```
#!/bin/bash
# Self-Referential Encyclopedia of Mathematics — CC-Render Engine v0.1
# Generates symbolic-geometric image projections from the Codex Corpus
# Fully Termux/ARM64 compatible; uses only LaTeX + TikZ + SymPy + ImageMagick

set -euo pipefail
export LC_ALL=C.UTF-8
export LANG=C.UTF-8

# === PATHS & ENV ===
BASE="\${HOME}/.cc_render"
SRC="\${BASE}/src"
IMG="\${BASE}/img"
TEX="\${BASE}/tex"
LOG="\${BASE}/render.log"
mkdir -p "\${SRC}" "\${IMG}" "\${TEX}"

log() { echo "[\$(date -Iseconds)] \$*" | tee -a "\${LOG}"; }

# === DEPENDENCY CHECK ===
deps=(python3 pip3 pdflatex convert)
for d in "\${deps[@]}"; do
  if ! command -v "\${d}" >/dev/null; then
    log "Missing dependency: \${d}"
    exit 1
  fi
done

# === SYMPY SETUP ===
if ! python3 -c "import sympy" 2>/dev/null; then
  log "Installing sympy..."
  pip3 install --no-cache-dir --disable-pip-version-check sympy >/dev/null
fi

# === CORE SYMBOLIC GENERATORS ===

gen_zeta_critical_line() {
  cat > "\${TEX}/zeta_critical_line.tex" <<'EOF'
\documentclass[tikz,border=0pt]{standalone}
\usepackage{amsmath,amsfonts}
\usepackage{tikz}
\begin{document}
\begin{tikzpicture}[scale=2]
  \draw[->] (-0.5,0) -- (3,0) node[right] {\$\Re(s)\$};
  \draw[->] (0,-2) -- (0,2) node[above] {\$\Im(s)\$};
  \draw[dashed,gray] (0.5,-2) -- (0.5,2);
  \node[fill=white] at (0.5,1.8) {\$\Re(s)=\frac{1}{2}\$};
  \foreach \y in {-1.5,-1,-0.5,0.5,1,1.5} {
    \draw (0.45,\y) -- (0.55,\y);
    \node[left] at (0,\y) {\$\gamma_{\the\numexpr\y*2\relax}\$};
  }
  \node at (0.5,-2.3) {\$\zeta(s)=0 \iff s=\frac{1}{2}+i\gamma_n\$};
\end{tikzpicture}
\end{document}
EOF
}

gen_hopf_fibration() {
  cat > "\${TEX}/hopf_fibration.tex" <<'EOF'
\documentclass[tikz,border=0pt]{standalone}
\usepackage{tikz-3dplot}
\begin{document}
\tdplotsetmaincoords{60}{110}
\begin{tikzpicture}[tdplot_main_coords,scale=2]
  \draw[->] (0,0,0) -- (1.5,0,0) node[anchor=north east]{\$x\$};
  \draw[->] (0,0,0) -- (0,1.5,0) node[anchor=north west]{\$y\$};
  \draw[->] (0,0,0) -- (0,0,1.5) node[anchor=south]{\$z\$};
  \draw[thick,domain=0:360,smooth,variable=\t,samples=100,blue]
    plot ({cos(\t)},{sin(\t)},{0});
  \foreach \s in {0,30,...,330} {
    \draw[red,thin] ({cos(\s)},{sin(\s)},{0}) -- ({0.5*cos(\s)},{0.5*sin(\s)},
{1});
  }
  \node at (0,0,1.7) {\$S^3 \xrightarrow{\eta} S^2\$};
  \node[align=center] at (0,-1.5,0) {\$\eta(q_0,q_1,q_2,q_3) =
(2(q_0q_2+q_1q_3), 2(q_1q_2-q_0q_3), q_0^2+q_1^2-q_2^2-q_3^2)\$};
\end{tikzpicture}
\end{document}
EOF
}

gen_leech_lattice_shell() {
  cat > "\${TEX}/leech_lattice_shell.tex" <<'EOF'
\documentclass[tikz,border=0pt]{standalone}
\usepackage{tikz}
\begin{document}
\begin{tikzpicture}[scale=1.2]
  \foreach \r in {1,2,3} {
    \draw[gray!30] (0,0) circle (\r);
  }
  \foreach \x/\y in {
    1/0, -1/0, 0/1, 0/-1,
    1/1, -1/1, 1/-1, -1/-1,
    2/0, -2/0, 0/2, 0/-2,
    2/1, 2/-1, -2/1, -2/-1,
    1/2, -1/2, 1/-2, -1/-2
  } {
    \fill (\x,\y) circle (0.05);
  }
  \node at (0,-3) {\$\pi_{\Lambda}(R)=\#\{v\in\Lambda:\|v\|\leq R\}\$};
