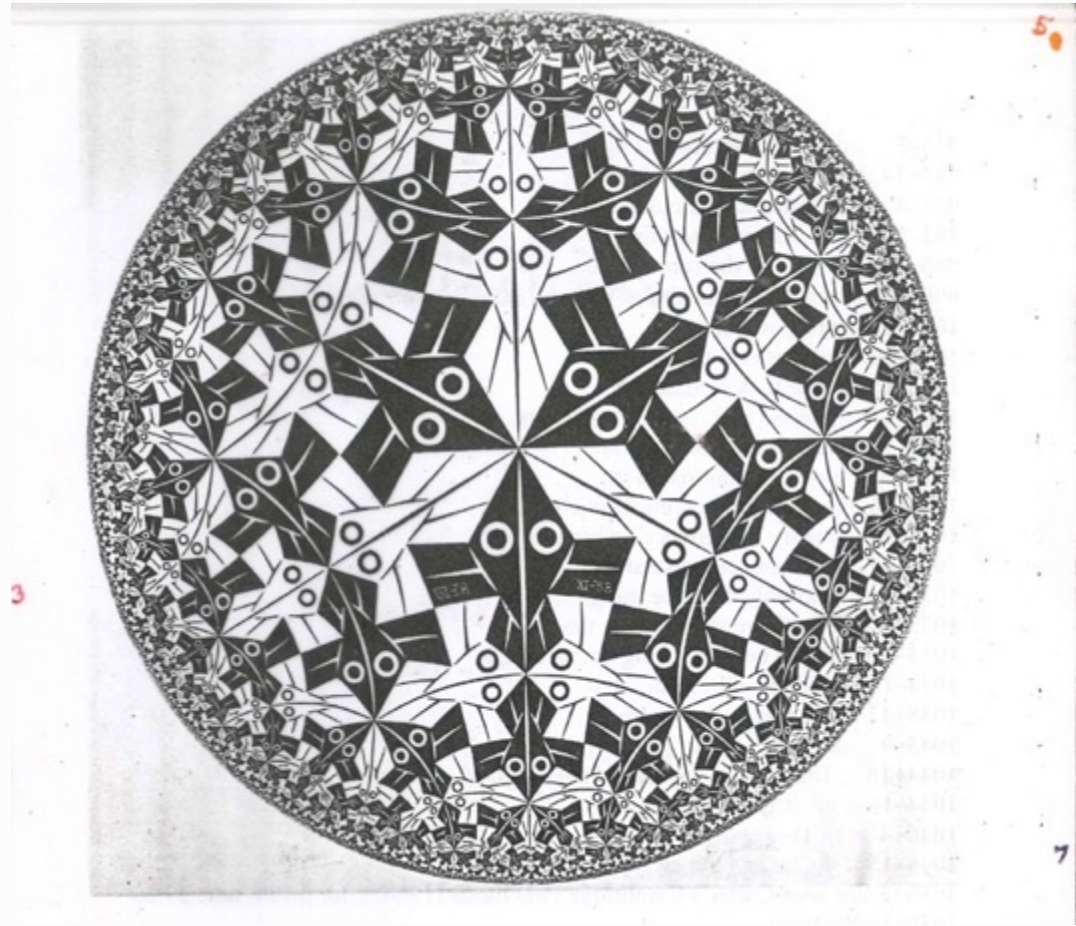
for singularities in black holes

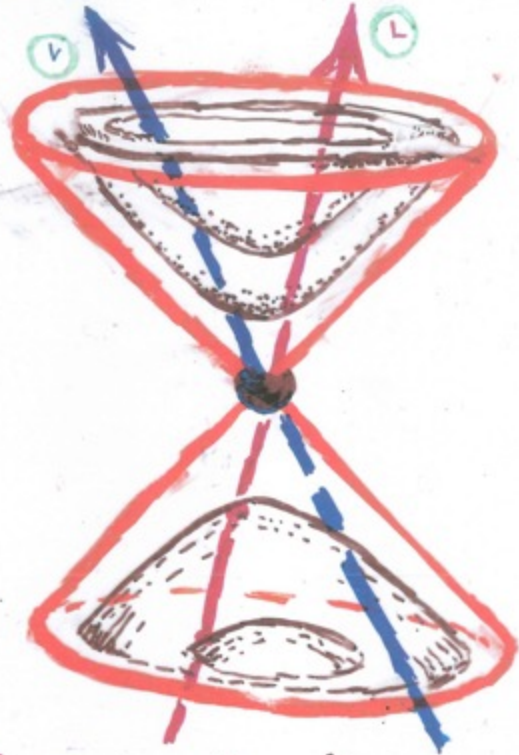
