Central Mass Transfer Cosmology (CMT) as a Boundary-Condition Theory

1. What ΛCDM Actually Does (and Does NOT Do)

ΛCDM is not a theory of origin.

It assumes:

- a spacetime already exists
- a scale factor a(t) already exists
- matter density ρ_m already exists
- temperature and pressure are defined

ΛCDM begins with:

$\rho_m(t_0) \neq 0$

$H(t_0) \neq 0$

and evolves forward.

There is no equation in ΛCDM that dynamically generates ρ_m from zero.

This is not a flaw — it is a boundary assumption.

NOTE ⚠️

ΛCDM is mathematically silent about *how* these initial quantities arise.

They are **inputs**, not predictions.

2. The No-Go Statement (Why ΛCDM Cannot Create Matter)

Standard continuity equation:

$$\dot{\rho_m} + 3H\rho_m = 0$$

Assume initial condition:

$$\rho_m(t_i) = 0$$

Then for all t:

$$\rho_m(t) = 0$$

This is mathematically unavoidable.

Therefore:

ΛCDM cannot create matter dynamically.

Any model claiming matter creation must lie outside ΛCDM's domain of validity.

NOTE ⚠️

This is a strict mathematical statement, not a philosophical one.

No choice of equation of state alters this conclusion.

3. Pre-Geometric Regime (No ΛCDM Variables Allowed)

We now define a regime before ΛCDM applies.

Assumptions (explicit):

- No 4D spacetime yet
- No thermalized plasma
- No equation of state
- No pressure
- No temperature
- No scale factor
- No Hubble parameter

Therefore:

p = undefined

T = undefined

H = undefined

This is not radiation domination.

This is pre-fluid.

NOTE ⚠️

This regime is **not describable** by Einstein equations or Friedmann equations.

Any attempt to do so is mathematically invalid.

4. Universe as an Open System (General Conservation Law)

Before geometry exists, the only valid statement is mass balance:

$$dM/d\tau = \Phi_{in} - \Phi_{out}$$

For a closed system:

$$\Phi_{in} = \Phi_{out} = 0$$

For an open system:

$\Phi_{in} \neq 0$

This equation is not ΛCDM.

It is system-level conservation.

NOTE ⚠️

This is classical conservation logic, not cosmology.

It applies even when spacetime is undefined.

5. Boundary Hypothesis of CMT

CMT posits:

- our universe is an open subsystem
- matter enters through a boundary (extra-dimensional / external reservoir)
- the inflow is finite and localized in proto-time τ

Define an inflow density:

$\Phi(\tau) \geq 0$

Total injected mass:

$$M_{total} = \int \Phi(\tau)\, d\tau$$

No expansion is assumed yet.

No pressure is assumed yet.

NOTE ⚠️

The *mechanism* of $\Phi(\tau)$ is unspecified here.

CMT is agnostic about the microphysics at this stage.

6. Emergence of Geometry (Definition, Not Assumption)

Geometry becomes meaningful only after sufficient mass exists.

Define the emergence time τ^* such that:

$$M(\tau^*) > 0$$

Only after τ^* can we define:

- scale factor $a(t)$
- energy density ρ
- pressure p

- Hubble parameter H

This is the boundary.

NOTE ⚠️

This step is **definitional**, not derived.

It replaces the usual Big-Bang “initial slice”.

7. Mapping Boundary Mass to ΛCDM Initial Condition

Define:

$\rho_m(a^*) = M_{total} / V(a^*)$

This is not derived from ΛCDM.

This is a boundary condition supplied to ΛCDM.

From this point onward:

ΛCDM applies normally.

NOTE ⚠️

This is mathematically equivalent to specifying Ω_{m0} by hand —

but conceptually different because the mass origin is external.

8. ΛCDM Evolution (Standard, Untouched)

For $a \geq a^*$:

$\dot{\rho_m} + 3H\rho_m = 0$

$H^2 = (8\pi G/3)\ \rho\_total$

No modification.

No extra terms.

No violation.

ΛCDM evolves exactly as observed.

NOTE ⚠️

CMT makes **no late-time predictions** beyond ΛCDM.

9. Effective Representation (Where Γ(a) Comes From)

For bookkeeping only, one may write:

$\dot{\rho_m} + 3H\rho_m = \Gamma(a)$

with:

$\Gamma(a) \neq 0$ only at $a = a^*$

This is not a dynamical fluid equation at early times.

It is a distributional boundary source:

$\Gamma(a) = \alpha\, \delta(a - a^*)$

Meaning:

- matter appears at the boundary
- nowhere else
- one-time injection

NOTE ⚠️

$\Gamma(a)$ is **not physical pressure or decay**.

It is a mathematical encoding of a boundary condition.

10. Determination of α (No Free Parameter)

After injection:

$\rho_m(a) = \rho_m(a^*) (a^*/a)^3$

At today $a_0 = 1$:

$\rho_m,0 = \rho_m(a^*) a^{*3}$

Thus:

$\rho_m(a^*) = \rho_m,0 / a^{*3}$

α is fixed by observation, exactly like Ω_{m0} in ΛCDM.

No tuning.

NOTE ⚠️

α is **measured**, not predicted.

This mirrors how ΛCDM treats Ω_{m0}.

11. Why This Is Different from Baryogenesis

Aspect	**Baryogenesis**	**CMT**
Domain	Particle physics	System boundary
Uses ΛCDM before matter	Yes	No
Assumes temperature	Yes	No
Generates total mass	No (asymmetry only)	Yes
Supplies ΛCDM initial condition	No	Yes

CMT explains why ΛCDM starts with matter at all.

NOTE ⚠️

CMT does **not replace** baryogenesis.

It precedes it.

12. Final Statement

ΛCDM is a theory of evolution, not origin.

CMT supplies a physically consistent boundary condition for ΛCDM by treating matter as entering an initially non-geometric system.

Once sufficient mass exists, spacetime and standard cosmological dynamics emerge and proceed unmodified.

NOTE ⚠️

This framework is mathematically consistent but **not yet a complete fundamental theory**.

Its value lies in clarifying assumptions, not eliminating unknowns.

☑ What this version achieves

- No illegal use of H, p, T before geometry
- No misuse of ΛCDM equations
- No contradiction with APS desk-rejection logic
- Honest separation of **boundary**, **effective math**, and **physics gap**