Gravity publication roadmap (draft)

Goal

Produce a **coherent, end-to-end, publication-ready documentation set** for the full gravitational theory (RS/RC foundations → classical limit/GR → effective kernels in galaxies/cosmology → quantum "display layer" + falsifiers), with clear separation between:

- **proved / machine-verified** statements (Lean certificates / rigorous math),
- **empirical fits** (parameter values inferred from data),
- **hypotheses / effective-theory closures** (explicitly labeled).

What has already been drafted (core papers deep-read)

- **Galaxy phenomenology (global-only causal response)**: `gravity-papers/0-0-0-gravity-submission-`
  - Scope: rotation curves, global-only fitting protocol, cluster lensing prediction, Caldeira–Leggett realization.
- **Cosmology (ILG Paper I: source-side kernel + linear regime theory)**: `gravity-papers/dark_energy`
  - Scope: fixed kernel $w(k,a) = 1 + C(k\tau_0/a)^{-\alpha}$; well-posedness for $\alpha \in (0, \frac{1}{2})$; **zero Buchert backreaction**; qualitative falsifiers (ISW suppression, scale-dependent growth, tracer-independent E_G, X-collapse).
  - Explicitly defers: quantitative ΛCDM amplitudes + nonlinear modeling ("Paper II").
- **Discrete foundations for a classical gravity limit (ledger → DEC → kernel)**: `gravity-papers/quantu`
  - Scope: MP + ledger axioms; DEC bridge to Poisson; fractional-memory mechanism for $k^{-\alpha}$; SPARC-only fits (with parameters free); catalogs open gaps (units quotient, parameter fixing, public Lean release, operational definition of "recognition event").
- **Quantum completion display layer (BRST + DEC + audit interfaces)**: `gravity-papers/quantum_g`
  - Scope: background-field / de Donder gauge; BRST framing; DEC nonperturbative outline; anomaly checks; BH thermodynamics check; **GW "audit bands"** pipeline.

Other relevant internal drafts (awareness; not assumed publishable as-is)

- **Coercive Projection Method (CPM) gravity law + certificates**: `gravity-papers/Gravity Set/CPM-Gravity.tex`
- **Gravity-as-pressure equivalence display**: `gravity-papers/Gravity Set/Pressure-Gravity.tex`
- **Disk-dynamics ILG series draft (older "Paper I")**: `gravity-papers/Gravity Set/Information-Limite`

- **Late-time kernel + Hubble tension (draft)**: `gravity-papers/Gravity Set/Hubble-Tension-Resoluti`
- **Universe origin / inflation / primordial signatures (draft)**: `gravity-papers/Gravity Set/Universe-Origin.tex`
- **Baryogenesis (draft)**: `gravity-papers/Gravity Set/Baryogenesis.tex`
- **Measurement/collapse bridge (not gravity per se, but overlaps RC cost/action)**: `gravity-papers/Gravity Set/gravity-coherence.tex`

Proposed publication set (what still needs to be written)

Paper 1 — Recognition/Ledger Foundations for Gravity (formal core)

Working title: *Recognition/Ledger Foundations for Gravity: discrete axioms, cost uniqueness, cadence, and the admissible-units quotient*

- **Purpose**: Provide the *canonical* statement of RS/RC primitives that later gravity papers cite as axioms/theorems, with machine-verifiable status.
- **Must include**:
  - Precise definitions: ledger, postings, neutrality/exactness, cost J, cadence/Octave constraints, and **admissible-units quotient** (parameter-free policy).
  - A **public, checkable artifact story** (Lean build, certificate ledger, versioning).
- **Inputs to reuse**:
  - `gravity-papers/quantum_gravity_A_mesedits.tex` (model + theorem sketches)
  - repo Lean sources (already present in `IndisputableMonolith/**`)
- **Missing today (by the paper's own status notes)**:
  - Public Lean release / citation-quality certificate summary for T2–T7 (or downgraded claims until released).
  - Completed units-quotient formalization (explicitly flagged as a blocker in Paper A).

Paper 2 — Machine-verified GR emergence (classical continuum target)

Working title: *Machine-Verified Emergence of Einstein Dynamics from Recognition Science*

- **Purpose**: Bridge RS primitives to **covariant GR** (Einstein–Hilbert action, EFE, stress-energy definition); the canonical citation for "RS → GR".
- **Inputs to reuse**:
  - `docs/GRAVITATIONAL_EMERGENCE_PAPER.tex` (already structured around proof-status honesty)

  - Lean files in `IndisputableMonolith/Relativity/**` (variational sector, Palatini, EFE emergence)

- **What still needs writing/work (to reach "full machine verified")**:
  - Close remaining `sorry`s and remove remaining gravity-sector scaffolds as per `docs/GR_EMERGENCE_PLAN.m`
  - Decide the precise statement of the RS→GR mapping (what is definition, what is theorem, what is hypothesis).

Paper 3 — ILG Cosmology II (the missing quantitative confrontation)

Working title: *Information-Limited Gravity II: quantitative ΛCDM predictions, nonlinear calibration, and likelihood-level tests*

- **Purpose**: Provide the missing "Paper II" promised by `dark_energy_paper1_mesedits.tex`: realistic amplitudes, parameter-free forecasts, and hard tests.
- **Must include**:
  - Numerical integration in ΛCDM for $D(k,a)$, $f(k,z)$, R_L, ISW predictions.
  - Nonlinear modeling plan: N-body or emulators + baryonic feedback treatment.
  - Likelihood pipeline that preserves the required (k,z) structure (no scale-averaging that erases the signal).
- **Inputs to reuse**:
  - `gravity-papers/dark_energy_paper1_mesedits.tex` (definitions + theory)
  - any existing analysis code (if present in repo) + explicit artifact bundle.
- **Status**: **not yet written** (only referenced).