Weyl curvature $\rightarrow \infty$

for the Big Bang

Weyl curvature $\rightarrow 0$

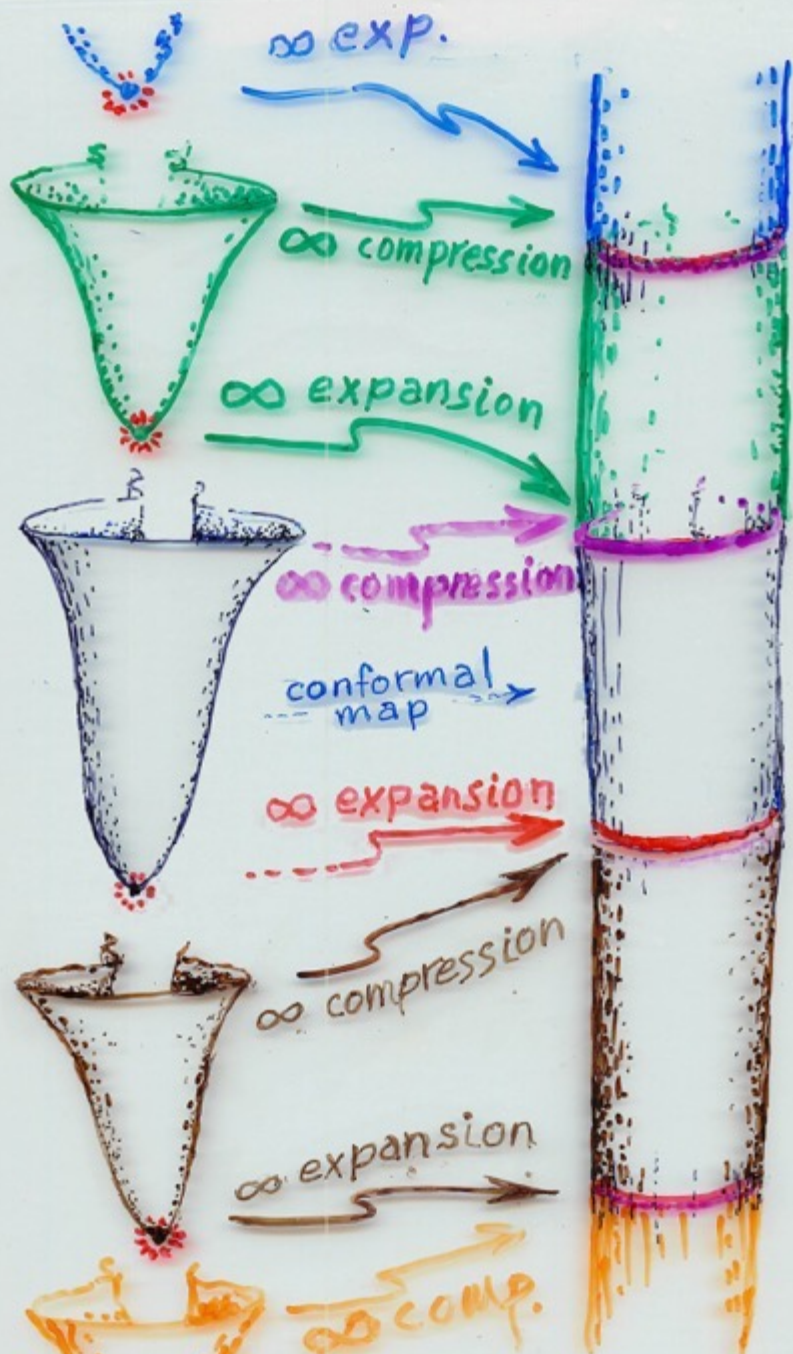




