7.3 Prediction of Multiverses

The goal of a universe could be to obtain a symbolic framework for generating information and thus knowledge, which can be superimposed on the universal photon as needed through fusion.

At the beginning of the universe, there is a photon similar to a blank hard drive without any information or knowledge. As space expands and its impulse divide, the information in the universe also grows. A treasure trove of knowledge from lived experience begins to form. According to the FSM model, the viable time in the universe is limited to only the first quarter of its period *T*. It would be a waste of energy and time, as well as a contradiction to the nature of nature, if new, more complex information were first formed in a universe and then simply disappeared again after a period of many billions of years. There must therefore be other places where this information could go. Using a multiverse, the information would be able to move to neighbouring universes and continue to grow. Such universes must be directly and comprehensively based on ours, which, among other things, currently form a viable environment. Since a universe only allows life within the first quarter period, at least four universes must exist as neighbours, offset by a quarter period. At the same time, other universes will already have begun to develop their own information in a temporal overlap. There must therefore be a multiple of four universes available as immediate neighbours to our universe. They may be clustered together like soap bubbles and are interconnected in such a way that each universe could absorb all possible information from another universe regardless of its spatial extent.

The mathematical representation of energy for a multiverse could be described as follows:

$$E_{Multiversum} = \sum_1^n m_n \, c^2 \, \frac{1}{\sin(\alpha_n)} \qquad \text{with: } n \in \mathbb{N} \qquad (7.22)$$

The maximum speed V_{max} with $c = 299792458 \frac{m}{s}$, the gravitational constant with $G = 6{,}67 \; 10^{-11} \, N\frac{m^2}{kg^2}$ and the Planck's constant with $h = 6{,}626 \; 10^{-34}$ Js seem to be a characteristic feature of the origin of universes. It represents a thumbprint of the universal photon.

Figure 7.4 could show the aforementioned foam of the multiverse.

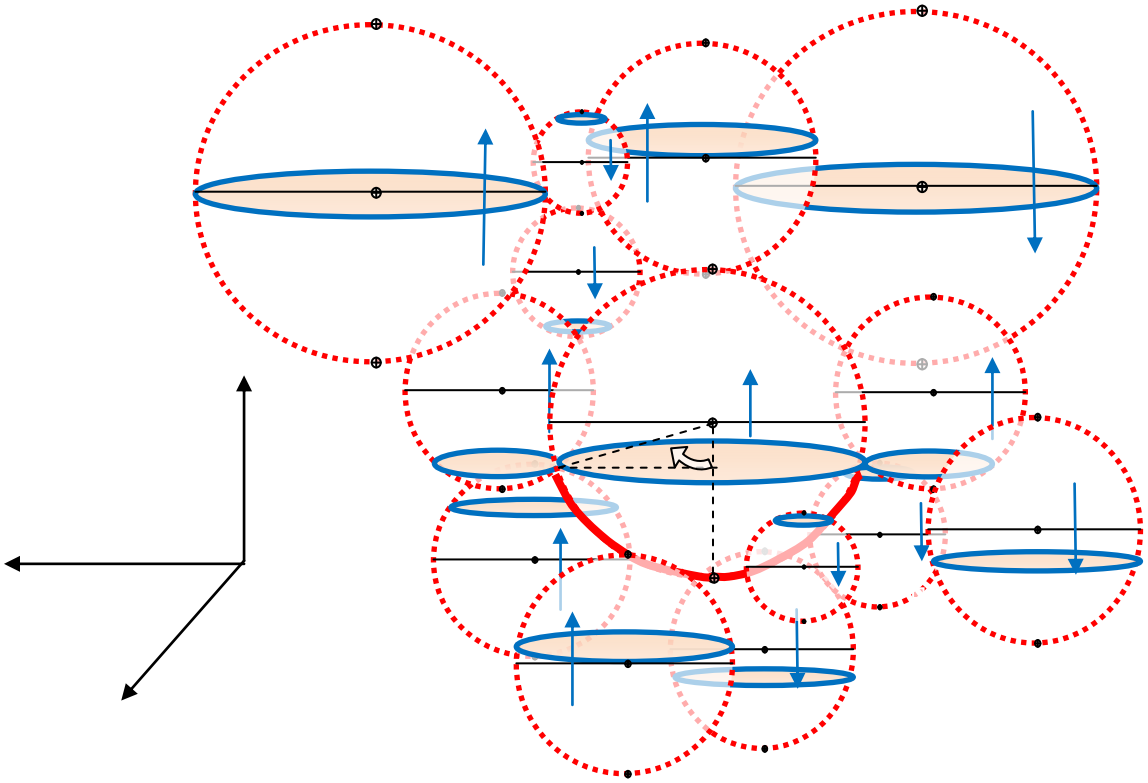

Figure 7.4: Multiple universes based on our own

The Landscape Problem and the FSM Solution

Context of the problem:

The landscape problem in string theory is that there are an extremely large number of possible vacua often 10^{500} or more. Each vacuum can give rise to different physical constants, particle masses and even different gauge groups. As a result, the theory largely loses its predictive power – almost any observation can be explained by a suitable vacuum.

