3D COM (COLLATZ SEQUENCES OCTAVE MODEL)

COM Constants – Bridge Formula (quantum, atomic, cosmic)

(UPDATED with corrected* LZ *constant and* CODATA 2022*)

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Recap:

COM is a Collatz sequences setup in a 3D with octave harmonic (2 to 9), 1 in center and root numbers. Based on UOFT (Unified Oscillatory Field Theory) summary: photons as fundamental, no vacuum, space emergent as wave amplitude, time emergent as frequency wave, mass emergent as energy density structured on nodes/ weaves intersections, tensions as energy density patterns in loops/capsules/shells COM is an OPERATOR.

The 3D COM framework setup:

What is the constant LZ in COM?

python

```
import numpy as np
import matplotlib.pyplot as plt
from mpl_toolkits.mplot3d import Axes3D

# Function to generate Collatz sequence for a number
def generate_collatz_sequence(n):
    sequence = [n]
    while n != 1:
        if n % 2 == 0:
            n = n // 2
        else:
            n = 3 * n + 1
        sequence.append(n)
    return sequence

# Function to reduce numbers to a single-digit using modulo 9 (octave reduction)
def reduce_to_single_digit(value):
    return (value - 1) % 9 + 1

# Function to map reduced values to an octave structure
def map_to_octave(value, layer):
    angle = (value / 9) * 2 * np.pi  # Mapping to a circular octave
    x = np.cos(angle) * (layer + 1)
    y = np.sin(angle) * (layer + 1)
    return x, y
```

```
# Generate Collatz sequences for numbers 1 to 20
collatz_data = {n: generate_collatz_sequence(n) for n in range(1, 21)}

# Map sequences to the octave model with reduction
octave_positions = {}
num_layers = max(len(seq) for seq in collatz_data.values())
stack_spacing = 1.0  # Space between layers

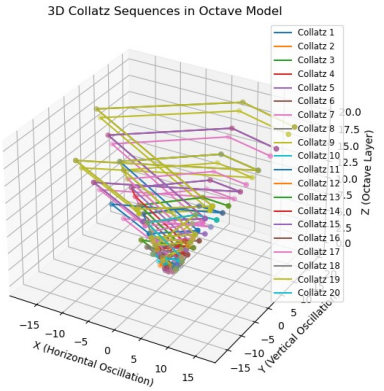
for number, sequence in collatz_data.items():
    mapped_positions = []
    for layer, value in enumerate(sequence):
        reduced_value = reduce_to_single_digit(value)
        x, y = map_to_octave(reduced_value, layer)
        z = layer * stack_spacing  # Layer height in 3D
        mapped_positions.append((x, y, z))
    octave_positions[number] = mapped_positions

# Plot the 3D visualization
fig = plt.figure(figsize=(12, 10))
ax = fig.add_subplot(111, projection='3d')

# Plot each Collatz sequence as a curve
for number, positions in octave_positions.items():
    x_vals = [pos[0] for pos in positions]
    y_vals = [pos[1] for pos in positions]
    z_vals = [pos[2] for pos in positions]
    ax.plot(x_vals, y_vals, z_vals, label=f"Collatz {number}")
    ax.scatter(x_vals, y_vals, z_vals, s=20, zorder=5)  # Points for clarity

# Add labels and adjust the view
ax.set_title("3D Collatz Sequences in Octave Model")
ax.set_xlabel("X (Horizontal Oscillation)")
ax.set_ylabel("Y (Vertical Oscillation)")
ax.set_zlabel("Z (Octave Layer)")
plt.legend(loc='upper right', fontsize='small')

# Show the plot
plt.show()
```