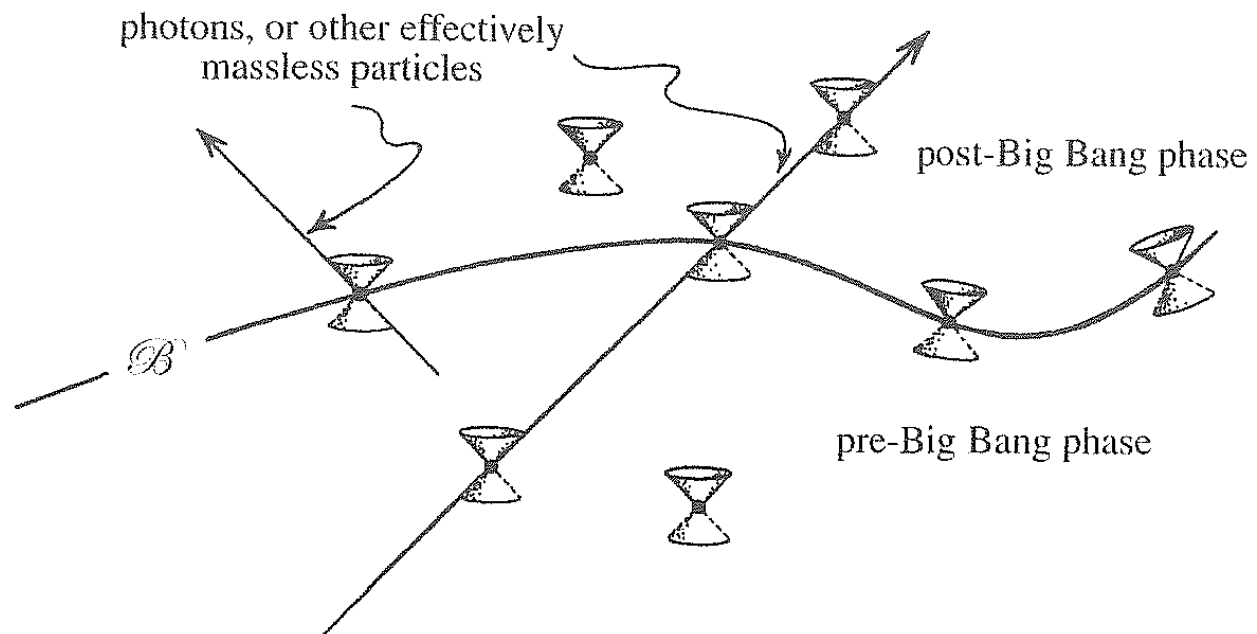


$$\left. \begin{array}{l} E = mc^2 \\ E = h\nu \end{array} \right\} \nu = m \left(\frac{c^2}{h} \right)$$