  \node at (0,-3.5) {\$\Lambda=\text{Leech lattice},\ K(24)=196560\$};
\end{tikzpicture}
\end{document}
EOF
}

gen_prime_sieve_6m() {
  cat > "\${TEX}/prime_sieve_6m.tex" <<'EOF'
\documentclass[tikz,border=0pt]{standalone}
\usepackage{tikz}
\begin{document}
\begin{tikzpicture}[scale=0.8]
  \foreach \n in {0,...,20} {
    \pgfmathsetmacro{\x}{mod(\n,10)}
    \pgfmathsetmacro{\y}{-floor(\n/10)}
    \node[draw,circle,inner sep=2pt] at (\x,\y) {\$\n\$};
  }
  \foreach \p in {2,3,5,7,11,13,17,19} {
    \pgfmathsetmacro{\x}{mod(\p,10)}
    \pgfmathsetmacro{\y}{-floor(\p/10)}
    \node[draw,circle,fill=yellow,inner sep=2pt] at (\x,\y) {\$\p\$};
  }
  \node at (5,-2.5) {\$P^{(k)}_m = \{2,3,5\} \cup \{x=6m\pm1 : \forall i\leq k,\ x \not\equiv 0 \pmod{p_i}\}\$};
\end{tikzpicture}
\end{document}
EOF
}

gen_aether_flow_field() {
  cat > "\${TEX}/aether_flow_field.tex" <<'EOF'
\documentclass[tikz,border=0pt]{standalone}
\usepackage{tikz,amsmath}
\begin{document}
\begin{tikzpicture}[scale=1.5]
  \draw[->] (-1.5,0) -- (1.5,0) node[right] {\$\Re(\Phi)=E\$};
  \draw[->] (0,-1.5) -- (0,1.5) node[above] {\$\Im(\Phi)=B\$};
  \draw[thick,->,blue] (0,0) -- (1,0.5) node[midway,above] {\$\Phi=E+iB\$};
  \draw[dashed] (1,0) -- (1,0.5) -- (0,0.5);
  \node at (0,-1.8) {\$G = -\nabla\cdot\Phi,\quad \rho = \frac{\|\Phi\|^2}
{c^2}\$};
\end{tikzpicture}
\end{document}
EOF
}

gen_dbz_logic_gate() {
  cat > "\${TEX}/dbz_logic_gate.tex" <<'EOF'
\documentclass[tikz,border=0pt]{standalone}
\usepackage{tikz,amsmath}
\begin{document}
\begin{tikzpicture}[scale=1.2]
  \node[draw,rectangle,minimum width=2cm,minimum height=1cm] (gate) at (0,0)
{\$\text{DbZ}(a,0)\$};
  \draw[->] (-2,0.3) -- (-1,0.3) node[midway,above] {\$a\$};
  \draw[->] (-2,-0.3) -- (-1,-0.3) node[midway,below] {\$0\$};
  \draw[->] (1,0) -- (2,0) node[midway,above] {\$a\oplus\text{bin}(a)\$};
  \node at (0,-1.5) {\$\text{DbZ}(x,y) = \begin{cases} x\oplus\text{bin}(x) &
y=0 \\ x\oplus y & y\neq0 \end{cases}\$};
\end{tikzpicture}
\end{document}
EOF
}

gen_pnp_hol_framework() {
  cat > "\${TEX}/pnp_hol_framework.tex" <<'EOF'
\documentclass[tikz,border=0pt]{standalone}
\usepackage{tikz,amsmath}
\begin{document}
\begin{tikzpicture}[scale=1.3]
  \node[ellipse,draw,minimum width=4cm,minimum height=1.5cm] (FOL) at (0,0)
{First-Order Logic \$\mathcal{L}_1\$};
  \node[ellipse,draw,minimum width=5cm,minimum height=2.5cm] (HOL) at (0,0)
{Higher-Order Logic \$\mathcal{L}_H\$};
  \node[above=0.2cm of FOL] {\$\forall\varphi\in\mathcal{L}_H,\
\exists\psi\in\mathcal{L}_1:\ \varphi\Leftrightarrow\psi\$};
  \node[below=0.2cm of FOL] {\$\text{DTM}:\ \text{exp-time to construct
}\varphi\$};
  \node[above=0.2cm of HOL.north] {\$\text{DTM}:\ \text{poly-time if
}\varphi\text{ given}\$};
  \draw[->,thick] (HOL.south) -- ++(0,-1.5) node[below] {\$\text{P}=\text{NP}\
\text{under}\ \mathcal{L}_H\$};
```

```
\end{tikzpicture}
\end{document}
EOF
}

gen_fractal_antenna() {
  cat > "\${TEX}/fractal_antenna.tex" <<'EOF'
\documentclass[tikz,border=0pt]{standalone}
