20. Roger Penrose – Cyclic Universe and Consciousness

1.Brief Biography & Context

Roger Penrose (b. 1931) is an English mathematician and theoretical physicist whose work reshaped our understanding of geometry, black holes, and the structure of spacetime. He received the 2020 Nobel Prize in Physics for demonstrating that black holes are a natural consequence of Einstein's theory. Beyond his achievements in relativity, Penrose ventured into cosmology with his proposal of Conformal Cyclic Cosmology (CCC) — a vision of the universe as an endless succession of cycles rather than a one-time Big Bang.

2.Core Theory

Conformal Cyclic Cosmology asserts that the remote future of our universe, when all mass decays and only radiation remains, becomes conformally equivalent to the Big Bang of a new universe. Each cycle, or 'aeon,' follows another without beginning or end, linked by a geometric rescaling of spacetime.

Mathematically, Penrose introduced a conformal transformation of the metric:

$$\delta g_{ab} = \Omega^2 g_{ab}$$

where $\Omega \longrightarrow 0$ in the infinite future of one aeon, allowing the geometry to remain finite

and smoothly connected to the Big Bang of the next. Thus, the end of one universe is mapped directly to the beginning of another.

3.What the Theory Explains Clearly

CCC provides a compelling narrative for avoiding a singular beginning. It explains how entropy might not grow without bound but reset across aeons. Penrose even suggested observational evidence, such as concentric low-variance circles in the cosmic microwave background, which might reflect collisions of supermassive black holes from a prior aeon.

4.Unresolved Issues / Limitations

CCC remains controversial. Many physicists argue that evidence for pre-Big Bang imprints is inconclusive. The requirement that all massive particles decay is also speculative, especially concerning protons, whose stability remains uncertain. Moreover, while the mathematics of conformal mapping is elegant, critics question whether it can adequately describe physical reality during extreme transitions.

5.Penrose's Perspective

Penrose viewed CCC as a way to reconcile entropy, cosmology, and the arrow of time. He resisted the notion of a singular, inexplicable beginning, insisting instead on continuity across aeons. For him, geometry — not merely particles — is the key to understanding the universe's deepest order.

6.CUWF Interpretation (Closing the Gap — Extended)

From the standpoint of the Chayut Universe Wave Function (CUWF), Penrose's vision resonates strongly. CUWF interprets the cycle not as conformal rescaling but as the return of the universal wave to stillness (Ψ_still) when entropy vanishes. From this absolute calm, even the smallest fluctuation ($\Delta\Psi > 0$) becomes the seed of a new resonance. Where CCC emphasizes geometry, CUWF emphasizes wave dynamics and entropy gradients. Both frameworks, however, point toward the same truth: no final beginning, no ultimate end — only the eternal rhythm of dissolution and renewal.

Mathematically, CUWF frames the transition as:

$$\lim (S \longrightarrow 0)\ \Psi(t) = \Psi\_still$$

$$\Psi\_next = \Psi\_new \quad if \quad \Delta\Psi > 0 \quad at\ \Psi\_still$$

Here, entropy collapse leads to stillness, and stillness enables rebirth.

7.Summary & Transition

Penrose's cyclic cosmology reframes the universe as an infinite sequence of aeons, bridging the end of one cosmos to the birth of the next. While CCC relies on conformal geometry, CUWF extends this into the language of waves and entropy. Together they challenge the notion of a singular beginning. This prepares the ground for Hugh Everett

III's Many Worlds Interpretation (Section 19), which addresses multiplicity not in time cycles, but in parallel realities branching within the quantum wave.