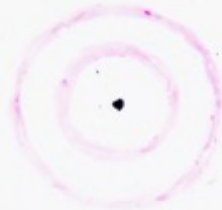
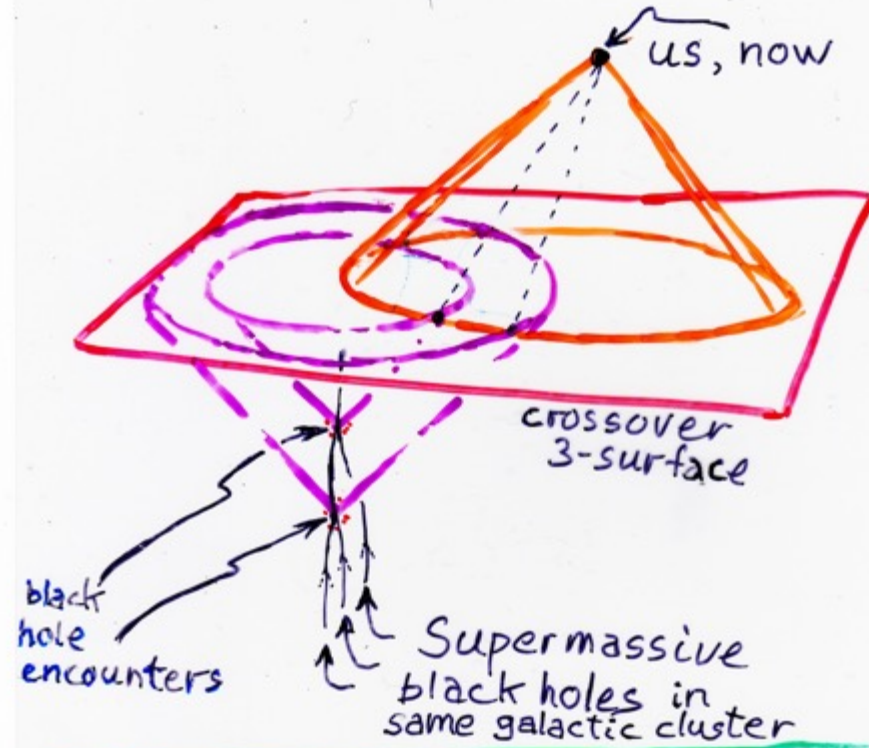




conformal cyclic cosmology (ccc)