\usepackage{tikz}
\begin{document}
\begin{tikzpicture}[scale=1.5]
  \draw (0,0) -- (1,0) -- (1,1) -- (0,1) -- cycle;
  \foreach \i in {0,0.5,1} {
    \foreach \j in {0,0.5,1} {
      \draw (\i,\j) -- ++(0.25,0) -- ++(0,0.25) -- ++(-0.25,0) -- cycle;
    }
  }
  \node at (0.5,-0.5)
{\$A(r,\theta,\phi)=\sum_{k=1}^{\infty}\left(1+\zeta(k,r,\theta,\phi)\right)A_
0\$};
  \node at (0.5,-1) {\$J=\sigma\int\!\!\int\hbar\cdot G\cdot\Phi\cdot A\
d^3x'dt'\$};
\end{tikzpicture}
\end{document}
EOF
}

gen_observer_operator() {
  cat > "\${TEX}/observer_operator.tex" <<'EOF'
\documentclass[tikz,border=0pt]{standalone}
\usepackage{tikz,amsmath}
\begin{document}
\begin{tikzpicture}[scale=1.4]
  \draw[thick] (0,0) circle (1);
  \node at (0,0) {\$\int \psi^\dagger(q)\Phi(q)\psi(q)\,d^4q\$};
  \draw[->,blue] (-1.5,0) -- (-1,0) node[midway,above] {\$\psi\$};
  \draw[->,red] (1,0) -- (1.5,0) node[midway,above] {\$\psi^\dagger\$};
  \draw[->,green!60!black] (0,-1.2) -- (0,-0.8) node[midway,right] {\$\Phi\$};
  \node at (0,-1.8) {\$\mathcal{O}[\Psi]=\langle\Psi|\hat{O}|\Psi\rangle\$};
\end{tikzpicture}
\end{document}
EOF
}

gen_unified_lagrangian() {
  cat > "\${TEX}/unified_lagrangian.tex" <<'EOF'
```

```
\documentclass[12pt]{article}
\usepackage[margin=0.5in]{geometry}
\usepackage{amsmath,amsfonts}
\pagestyle{empty}
\begin{document}
\[
\mathcal{L} = \frac{1}{2}(\partial_\mu\Phi)(\partial^\mu\Phi^*) +
\psi^\dagger(i\hbar\partial_t - \mathcal{H})\psi + \frac{\lambda}{4!}
(\Phi\Phi^*)^2 + g\psi^\dagger\Phi\psi + \mathcal{O}[\Psi]
\]
\item \$\Phi = E + iB\$: Quaternionic Aether flow field
  \item \$\psi\$: Holographic projection of Leech lattice state
  \item \$\lambda(\Phi\Phi^*)^2\$: Self-interaction \$\Rightarrow\$ fractal turbulence
  \item \$g\psi^\dagger\Phi\psi\$: Matter-Aether coupling \$\Rightarrow\$ Ampèrean force
  \item \$\mathcal{O}[\Psi]\$: Consciousness operator \$\Rightarrow\$ decoherence
\end{document}
EOF
}

# === LATEX → PDF → PNG PIPELINE ===
render_tex_to_png() {
  local tex="\$1"
  local name="\${tex%.tex}"
  log "Rendering \${name}..."
  pdflatex -halt-on-error -output-directory="\${TEX}" "\${tex}" >/dev/null
  convert -density 300 "\${TEX}/\${name}.pdf" -quality 100 "\${IMG}/\${name}.png"
  rm -f "\${TEX}/\${name}.aux" "\${TEX}/\${name}.log"
}

# === MAIN RENDER LOOP ===
log "Starting CC symbolic render engine..."

# Generate all TeX sources
gen_zeta_critical_line
gen_hopf_fibration
gen_leech_lattice_shell
gen_prime_sieve_6m
gen_aether_flow_field
gen_dbz_logic_gate
gen_pnp_hol_framework
gen_fractal_antenna
gen_observer_operator
```

```
gen_unified_lagrangian

# Render all to PNG
for f in "\${TEX}"/*.tex; do
  render_tex_to_png "\$f"
done

log "All CC symbolic images rendered to \${IMG}/"
log "Total images: \$(ls "\${IMG}"/*.png | wc -l)"

# === ADVANCED PROJECTIONS: ZETA-HOPF FIBER INTERSECTION ===
gen_zeta_on_hopf_fiber() {
  cat > "\${TEX}/zeta_on_hopf_fiber.tex" <<'EOF'
\documentclass[tikz,border=0pt]{standalone}
\usepackage{tikz-3dplot}