Paper 4 — Galaxy-scale kernel paper (choose/merge the competing "galaxy kernels")

Working title: *Information-limited response in galaxies: nonlocal kernel prediction, disk convolution, and global-only inference*

- **Purpose**: Provide a single, canonical galaxy-scale prediction pipeline consistent with the cosmology kernel (if unification is intended), and/or explain why galaxy and cosmology kernels differ.
- **Why this paper is needed**:
  - Multiple overlapping galaxy presentations exist (ILG kernel as $w(k)/w(r)$ vs. causal-response $w(r)$ with morphology factors). The publication set needs **one "source of truth"** or a clear regime map.
- **Must include**:

  - Full nonlocal prediction for disks (Hankel/FFT convolution) as the primary forward model (not only the effective $v^2 \approx w(r)v_b^2$ closure).
  - Strict global-only policy and a reproducibility bundle (SPARC snapshot + masks + code).
  - A "regime map" explaining which assumptions are phenomenological (e.g., exponential-memory kernel, morphology factor) vs. derived.

- **Inputs to reuse**:
  - `gravity-papers/0-0-0-gravity-submission-aaa-v07-shorted-v04.tex` (global-only causal response)
  - `gravity-papers/quantum_gravity_A_mesedits.tex` (kernel-from-latency story + SPARC evidence)
  - `gravity-papers/Gravity Set/Pressure-Gravity.tex` (pressure display)
  - `gravity-papers/Gravity Set/Information-Limited-Gravity-Paper1-Sept26.tex` (older ILG disk framing)

Paper 5 — Covariant completion of the source-side kernel (the core conceptual gap)

Working title: *Covariant completion of source-side information-limited gravity: action, Bianchi identity, causality, and GW sector*

- **Purpose**: ILG Paper I calls this the main theoretical gap. A full "gravity theory" needs a covariant embedding (even if phenomenology is tested first).
- **Must include**:
  - Covariant operator realization (e.g., nonlocal $\mathcal{F}[\Box]$, auxiliary-field completion, or equivalent) reducing to the Poisson multiplier in the Newtonian/quasi-static regime.
  - Demonstrate: Bianchi identity compatibility, causal (retarded) structure, ghost-freedom, and GW-sector predictions consistent with GW170817-style constraints.
- **Inputs to reuse**:
  - candidate operator sketches already in `dark_energy_paper1_mesedits.tex` (covariant completion section)
  - Caldeira–Leggett style constructions (already in the galaxy paper) if relevant.

Paper 6 — Quantum completion + audit interfaces (tighten the artifact story)

Working title: *Recognition Calculus quantum gravity: BRST + DEC realization and falsifiable audit bands*

- **Purpose**: Keep `quantum_gravity_B_v4.tex` as the quantum-facing paper, but ensure it cleanly references proved artifacts and does not overclaim beyond what is certified.

- **Still needed**:
  - Consolidated public artifact bundle: certificate hashes, where Lean lives, and how a referee rebuilds it.
  - Clear separation between "standard EFT/BRST review" vs. "RC-specific additional claims".

Optional papers (valuable, but not strictly required for "gravity core")

- **Hubble tension / late-time inference**: formalize whether "late-time kernel" genuinely changes *inference* vs. *physics* and how this interacts with Paper 3.
- **Coercive projection law + certificate schema** (CPM): a methods paper that becomes the audit standard across RS phenomenology papers.
- **Origin / inflation / primordial signatures** (Universe-Origin): if you want full gravitational *cosmology*, this becomes part of the suite.
- **Baryogenesis**: if included, should reference the same constants/units policy and the same GR emergence baseline.
- **Collapse/coherence bridge**: adjacent to gravity via RC cost/action, but likely a separate measurement series.

Cross-paper consistency checklist (must be harmonized before submission)

- **Kernel naming**: distinguish $w(r)$ (galaxy display), $w(k, a)$ (cosmology), and any transfer function $H(i\omega)$ (memory model). Spell out the mapping/assumptions between them.
- **Constants and "parameter-free" claims**: every paper must separate:
  - **derived constants** (with certificates),
  - **calibration constants** (SI mappings / survey M/L choices),
  - **fit parameters** (if any are used, label them honestly).
- **Units policy**: adopt one "quotient-first, units-last" policy and apply it everywhere (avoid mixing micro tick τ_0 with macro anchors like $\tau_\star$ without explicit bridges).
- **Nonlocal vs. local closures**: if using an effective local $w(r)$ multiply rule, label it as a closure and provide a plan (or results) for the full convolution check.
- **Covariant completion boundary**: every effective kernel paper should state what is and is not claimed without a covariant embedding.

Recommended execution order

1. Paper 2 (Lean GR emergence): close proof debt → establishes the GR baseline.
2. Paper 1 (foundations + units quotient): finalize the RS/RC primitives and parameter policy.
3. Paper 3 (ILG cosmology II): quantitative tests + pipeline.
4. Paper 4 (galaxy-scale canonical kernel paper): unify/choose the galaxy story with full convolution.
5. Paper 5 (covariant completion): once phenomenology survives, complete the conceptual embedding.
6. Paper 6 (quantum + audits): finalize the QG display layer and public artifacts.