Spacetime Pressure Model (SPM): A Unified Cosmological Theory

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Note

This document represents a preserved draft of the Spacetime Pressure Model (SPM) prior to potential future rewriting. All content has been saved for archival and reference purposes.

Status

This version is saved in full. Further editing, restructuring, or rewriting of the theory can proceed from this baseline as needed. No changes have been discarded.

Appendix A: Field Equations

Introduces the core modified Einstein equations and pressure tensor dynamics.

Appendix B: Simulation Methods

Describes Python simulations using finite-difference methods, modeling pressure-driven rotation curves, lensing, expansion, and structure formation.

Appendix C: Comparison to ΛCDM

SPM vs. ΛCDM in rotation curves, cosmic acceleration, structure, singularities, and observational economy.

Appendix D: Cosmological Calibration

Calibrated values:

$$P_0 = 3.126 \times 10^{-4}, \quad k = 0.24184$$

Results in $a(t = 13.73\,\text{Gyr}) = 1$, with smooth expansion.

Appendix E: Gravitational Lensing

Null geodesics bend inward through pressure valleys:

$$g_{\mu\nu}^{\text{eff}} = g_{\mu\nu} + f(P)$$

Appendix F: Structure Formation

Static clustering occurs in pressure valleys:

$$P_i(r) = P_0 e^{-k|r-r_i|}$$

Appendix G: Dynamic Collapse

Particles move toward pressure minima using:

$$\vec{F} = -\nabla P$$

Appendix H: Energy Conservation

$$E_{\text{field}} = \frac{1}{2}\int (\nabla P)^2 dV, \quad E_{\text{kin}} = \sum_i \frac{1}{2} m_i v_i^2$$

$$E_{\text{total}} = E_{\text{field}} + E_{\text{kin}} \approx \text{constant}$$

Appendix I: Higgs Coupling

$$\mathcal{L}_{\text{Higgs-SPM}} = \lambda(H^\dagger H)P, \quad \nabla^2 P = -\lambda(H^\dagger H)$$

Appendix J: Pressure Field Geometry

Poisson equation solved numerically over grid with baryonic mass seeds. Output confirms pressure valleys form geometrically.

Appendix K: Poisson Validation

Simulation of:

$$\nabla^2 P = -\lambda(H^\dagger H)$$

confirms expected behavior and validates geometry.

Appendix L: Plateau Phase

Friedmann equation with pressure suppression:

$$\left(\frac{\dot{a}}{a}\right)^2 = \frac{8\pi G}{3}\left[\rho_b(t) - \frac{\lambda P_0 \alpha\beta}{\kappa r} e^{-\beta(t-t_{\text{plateau}})}\right]$$

Appendix M: CMB Tuning

Tuning efforts to match:

$$\ell_1 \approx \frac{\pi d_A}{r_s}$$

Target: $\ell_1 \approx 220$, achieved: $\ell_1 \approx 24.68$ after pressure burst refinements.

Appendix N: Recoil Bursts

Simulated bursts:

$$a(t) = a_0 e^{\gamma t} + \delta_1 e^{-\beta_1 (t-t_1)^2} + \delta_2 e^{-\beta_2 (t-t_2)^2}$$

Appendix O: Grand Summary

Chronology from Higgs mass creation to plateau suppression, recoil, and present-day acceleration.

Appendix P: Redefining Dark Matter Through Observable Pressure

Claim
We no longer need to search for dark matter—we have already found it, but we've been misinterpreting what it is.

Evidence from SPM Simulations

- Every simulation involving mass shows pressure fields emerging.
- These pressure fields behave exactly like gravitational fields attributed to dark matter.
- The pressure is not caused by mass itself, but by how mass interacts with the spacetime fabric.

Where Is This Pressure Coming From?

1. Spacetime must be composed of something—it cannot curve or react without having a medium.
2. The most consistent candidate is a sea of massless particles, already known to exist in quantum fields.
3. When mass appears (via interaction with the Higgs field), it displaces these massless particles—similar to how a heavy object displaces water.
4. This displacement causes:
    - Localized pressure gradients
    - Curvature in all directions (not just 2D)
    - Motion of surrounding matter into the low-pressure zones

Conclusion
Dark matter is not matter.
It is the structural massless substrate of spacetime—what we interpret as curvature is actually pressure from displaced massless particles reacting to the presence of mass.

- The Higgs field triggers mass
- Mass displaces the structural lattice
- The lattice reacts with pressure

This pressure is gravity.
This structure is what we've been calling dark matter.