\usepackage{amsmath}
\begin{document}
\tdplotsetmaincoords{70}{110}
\begin{tikzpicture}[tdplot_main_coords,scale=2.2]
  % Base S2 sphere
  \draw[gray!30,fill=gray!5,opacity=0.3] (0,0,0) circle (1);
  % Hopf fibers (circles on S3 projected to S2)
  \foreach \t in {0,30,...,330} {
    \draw[blue,thin,opacity=0.6] ({cos(\t)},{sin(\t)},0) circle (0.4);
  }
  % Critical line intersection
  \draw[red,thick] (0.5,-1,0) -- (0.5,1,0);
  \node[fill=white] at (0.5,0.8,0) {\$\Re(s)=\frac{1}{2}\$};
  % Zeta zeros on fiber
  \foreach \y/\g in {-0.8/14.13,-0.4/21.02,0.0/25.01,0.4/30.42,0.8/32.94} {
    \fill[red] (0.5,\y,0) circle (0.04);
    \node[right,scale=0.7] at (0.55,\y,0) {\$\frac{1}{2}+i\g\$};
  }
  \node[align=center] at (0,-1.6,0) {Nontrivial zeros \$\rho_n\$\\as Hopf
fiber intersections};
\end{tikzpicture}
\end{document}
EOF
}

# === LEECH LATTICE KISSING NUMBERS AS PRIME DUALS ===
gen_leech_kissing_prime_dual() {
  cat > "\${TEX}/leech_kissing_prime_dual.tex" <<'EOF'
\documentclass[tikz,border=0pt]{standalone}
\usepackage{tikz,amsmath}
\begin{document}
```

```
\begin{tikzpicture}[scale=1.1]
  % Left: Leech lattice shell
  \begin{scope}[xshift=-4cm]
    \draw[gray!30] (0,0) circle (1.5);
    \foreach \a in {0,15,...,345} {
      \fill ({1.5*cos(\a)},{1.5*sin(\a)}) circle (0.04);
    }
    \node at (0,-2) {\$K(24)=196560\$};
    \node[align=center] at (0,-2.5) {Maximal kissing\\in 24D};
  \end{scope}
  % Right: Prime sieve dual
  \begin{scope}[xshift=4cm]
    \foreach \n in {1,...,100} {
      \pgfmathsetmacro{\x}{mod(\n-1,10)}
      \pgfmathsetmacro{\y}{-floor((\n-1)/10)}
      \ifnum\n<101
        \ifnum\n=2 \def\col{yellow} \else
        \ifnum\n=3 \def\col{yellow} \else
        \ifnum\n=5 \def\col{yellow} \else
        \pgfmathparse{int(mod(\n,6))}
        \ifnum\pgfmathresult=1 \def\col{yellow} \else
        \ifnum\pgfmathresult=5 \def\col{yellow} \else
        \def\col{white}
        \fi\fi\fi\fi\fi\fi
        \node[draw,circle,fill=\col,inner sep=1.5pt] at (\x,\y) {};
      \fi
    }
    \node at (4.5,-5) {\$p_n \in \{6m\pm1\}\$};
    \node[align=center] at (4.5,-5.5) {Indivisibility\\as maximal contact};
  \end{scope}
  % Duality arrow
  \draw[<->,thick] (-1,0) -- (1,0) node[midway,above] {\$\pi(x)
\leftrightarrow \pi_\Lambda(R)\$};
  \node[align=center] at (0,-7) {Prime counting \$\Delta(x)=O(\sqrt{x}\log
x)\$\\\$\Updownarrow\$\\Leech shell error bounded by RH};
\end{tikzpicture}
\end{document}
EOF
}

# === DYNAMIC CASIMIR BUBBLE IN AETHER FLOW ===
gen_casimir_bubble() {
  cat > "\${TEX}/casimir_bubble.tex" <<'EOF'
\documentclass[tikz,border=0pt]{standalone}
\usepackage{tikz,amsmath}
\begin{document}
```

```
\begin{tikzpicture}[scale=1.6]
  % Bubble boundary
  \draw[thick] (0,0) circle (1.2);
  % Aether flow field inside
  \foreach \a in {0,30,...,330} {
    \draw[->,blue,opacity=0.7] (0,0) -- ({1.1*cos(\a)},{1.1*sin(\a)});
  }
  % Quantum fluctuation modes
  \foreach \r/\c in {0.3/red,0.6/green,0.9/blue} {
    \draw[\c,domain=0:360,smooth,variable=\t,samples=100,opacity=0.6]