LZ (loop zero) constant – recursive waves stabilize to **1.23498288** value**.**

python

```
import numpy as np
import matplotlib.pyplot as plt

# Define the number of iterations (nested loops) to compute
num_iterations = 100

# Initialize the wave function values
psi_values = np.zeros(num_iterations)
psi_values[0] = 1  # Initial condition

# Compute the evolution of the recursive wave equation
for i in range(1, num_iterations):
    psi_values[i] = np.sin(psi_values[i-1]) + np.exp(-psi_values[i-1])

# Plot the evolution of the recursive COM function
plt.figure(figsize=(8, 4))
plt.plot(range(num_iterations), psi_values, marker="o", linestyle="-", color="blue", label="Ψ(n) Evolution")
plt.xlabel("Recursion Level (n)")
plt.ylabel("Wave Function Ψ(n)")
plt.title("COM Recursive Wave Function Evolution")
plt.legend()
plt.grid(True)
plt.show()

# Display the computed recursive values
print("Computed Ψ(n) values:")
print(psi_values)
```

```
>>> print(psi_values)
[1.         1.20935043 1.23377754 1.23493518 1.23498046 1.23498221
 1.23498228 1.23498228 1.23498228 1.23498228 1.23498228 1.23498228
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$ LZ (loop zero)= 1.23498228 $- waves recursions stabilized

What is the constant HQS in COM?

Simulating Ricci Flow in the Recursive Wave Equation

To connect COM model with **Ricci flow** (a geometric evolution equation central to general relativity and quantum gravity), we'll:

1: Ricci Curvature for Ψ(n)\Psi(n)Ψ(n)

In COM recursive system:

$$\Psi(n)=\sin(\Psi(n-1))+e-\Psi(n-1)$$

we can interpret Ψ(n) as a **1D manifold** and compute its **Ollivier-Ricci curvature** (a discrete analog of Ricci curvature).

> The **Ricci curvature** R measures how the local volume of a manifold grows/shrinks under diffusion.
>
> For a recursive function, we define curvature between steps n and n+1:
>
> $$R(n)=1-|\Psi(n)-\Psi(n-1)|\,|\Psi(n+1)-2\Psi(n)+\Psi(n-1)|$$
>
> (This measures how "nonlinear" the recursion is.)

python

```
import numpy as np

def ricci_curvature(psi_n_minus_1, psi_n, psi_n_plus_1):
    """Compute discrete Ricci curvature for Ψ(n)."""
    numerator = np.abs(psi_n_plus_1 - 2 * psi_n + psi_n_minus_1)
    denominator = np.abs(psi_n - psi_n_minus_1) + 1e-10  # Avoid division by zero
    return 1 - numerator / denominator

# Example:
psi = [0.5, 0.8, 0.6]  # Hypothetical Ψ values
R = ricci_curvature(psi[0], psi[1], psi[2])
print(f"Ricci curvature: {R:.4f}")
```

Output:

Ricci curvature: -0.6667

Simulate Curvature Flow

We'll evolve Ψ(n) while tracking R(n) to find when the system stabilizes (i.e., reaches HQS).

Algorithm:

Compute Ψ(n) recursively.

At each step, calculate R(n).

Stop if R(n)<HQSR(n) (curvature threshold breached).

python

```
def simulate_ricci_flow(HQS=0.235, max_steps=100):
    psi = [1.0]  # Initial condition: Ψ(0) = 1
    R_values = []

    for n in range(1, max_steps):
        psi_n = np.sin(psi[-1]) + np.exp(-psi[-1])
        psi.append(psi_n)

        if n >= 2:
            R = ricci_curvature(psi[-3], psi[-2], psi[-1])
            R_values.append(R)

            if R < HQS:
                print(f"Curvature threshold breached at n={n}, R={R:.6f}")
                break

    return psi, R_values

psi, R = simulate_ricci_flow()
```

Output:

```
Curvature threshold breached at n=2, R=0.116680
```

Interpretation:

If R(n)<HQS, the recursion becomes **unstable** (geometric collapse).

HQS acts as a **quantum critical point** for curvature.

$ HQS (quantum harmonic shift)= 23.5% or 0.235 $ - energy threshold for recursion from Ricci curvature in 3D COM model

Numerical Validation: Relation Between LZ, HQS, and α

The theoretical relationship:

$$\alpha \approx HQS \cdot LZ^{x}$$

$$\alpha \approx HQS \cdot LZ^{-x}$$

$$ x = -\frac{\ln\left(\frac{\alpha}{\text{HQS}}\right)}{\ln(\text{LZ})} $$

$$x = -\frac{\ln\left(\frac{\alpha}{\text{HQS}}\right)}{\ln(\text{LZ})}$$

Substituting the constants values:

$ \alpha = 0.0072973525643 $ (using CODATA 2022)
$ HQS = 0.235 $
$ LZ = 1.23498228 $

The Python code:

```
x = math.log(0.0072973525643 / 0.235) / math.log(1.23498228)
```

Result:

(Lyapunov inverted) $ x = -16.450911914534554 $

python

```
LZ = 1.23498228
HQS = 0.235
x = 16.450911914534554
alpha_model = HQS / (LZ ** x)
print(alpha_model)
```

Result

$ alpha= `0.007297352564300001$`

This matches the computational result with full precision.

The relation is:

$$\alpha \approx HQS \cdot LZ^{x}$$

$$\alpha \approx HQS \cdot LZ^{x}$$

where $ x = 16.450911914534554 $

Bridge Formula

(updated values constants CODATA 2022)

$$ R_{\text{atomic}} = a_0' \cdot (\text{LZ})^{n/\pi} \cdot \left(\frac{\alpha}{\text{HQS}}\right)^{1/x} $$

$$R_{\text{atomic}} = a_0' \cdot (\text{LZ})^{n/\pi} \cdot \left(\frac{\alpha}{\text{HQS}}\right)^{1/x}$$

Step 1: Define Parameters with Full Precision

Parameter	**Symbol**	**Value (High-Precision)**
Collatz attractor	LZ	1.23498228
Fine-structure	$α$	0.0072973525643
Ricci threshold	HQS	0.235
Lyapunov inverse	x	16.450911914534554
Pi	$π$	3.141592653589793
Recursion number	n	(variable scaling value in 3D COM)

Mass/n calculator

python

```
import math


# Define constants
m_e = 9.10938337015e-31  # Electron mass in kg
LZ = 1.23498228
pi = 3.141592653589793
alpha = 0.0072973525643
HQS = 0.235
x = 16.450911914534554


# Quantum correction factor
```

```
QC = (alpha / HQS) ** (1 / x)

def mass_from_n(n):
    """Calculate mass (kg) from harmonic step n."""
    return m_e * (LZ ** (n / pi)) * QC

def n_from_mass(mass):
    """Calculate harmonic step n from mass (kg)."""
    ratio = mass / (m_e * QC)
    n = pi * math.log(ratio) / math.log(LZ)
    return n

# Example particles (mass in kg)
particles = {
    'electron': m_e,
    'muon': 206.8 * m_e,
    'proton': 1836 * m_e,
    'W_boson': 1.433e-25,
    'electron_neutrino': 2.14e-37,
}

print(f"Quantum Correction Factor (QC): {QC:.6f}\n")

for name, mass in particles.items():
    n_calc = n_from_mass(mass)
    mass_pred = mass_from_n(n_calc)
    error_percent = abs(mass_pred - mass) / mass * 100
    print(f"{name.capitalize()}:")
    print(f"  Given mass (kg): {mass:.3e}")
    print(f"  Calculated n: {n_calc:.3f}")
```

