99th Annual AAAS-PD Meeting
12-15 June 2018
Pomona, California

PRELIMINARY

Relativistic Formulation of Cosmic Acceleration vs. Cosmic Deceleration in the Local Universe

ESSENTIAL CONSIDERATIONS:

- Postulated Inwardly Unbounded Light Speed Within the Hubble Expansion
- Deeper Theory Derived: eg , $a_{CosAcc}=rH^2$ and $\Lambda=3H^2/c^2$ (Latter Accords with the Friedmann Solution)

Thomas E. Chamberlain, PhD
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EINSTEIN'S SAME MOTION PRINCIPLE
SAME MOTION ACCELERATION/SYNCHRONY

- **BASIS FOR GRT AND THE PRESENT DEEPER THEORY**
- **UNBOUNDED LIGHT SPEED DERIVED FROM THE SAME MOTION PRINCIPLE**

OVERVIEW

- CONCEPTS
- THEORY
- COMPARISON WITH MEASUREMENTS
  - Wide Binary Star Rotation Flattening
  - Baryonic Tully-Fisher Relation
  - Sn-1a Magnitude Residuals vs Redshift z

    (Initial Results— z<~0.3)
- CONCLUSIONS

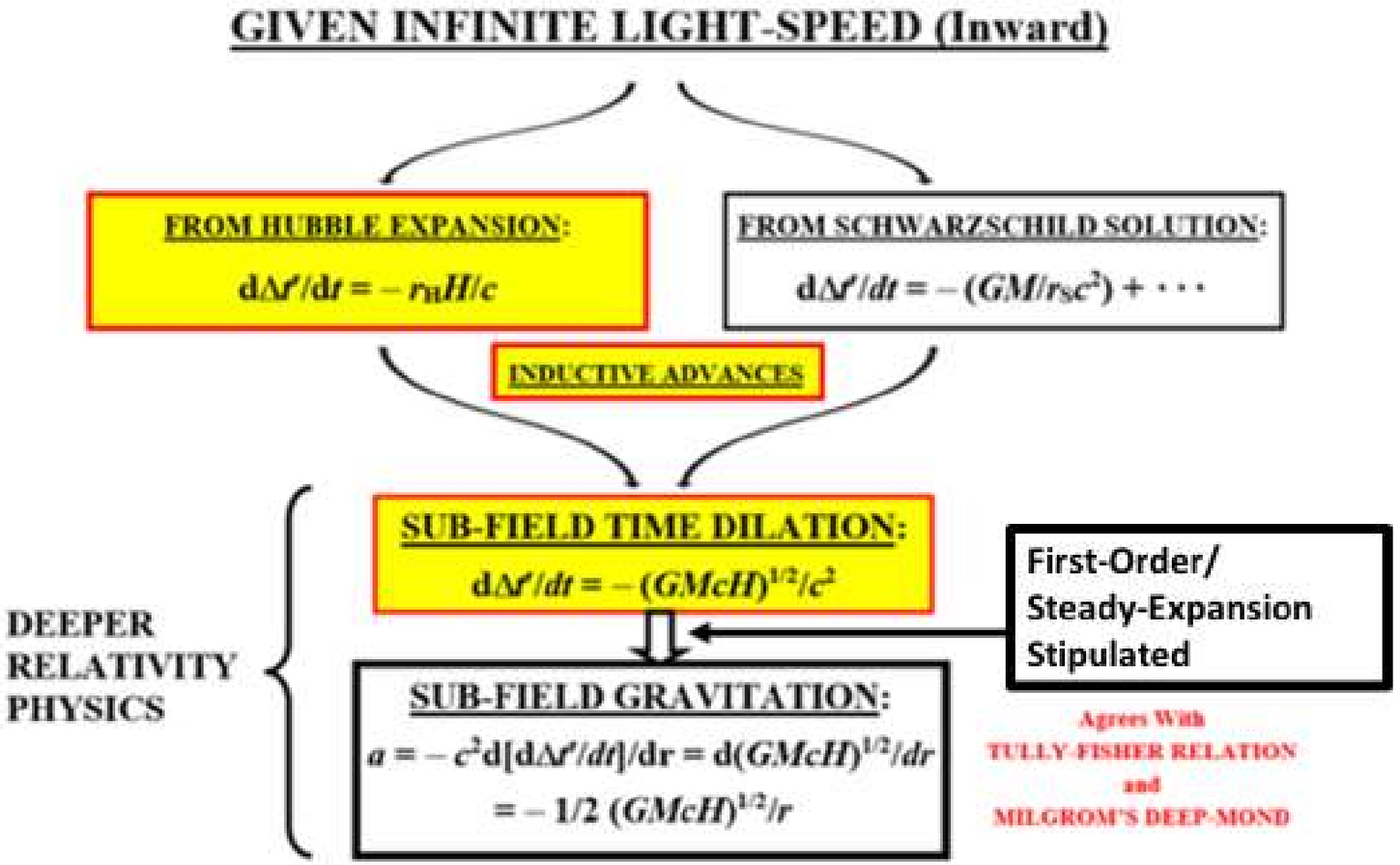
CONCEPTUAL ASPECTS

- **AFTER SAME-MOTION ACCELERATION**
  - **Depending on Resynchronization**
  - **Measured Rod Lengths and Clock Rates can be Increased or Decreased.**

(BASIS: Einstein on *Same-Motion* (1907) and Chamberlain (2015))

- **IN ADDITION: (From the Present Work)**
  - **Distant Events (From the Past) ARE INSTANTLY SEEN (Inductive Postulate)**
  - **Outgoing Photons Fly at Half-C.**

THEORETICAL DEVELOPMENTS