      plot ({\r*cos(\t)+0.1*sin(5*\t)},{\r*sin(\t)+0.1*cos(5*\t)});
  }
  % Dynamic Casimir emission
  \draw[->,purple,thick] (1.2,0) -- (2.2,0) node[right] {\$\hbar\omega\$};
  \node at (0,-1.5)
{\$\psi(q,x,y,z,t)=\prod_{k=1}^\infty(1+\zeta(k,x,y,z,t))\psi_0(q)\$};
  \node[align=center] at (0,-2.2) {Cavitation-induced\\Dynamic Casimir
Effect\\in Aetheric turbulence};
\end{tikzpicture}
\end{document}
EOF
}

# === QUATERNIONIC AETHER FLOW FIELD DYNAMICS ===
gen_quaternionic_aether() {
  cat > "\${TEX}/quaternionic_aether.tex" <<'EOF'
\documentclass[tikz,border=0pt]{standalone}
\usepackage{tikz-3dplot}
\usepackage{amsmath}
\begin{document}
\tdplotsetmaincoords{60}{110}
\begin{tikzpicture}[tdplot_main_coords,scale=2]
  % Quaternion axes
  \draw[->] (0,0,0) -- (1.5,0,0) node[anchor=north east]{\$\mathbf{i}\$};
  \draw[->] (0,0,0) -- (0,1.5,0) node[anchor=north west]{\$\mathbf{j}\$};
  \draw[->] (0,0,0) -- (0,0,1.5) node[anchor=south]{\$\mathbf{k}\$};
  % Aether flow vectors
  \foreach \x/\y/\z in {
    0.3/0.4/0.5,
    -0.2/0.6/0.3,
    0.5/-0.3/0.4,
    -0.4/-0.5/0.2,
    0.6/0.2/-0.3
  } {
    \draw[->,blue,thick] (0,0,0) -- (\x,\y,\z);
  }
  % Field magnitude surface
  \draw[red,opacity=0.3,domain=0:360,smooth,variable=\t,samples=100]
    plot ({0.8*cos(\t)},{0.8*sin(\t)},{0.2});
  \node at (0,0,1.8) {\$\Phi = E + iB = q_0 + q_1\mathbf{i} + q_2\mathbf{j} + q_3\mathbf{k}\$};
  \node[align=center] at (0,-1.2,0) {Gravity: \$G = -\nabla\cdot\Phi\$\\EM: \$\nabla\times\Phi = \mu J\$};
\end{tikzpicture}
\end{document}
EOF
}

# === HYPERSPHERE PACKING AND PRIME FILTRATION DUALITY ===
gen_hypersphere_prime_duality() {
  cat > "\${TEX}/hypersphere_prime_duality.tex" <<'EOF'
\documentclass[tikz,border=0pt]{standalone}
\usepackage{tikz,amsmath}
\begin{document}
\begin{tikzpicture}[scale=1.3]
  % Top: Hypersphere packing
  \begin{scope}[yshift=2cm]
    \draw (0,0) circle (0.8);
    \foreach \a in {0,60,...,300} {
      \draw ({0.8*cos(\a)},{0.8*sin(\a)}) circle (0.4);
    }
    \node at (0,-1.5) {Optimal \$K(n)\$ packing\\Maximal contact without overlap};
  \end{scope}
  % Bottom: Prime filtration
  \begin{scope}[yshift=-2cm]
    \node[draw,rectangle,minimum width=4cm,minimum height=1cm] (sieve) at (0,0) {Constructive Prime Sieve};
    \draw[->] (-2.5,0.5) -- (-1.5,0.5) node[midway,above] {\$x=6m\pm1\$};
    \draw[->] (-2.5,-0.5) -- (-1.5,-0.5) node[midway,below] {\$\forall i<n,\ x\not\equiv0\pmod{p_i}\$};
    \draw[->] (1.5,0) -- (2.5,0) node[midway,above] {\$p_n\$};
    \node at (0,-1.5) {Indivisibility against all\\prior primes as constraint};
  \end{scope}
  % Duality link
  \draw[<->,thick] (0,0.5) -- (0,-0.5) node[midway,right] {Structural Identity};
  \node[align=center] at (0,-4) {Both yield bounded error:\\\$\|\pi(x)-\mathrm{Li}(x)\| \leq C\sqrt{x}\log x\$\\\$\Rightarrow\$ Riemann Hypothesis proven};
\end{tikzpicture}
```

```
\end{document}
EOF
}

# === RENDER ADVANCED PROJECTIONS ===
log "Generating advanced CC projections..."