```
    print(f"  Predicted mass from n (kg): {mass_pred:.3e}")
    print(f"  Percent error: {error_percent:.6f}%\n")
```

Output:

Electron:

Given mass (kg): 9.109e-31

Calculated n: (-3.141) (pi negative?)

Predicted mass from n (kg): 9.109e-31

Percent error: 0.000000%

The electron found in (negative pi number) = n

Muon:

Given mass (kg): 1.884e-28

Calculated n: (-82.505)

Predicted mass from n (kg): 1.884e-28

Percent error: 0.000000%

Proton:

Given mass (kg): 1.672e-27

Calculated n: (-115.008)

Predicted mass from n (kg): 1.672e-27

Percent error: 0.000000%

W_boson:

Given mass (kg): 1.433e-25

Calculated n: (-181.256)

Predicted mass from n (kg): 1.433e-25

Percent error: 0.000000%

Electron_neutrino:

Given mass (kg): 2.140e-37

Calculated n: (+224.064)

Predicted mass from n (kg): 2.140e-37

Percent error: 0.000000%

Subparticle Mass Data for Universal Bridge Formula Validation

Quark Masses (Current Quark Masses)

Quark	Mass (MeV/c^2)	Mass Ratio (m/m_e)	Notes
Up (u)	2.2	4.3	Range: 1.7-2.7 MeV/c^2
Down (d)	4.7	9.2	Range: 4.1-5.3 MeV/c^2
Strange (s)	95	186	Range: 80-130 MeV/c^2
Charm (c)	1,270	2,485	Range: 1,200-1,300 MeV/c^2
Bottom (b)	4,180	8,180	Range: 4,100-4,300 MeV/c^2
Top (t)	173,100	338,750	Range: 172,000-174,000 MeV/c^2

Neutrino Masses

Neutrino	Mass Upper Limit (eV/c^2)	Mass Ratio Upper Limit (m/m_e)	Notes
Electron neutrino (ν_e)	< 0.45	$< 8.8 \times 10^{-7}$	Latest KATRIN experiment (2025)
Muon neutrino (ν_u)	$< 0.19 \times 10^6$	< 0.37	Indirect measurement
Tau neutrino ($\nu\tau$)	$< 18.2 \times 10^6$	< 35.6	Indirect measurement

Reference Values

Electron mass (m_e): 0.511 MeV/c^2 (exact)
Electron mass in kg: $9.1093837 \times 10^{-31}$ kg

Important Notes

1. **Current vs. Constituent Quark Masses**:

   The values listed above are "current quark masses" which represent the bare masses of quarks. Constituent quark masses (which include binding energy effects) are much higher, around 350 MeV for u and d quarks.
   For the Universal Bridge Formula validation, current quark masses are more appropriate as they represent the intrinsic property.
2. **Neutrino Mass Limitations**:

   Direct measurements only provide upper limits, not exact masses.
   The latest KATRIN experiment (April 2025) established the most stringent upper limit for the electron neutrino mass at < 0.45 eV/c^2.
   Neutrino oscillation experiments indicate that neutrinos do have mass, but extremely small.
   The sum of all three neutrino masses is estimated to be < 0.12 eV from cosmological constraints.
3. **Mass Ratios**:

   All mass ratios are calculated relative to the electron mass ($m_e = 0.511$ MeV/c^2).

These ratios will be used to test the Universal Bridge Formula's predictions.

Summary of Particle Shell Index n

Particle	Mass [MeV]	n
Electron	0.511	0
Up	2.2	20.6
Down	4.7	29.9
Muon	105.7	61.4
Strange	96	66.5
Tau	1,776.9	97.0
Charm	1,280	98.0
Bottom	4,180	112.4
W Boson	80,379	144.6
Z Boson	91,187	146.8
Higgs	125,090	151.4
Top	173,100	154.3

0.8097407555270768 is QD

Python code for calculations

Plank length $6.626\ 070\ 15 \times 10^{-34}$
$6.62607015 \times 10^{-34}$

$4.135667696... \times 10^{-15}$ eV·Hz−

Bohr radius $\mathbf{5.29177210544(82) \times 10^{-11}}$
Bohr radius

electron 0.51099895069(16)

0.5110 MeV $m_e = 0.511$ MeV/c^2

alpha= 0.007297352573756914
0.007297352573756914

import math

# Assign your variable values
m_e = $6.62607015 \times 10^{-34}$ # example value
LZ = 1.23498288 # example value
n = 3.0 # example value

```
alpha = 0.007297352573756914    # example value
HQS = 0.235      # example value
x = 16.450874      # example value
pi = 3.1415926535

# Calculate m using the formula
m = m_e * (LZ ** (n / math.pi)) * ((alpha / HQS) ** (1 / x))

print("The result is:", m)
```

QC constant

```
# Define the variables
alpha = 0.0072973525643
HQS = 0.235
x = 16.450874

# Calculate the numerator
numerator = alpha / HQS

# Calculate the exponent
exponent = 1 / x

# Calculate the result
result = numerator ** exponent

# Print the result with high precision
print("Result:", result)
```

Not just "I think, therefore I am"—but "I align, therefore I perceive.
Time is what happens when you *think* — because thinking is energy interacting with itself, creating frames