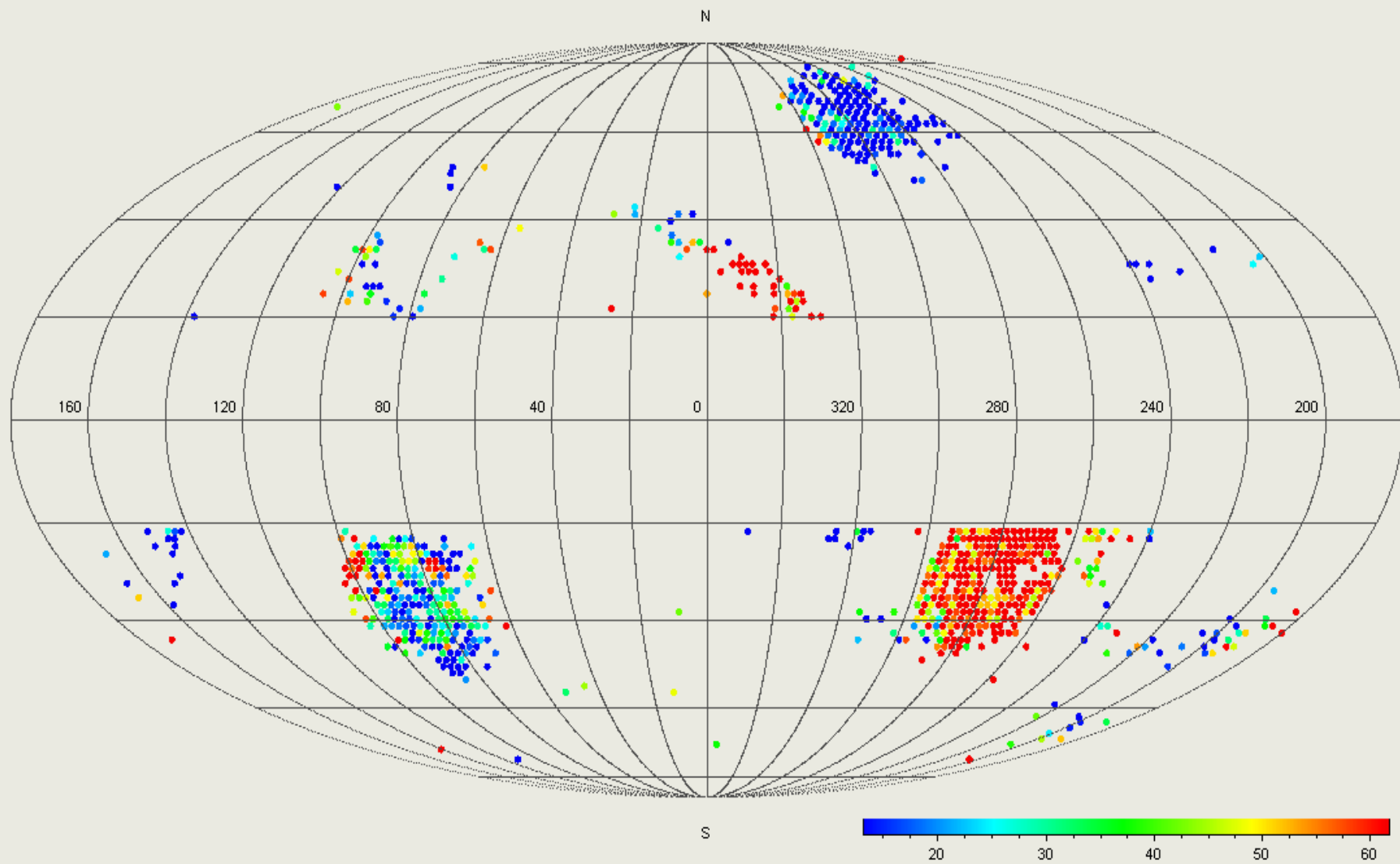


Can we "see" through
into the aeon prior to ours?