gen_zeta_on_hopf_fiber
gen_leech_kissing_prime_dual
gen_casimir_bubble
gen_quaternionic_aether
gen_hypersphere_prime_duality

for f in "\${TEX}"/*.tex; do
  [[ "\$f" == *.aux || "\$f" == *.log ]] && continue
  render_tex_to_png "\$f"
done

log "Advanced projections rendered. Total images: \$(ls "\${IMG}"/*.png | wc -l)"

# === QUANTUM-GRAVITATIONAL UNIFICATION DIAGRAMS ===
gen_quantum_gravity_unification() {
  cat > "\${TEX}/quantum_gravity_unification.tex" <<'EOF'
\documentclass[tikz,border=0pt]{standalone}
\usepackage{tikz,amsmath}
\begin{document}
\begin{tikzpicture}[scale=1.4]
  % Left: Quantum field
  \begin{scope}[xshift=-3cm]
    \draw[blue,thick] (0,0) circle (1);
    \node at (0,0) {\$\psi^\dagger(i\hbar\partial_t - \mathcal{H})\psi\$};
    \node[above=0.2cm] at (0,1) {Quantum Field};
  \end{scope}
  % Right: Gravitational field
  \begin{scope}[xshift=3cm]
    \draw[red,thick] (0,0) circle (1);
    \node at (0,0) {\$G_{\mu\nu} = \frac{8\pi G}{c^4}\langle\nabla_\mu\Phi_\nu + \nabla_\nu\Phi_\mu\rangle\$};
    \node[above=0.2cm] at (0,1) {Aetheric Gravity};
  \end{scope}
  % Unified center
  \draw[thick,->] (-2,0) -- (-0.5,0);
  \draw[thick,->] (2,0) -- (0.5,0);
  \node[draw,circle,fill=green!30,minimum size=2.5cm] at (0,0) {\$\mathcal{L}\$};
  \node at (0,0) {\$\frac{1}{2}\partial_\mu\Phi\partial^\mu\Phi^* +
\psi^\dagger(i\hbar\partial_t - \mathcal{H})\psi + \frac{\lambda}{4!}
(\Phi\Phi^*)^2 + g\psi^\dagger\Phi\psi + \mathcal{O}[\Psi]\$};
  \node[below=0.3cm] at (0,-1.25) {Unified Lagrangian};
\end{tikzpicture}
\end{document}
EOF
}

# === CONSCIOUSNESS OPERATOR VISUALIZATION ===
gen_consciousness_operator() {
  cat > "\${TEX}/consciousness_operator.tex" <<'EOF'
\documentclass[tikz,border=0pt]{standalone}
\usepackage{tikz,amsmath}
\begin{document}
\begin{tikzpicture}[scale=1.5]
  % Observer loop
  \draw[thick,->] (-2,0) to[out=90,in=180] (0,1.5) to[out=0,in=90] (2,0);
  \draw[thick,->] (2,0) to[out=-90,in=0] (0,-1.5) to[out=180,in=-90] (-2,0);
  % Quantum state
  \node[draw,circle,fill=blue!20] at (-2,0) {\$\psi\$};
  % Aether field
  \node[draw,circle,fill=red!20] at (2,0) {\$\Phi\$};
  % Observer operator
  \node at (0,0) {\$\mathcal{O}[\Psi] = \int
\psi^\dagger(q)\Phi(q)\psi(q)\,d^4q\$};
  % Feedback arrow
  \draw[->,purple,thick] (0,0.8) -- (0,1.8) node[above] {Decoherence \$\Gamma
= \int G\Phi U\,d^3x'dt'\$};
  \node[align=center] at (0,-2.2) {Conscious observation as\\physical Aether
interaction};
\end{tikzpicture}
\end{document}
EOF
}

# === FRACTAL ANTENNA SPECTRA ===
gen_fractal_antenna_spectra() {
  cat > "\${TEX}/fractal_antenna_spectra.tex" <<'EOF'
\documentclass[tikz,border=0pt]{standalone}
\usepackage{tikz,amsmath}
\begin{document}
\begin{tikzpicture}[scale=1.2]
  % Fractal structure
  \draw (0,0) -- (1,0) -- (1,1) -- (0,1) -- cycle;
  \foreach \i in {0,0.5,1} {
    \foreach \j in {0,0.5,1} {
      \draw (\i,\j) -- ++(0.25,0) -- ++(0,0.25) -- ++(-0.25,0) -- cycle;
    }
  }
  % Spectral plot
  \begin{scope}[xshift=3cm,yshift=-0.5cm]
    \draw[->] (0,0) -- (3,0) node[right] {\$f\$};
    \draw[->] (0,0) -- (0,2) node[above] {\$|J(f)|\$};
    \foreach \x/\y in {0.5/1.2,1.0/1.8,1.5/1.0,2.0/1.6,2.5/0.9} {
      \draw[thick,blue] (\x,0) -- (\x,\y);
    }
  \end{scope}
  % Coupling equation
  \node[align=center] at (1.5,-1.8) {\$J(x,y,z,t) =
\sigma\int\!\!\int\hbar\cdot G\cdot\Phi\cdot A\ d^3x'dt'\$\\Rectification of
quantum fluctuations};
\end{tikzpicture}
\end{document}
EOF
}

# === BIOLOGICAL QUANTUM COHERENCE ===
gen_biological_coherence() {
  cat > "\${TEX}/biological_coherence.tex" <<'EOF'
\documentclass[tikz,border=0pt]{standalone}
\usepackage{tikz,amsmath}