How FSM solves the landscape problem:

The FSM structurally avoids the landscape problem by making assumptions that differ fundamentally from those of string theory. The solution arises from several interrelated principles.

a) Fixed and small number of dimensions

- The FSM operates with **exactly 7 dimensions** (4 visible + 3 compact)
- Unlike string theory, there are not an arbitrary number of extra dimensions, nor is there a wide variety of Calabi-Yau manifolds. The three **compact dimensions** (D_4, D_5, D_6) are **fixed** and **oscillate dynamically**.

b) Dynamic rather than static compactification

- The compact dimensions oscillate with cos($kt + \beta$). As a result, there are **no static vacua** in the string sense.
- The **geometry is time-dependent**. This alone drastically reduces the number of possible stable configurations.

c) Fixed initial symmetry and geometric refraction

- **Fixed** symmetry group **SU(4)**.
- This **breaks dynamically** to SU(3) × U(1) via the phase angle β and the oscillation.
- There are **no arbitrary gauge groups** or arbitrary symmetry breaking as in the string landscape.

d) Topological and geometric fixing of constants

Many fundamental quantities cannot be chosen arbitrarily, but are determined geometrically or topologically:

- Number of **generations = 3** (based on the number of turns $n = 1, 2, 3$)
- **Fine-structure constant α ≈ 1/137**
- **Anomaly-free** via Chern classes ($c_1 = 0$, $c_3 = 0$)
- Colour neutrality and transition achieved by **projecting** onto the visible area

e) A multiverse with uniform constants as a ‘fingerprint’

- The universal photon is the **origin** of the universe
- **Any number** of universes can come into being.
- **Crucially:** all these universes share the **same fundamental constants** (like a fingerprint). They differ only in size, depending on the energy input, and in the **current stage of their periodic expansion.**
- The universes are **interconnected** via the universal photon.
- Because universes go through different phases of their oscillation (**Figure 7.4**), information or life can **migrate** from an ‘unfavourable’ universe to a life-friendly one (e.g. the first quarter of the period).
- In the Planck regime, the universe does not collapse into a singularity, but into a **pure wave state**. When transformed back using relativistic principles, this leads to a **resonance with the universal photon**. No information is lost; instead, it is written back into a shared ‘quantum register’ of all universes. The FSM possesses **built-in quantum consistency** on the Planck scale, even without a complete quantum field theory of the metric having been formulated.

This multiverse is not a landscape in the string theory sense, because the physics is the same in all universes. There are no arbitrary vacua with different laws.

Unresolved issues:

Although FSM largely avoids the landscape problem, some questions remain unanswered:

- How does the mechanism of the universe's creation from the universal photon work?
- What determines the energy distribution, and why should the values differ?
- Information transfer: How exactly can information or 'life' be exchanged between universes in different phases?
- Testability of the multiverse and its linking mechanism
- Entropy and information: How is the loss of information dealt with in collapsing or 'unfavourable' universes?

The FSM solves the landscape problem by severely restricting the degrees of freedom from the outset. Because so many constants are fixed, no classical landscape emerges. Instead, the FSM model allows for a multiverse with uniform physics, in which universes differ only in size and their current state of expansion.

The dynamic details of the origin of the universe and the specific transfer of information between universes remain unclear at this stage.

Possible links between FSM and quantum information theory

In FSM, the universal photon is the common origin of all universes. It connects these universes in a fundamental, non-local way.

The universal photon as a non-local channel of information:

- **Entanglement** (EPR) is equivalent to an Einstein–Rosen wormhole (ER)
- The **universal photon** can be interpreted as a **shared entangled state** that connects all universes, much like a **quantum network** in which the individual universes act as nodes.
- In principle, **information** can be exchanged between universes without signals having to exceed the speed of light in the classical sense – **quantum teleportation**.

Phase-dependent multiverse and quantum information:

The FSM posits that different universes are at different stages of their periodic expansion. A universe in an 'unfavourable' phase (e.g. excessive expansion or contraction) can transmit information to a universe in a 'life-friendly' phase (e.g. the first quarter of the cycle).

- This corresponds to the concept of **quantum error correction** from quantum information theory. Information is not lost, but is distributed redundantly across multiple 'codes' – in this case, universes in different phases.
- A universe in an 'unfavourable' phase can be regarded as a **decoherent state**, whilst another universe in a 'favourable' phase functions as a **coherent, information-preserving state**.
- The transmission of information between universes via the universal photon can be understood as a form of **quantum teleportation** or **quantum communication** over long distances (between universes).

Preservation of quantum information:

In FSM, the problem of information loss in black holes or during transitions between universes is mitigated by the **universal photon** and the **phase-dependent structure**.

- **Information is not lost**, but is 'transferred' to other universes that are in a more information-friendly phase.
- The universal photon acts as a **shared quantum memory** or as a **medium for entanglement**, much like a **quantum register** in quantum information theory.

Spin-0 pair state and entanglement:

The spin-0 pair state of dark energy described in the FSM (**Chapter 2.2, Point 18**), involving two entangled spin-1 photons with opposite helicities, is already a concept derived directly from quantum information theory.

- This is a **maximally entangled state**.
- As long as the pair exists such that $f < f_{min}$, it is **non-separable** – a measurement on one part of the pair instantly affects the other part.
- This is a direct application of **quantum entanglement** on a **cosmological scale**.

The FSM forms a natural and consistent bridge to quantum information theory. It describes the multiverse as a quantum information system in which information can be preserved and exchanged between different 'branches'.