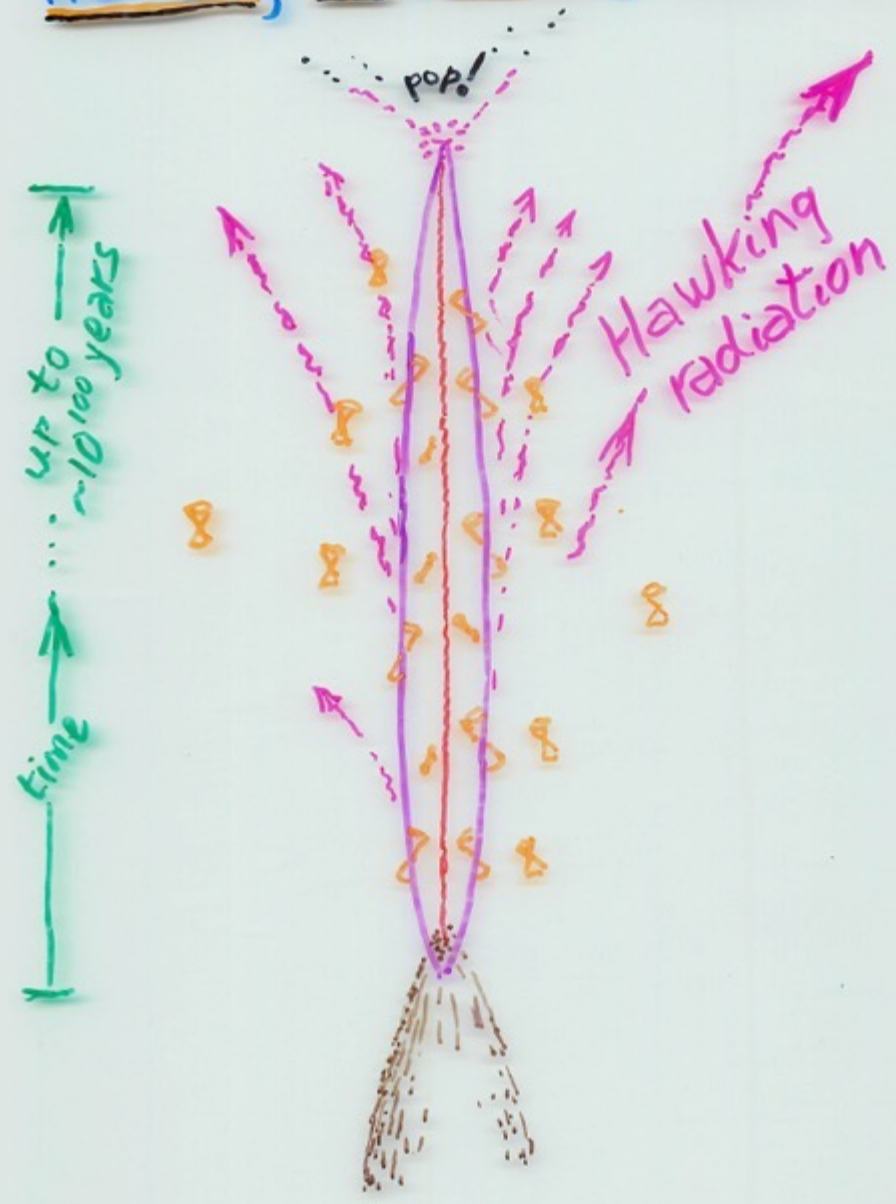


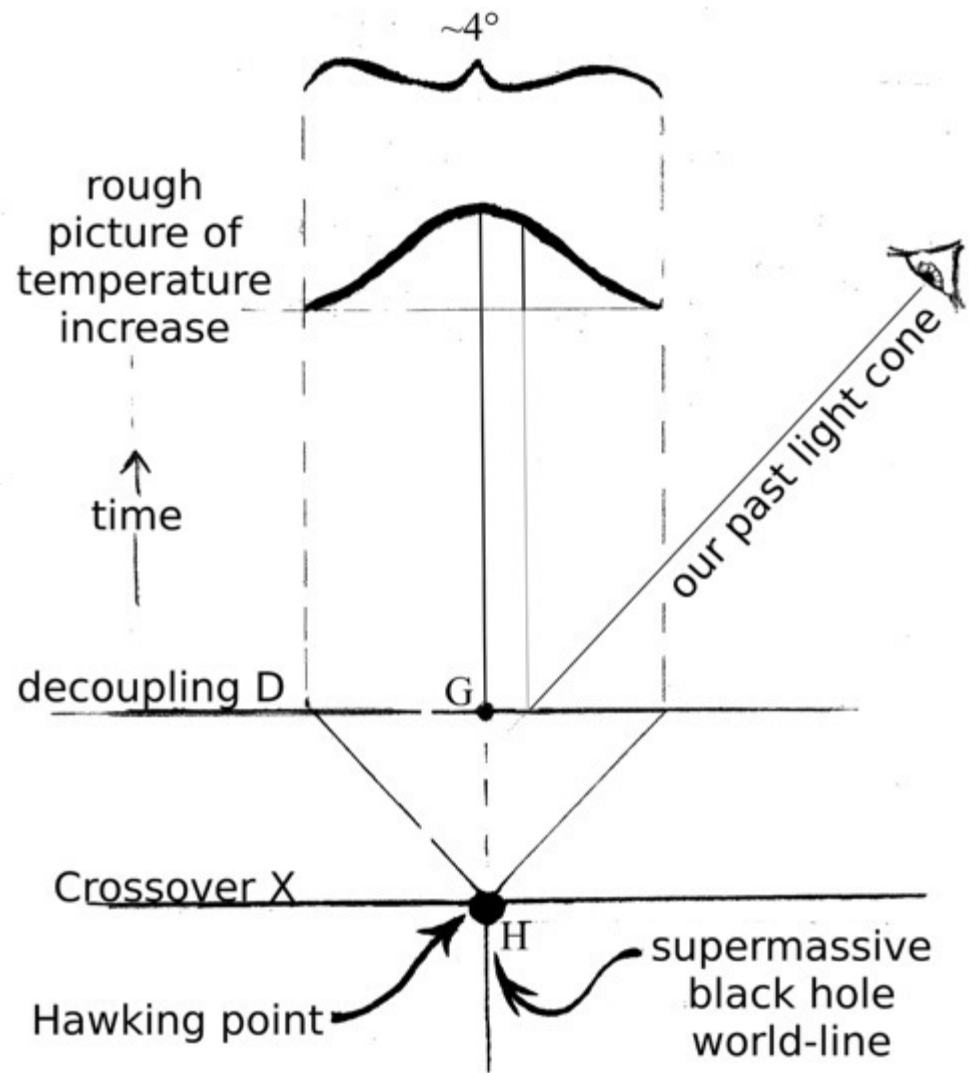
V. Gurzadyan

atypical
• temperature
↪ better diagnosis
• low variance
concentric rings