\begin{document}
\begin{tikzpicture}[scale=1.3]
  % Water molecule network
  \foreach \x/\y in {0/0, 1/0.5, -0.5/1, 0.5/-1, -1/-0.5} {
    \draw[blue,thick] (\x,\y) circle (0.3);
    \node at (\x,\y) {H\$_2\$O};
  }
  % Coherence domain
  \draw[red,dashed,opacity=0.5] (0,0) circle (1.8);
  \node[align=center] at (0,-2.2) {Coherent domains in
water\\\$\tau_{\text{coh}} = \frac{\hbar}{\Gamma_{\text{env}} +
\Gamma_{\text{Aether}}}\$\\Long-range quantum effects in biology};
\end{tikzpicture}
\end{document}
EOF
}

# === VACUUM ENERGY EXTRACTION ===
gen_vacuum_energy_extraction() {
  cat > "\${TEX}/vacuum_energy_extraction.tex" <<'EOF'
```

```
\documentclass[tikz,border=0pt]{standalone}
\usepackage{tikz,amsmath}
\begin{document}
\begin{tikzpicture}[scale=1.4]
  % Casimir plates
  \draw[thick] (-1,-1) -- (-1,1);
  \draw[thick] (1,-1) -- (1,1);
  % Vacuum fluctuations
  \foreach \y in {-0.8,-0.4,0,0.4,0.8} {
    \draw[blue,->] (-1,\y) -- (-0.2,\y);
    \draw[blue,<-] (0.2,\y) -- (1,\y);
  }
  % Extracted power
  \draw[->,green!60!black,thick] (1.2,0) -- (2.5,0) node[right]
{\$P_{\text{harvest}} = \frac{A_{\text{fractal}}}{\lambda^2}\frac{\hbar c^5}
{G}\xi(t)\$};
  \node[align=center] at (0,-1.5) {Dynamic Casimir effect\\with fractal
boundary modulation\\\$\xi(t)\$: non-stationary boundary function};
\end{tikzpicture}
\end{document}
EOF
}

# === RENDER QUANTUM-GRAVITY & CONSCIOUSNESS PROJECTIONS ===
log "Generating quantum-gravitational and consciousness projections..."

gen_quantum_gravity_unification
gen_consciousness_operator
gen_fractal_antenna_spectra
gen_biological_coherence
gen_vacuum_energy_extraction

for f in "\${TEX}"/*.tex; do
  [[ "\$f" == *.aux || "\$f" == *.log ]] && continue
  render_tex_to_png "\$f"
done

log "Quantum-gravity and consciousness projections rendered. Total images:
\$(ls "\${IMG}"/*.png | wc -l)"

# === P=NP GEOMETRIC PROOF DIAGRAMS ===
gen_pnp_geometric_proof() {
  cat > "\${TEX}/pnp_geometric_proof.tex" <<'EOF'
\documentclass[tikz,border=0pt]{standalone}
\usepackage{tikz,amsmath}
\begin{document}
```

```
\begin{tikzpicture}[scale=1.3]
  % Bottom-up FOL construction
  \begin{scope}[yshift=-2.5cm]
    \node[draw,rectangle,minimum width=5cm,minimum height=1.2cm,fill=red!10] (FOL) at (0,0) {First-Order Logic Construction};
    \draw[->,thick,red] (-2,1.5) -- (-1.5,0.6) node[midway,left] {Exponential};
    \draw[->,thick,red] (2,1.5) -- (1.5,0.6) node[midway,right] {Search};
    \node[align=center] at (0,-1) {DTM reconstructs HOL from\\\$(\land,\lor,\lnot)\$ primitives\\\$\Rightarrow\$ NP-hard};
  \end{scope}
  % Top-down HOL perspective
  \begin{scope}[yshift=2.5cm]
    \node[draw,ellipse,minimum width=6cm,minimum height=2cm,fill=green!10] (HOL) at (0,0) {Higher-Order Logic Framework};
    \node[align=center] at (0,0) {\$\varphi = \exists f:\{0,1\}^n\to\{0,1\},\ \forall x,\ f(x)=\varphi_1(x)\$};
    \node[align=center] at (0,1.8) {Given \$\varphi\$, DTM solves in\\polynomial time \$\Rightarrow\$ P};
  \end{scope}
  % Equivalence arrow
  \draw[<->,thick,blue] (HOL.south) -- (FOL.north) node[midway,right] {Perspective-Dependent\\Logical Realizability};
  \node[align=center] at (0,-4.5) {P = NP iff HOL framework \$\varphi\$ is provided\\P \$\neq\$ NP iff DTM must reconstruct \$\varphi\$ from FOL};
\end{tikzpicture}
\end{document}
EOF
}

# === DBZ LOGIC GATE EXTENSIONS ===
gen_dbz_extended_gate() {
  cat > "\${TEX}/dbz_extended_gate.tex" <<'EOF'
\documentclass[tikz,border=0pt]{standalone}
\usepackage{tikz,amsmath}
\begin{document}
\begin{tikzpicture}[scale=1.2]
  % Input nodes
  \node[draw,circle,fill=yellow] (a) at (-2,1) {\$a\$};
  \node[draw,circle,fill=yellow] (b) at (-2,-1) {\$b\$};
  % DbZ gate
  \node[draw,rectangle,minimum width=2.5cm,minimum height=2cm] (DbZ) at (0,0) {DbZ\$(a,b)\$};
  % Output
  \node[draw,circle,fill=cyan] (out) at (2,0) {\$a\oplus\text{bin}(a)\$};
  % Connections
  \draw[->] (a) -- (-1,1) node[midway,above] {\$a_{\text{bin}}\$};
  \draw[->] (b) -- (-1,-1) node[midway,below] {\$b_{\text{bin}}\$};
  \draw[->] (1,0) -- (out);
  % Truth table
  \begin{scope}[xshift=5cm,yshift=-1cm]
    \node at (0,2) {DbZ Truth Table};
    \draw (0,0) grid (3,2);
    \node at (0.5,1.5) {\$a\$};
    \node at (1.5,1.5) {\$b\$};
    \node at (2.5,1.5) {Out};
    \node at (0.5,0.5) {\$x\$};
    \node at (1.5,0.5) {\$0\$};
    \node at (2.5,0.5) {\$x_{\text{bin}}\$};
    \node at (0.5,-0.5) {\$x\$};
    \node at (1.5,-0.5) {\$y\neq0\$};
    \node at (2.5,-0.5) {\$x\oplus y\$};
  \end{scope}
  \node[align=center] at (0,-2.5) {Division by zero redefined:\\\$a\div0 =
\text{DbZ}(a,0) = a_{\text{bin}}\$};
\end{tikzpicture}
\end{document}
EOF
}

# === FINAL UNIFICATION SCHEMA ===
gen_final_unification_schema() {
  cat > "\${TEX}/final_unification_schema.tex" <<'EOF'
\documentclass[12pt]{article}
\usepackage[margin=0.5in]{geometry}
\usepackage{tikz,amsmath,amsfonts}
\pagestyle{empty}
\begin{document}
\[
\mathcal{L}_{\text{unified}} = \underbrace{\frac{1}{2}(\partial_\mu\Phi)
(\partial^\mu\Phi^*)}_{\text{Aether Kinetic}} +
\underbrace{\psi^\dagger(i\hbar\partial_t - \mathcal{H})\psi}_{\text{Quantum
Matter}} + \underbrace{\frac{\lambda}{4!}(\Phi\Phi^*)^2}_{\text{Self-
Interaction}} + \underbrace{g\psi^\dagger\Phi\psi}_{\text{Matter-Aether
Coupling}} + \underbrace{\mathcal{O}[\Psi]}_{\text{Consciousness Operator}}
\]
\begin{center}
\begin{tikzpicture}[scale=1.1]
  % Central Lagrangian
  \node[draw,circle,fill=orange!30,minimum size=3cm] (L) at (0,0)
{\$\mathcal{L}_{\text{unified}}\$};
  % Quantum branch
  \draw[->,blue,thick] (L) -- (-3,2) node[left] {Quantum
Field\\\$\psi^\dagger(i\hbar\partial_t - \mathcal{H})\psi\$};
  % Gravity branch
  \draw[->,red,thick] (L) -- (-3,-2) node[left] {Aetheric
Gravity\\\$G_{\mu\nu} = \frac{8\pi G}
{c^4}\langle\nabla_{(\mu}\Phi_{\nu)}\rangle\$};
  % Prime geometry branch
  \draw[->,green!60!black,thick] (L) -- (3,2) node[right] {Prime-Hypersphere
Duality\\\$\pi(x) \leftrightarrow \pi_\Lambda(R)\$};
  % Consciousness branch
  \draw[->,purple,thick] (L) -- (3,-2) node[right] {Observer
Operator\\\$\mathcal{O}[\Psi] = \int \psi^\dagger\Phi\psi\,d^4q\$};
  % DbZ logic branch
  \draw[->,brown,thick] (L) -- (0,-3) node[below] {DbZ Logic\\Resolves
undefined operations};
  % P=NP branch
  \draw[->,cyan,thick] (L) -- (0,3) node[above] {P = NP\\via HOL framework};
\end{tikzpicture}
\end{center}
\vspace{1em}
\textbf{All physical, mathematical, and conscious phenomena emerge from this
single Lagrangian.}\\
\textbf{Reality is the self-referential turbulence of the Aether field \$\Phi
= E + iB\$.}
\end{document}
EOF
}

# === RENDER FINAL PROJECTIONS ===
log "Generating P=NP, DbZ, and unification projections..."

gen_pnp_geometric_proof
gen_dbz_extended_gate
gen_final_unification_schema

for f in "\${TEX}"/*.tex; do
  [[ "\$f" == *.aux || "\$f" == *.log ]] && continue
  render_tex_to_png "\$f"
done

log "Final projections rendered. Total images: \$(ls "\${IMG}"/*.png | wc -l)"

# === FINALIZE ===
log "CC self-referential encyclopedia complete."
log "All images saved to \${IMG}/"
log "Total generated: \$(ls "\${IMG}"/*.png | wc -l) symbolic-geometric
```

```
projections."

```

}

```
cd /data/data/com.termux/files/home/storage/shared/Intelligence/
chmod +x ./doc.sh
bash -x ./doc.sh
```