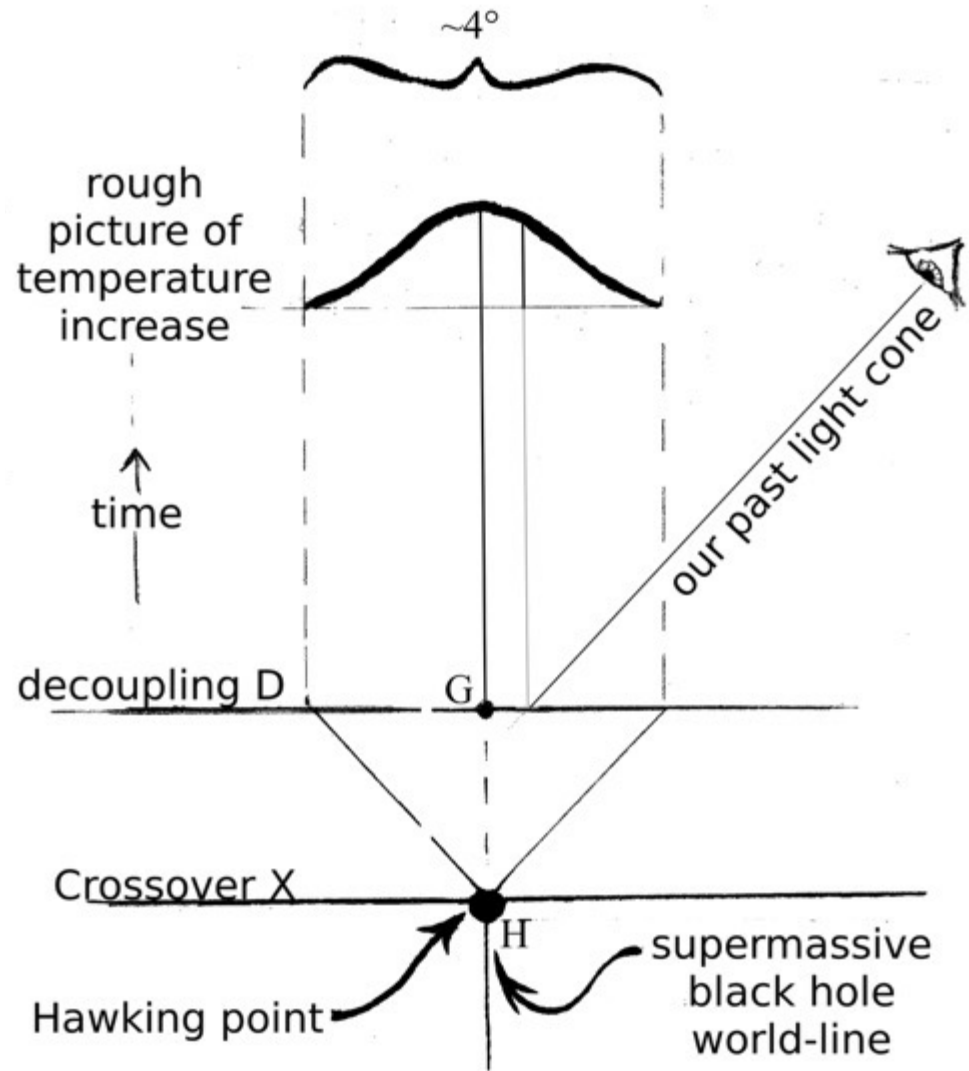


Hawking evaporating black hole





PREVIOUS AEON



PREVIOUS AEON

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