GIVEN INFINITE LIGHT-SPEED (Inward)
FROM HUBBLE EXPANSION:
$d\Delta t'/dt = -r_H H/c$
FROM SCHWARZSCHILD SOLUTION:
$d\Delta t'/dt = -(GM/r_S c^2) + \cdots$
INDUCTIVE ADVANCES
SUB-FIELD TIME DILATION:
$d\Delta t'/dt = -(GMcH)^{1/2}/c^2$
First-Order/
Steady-Expansion
Stipulated
DEEPER
RELATIVITY
PHYSICS
SUB-FIELD GRAVITATION:
$a = -c^2 d[d\Delta t'/dt]/dr = d(GMcH)^{1/2}/dr$
$= -1/2\ (GMcH)^{1/2}/r$
Agrees With
TULLY-FISHER RELATION
and
MILGROM'S DEEP-MOND

REVISED SCHWARZSCHILD SOLUTION

- **THE SUB-FIELD METRIC MAY BE WRITTEN:**

$$ds^2 = -c^2dt^2\,(1-(GMcH)^{1/2}/c^2)^2 + dr^2\,(1-(GMcH)^{1/2}/c^2)^{-2} + r^2d\Omega^2$$

- **APPLYING WITHIN THE SCHWARZSCHILD SOLUTION ALLOWS:**

Schwarzschild Solution / **Sub-Field Counterpart**

$$ds^2 = -\overbrace{\left(1 - 2GM/rc^2\right)}\, c^2dt^2\, \overbrace{\left(1-(GMcH)^{1/2}/c^2\right)^2} + \left(1 - 2GM/rc^2\right)^{-1} dr^2\, \left(1-(GMcH)^{1/2}/c^2\right)^{-2} + r^2d\Omega^2$$

COSMIC ACCELERATION vs.

COSMIC DECELERATION

Newtonian-Field:

$$a_{NF} = -\,G[(4/3\ \pi r^3)\rho_0])/r^2 = -4/3\ \pi G\rho_0 r$$

Sub-Field:

$$a_{SF} = -((G[(4/3\ \pi r^3)\rho_0]cH_0)^{1/2}/2r) \quad = -\,1/2\ ([4/3\ \pi G\rho_0]cH_0)^{1/2}r^{1/2}$$

INWARD

Cosmic-Field:

$$a_{CF} = rH_0^2$$

(**DERIVED** within the Lorentz Transformation)

(**ACCORDS** with $\Lambda=3H_0^2/c^2$ of the Friedmann Solution)

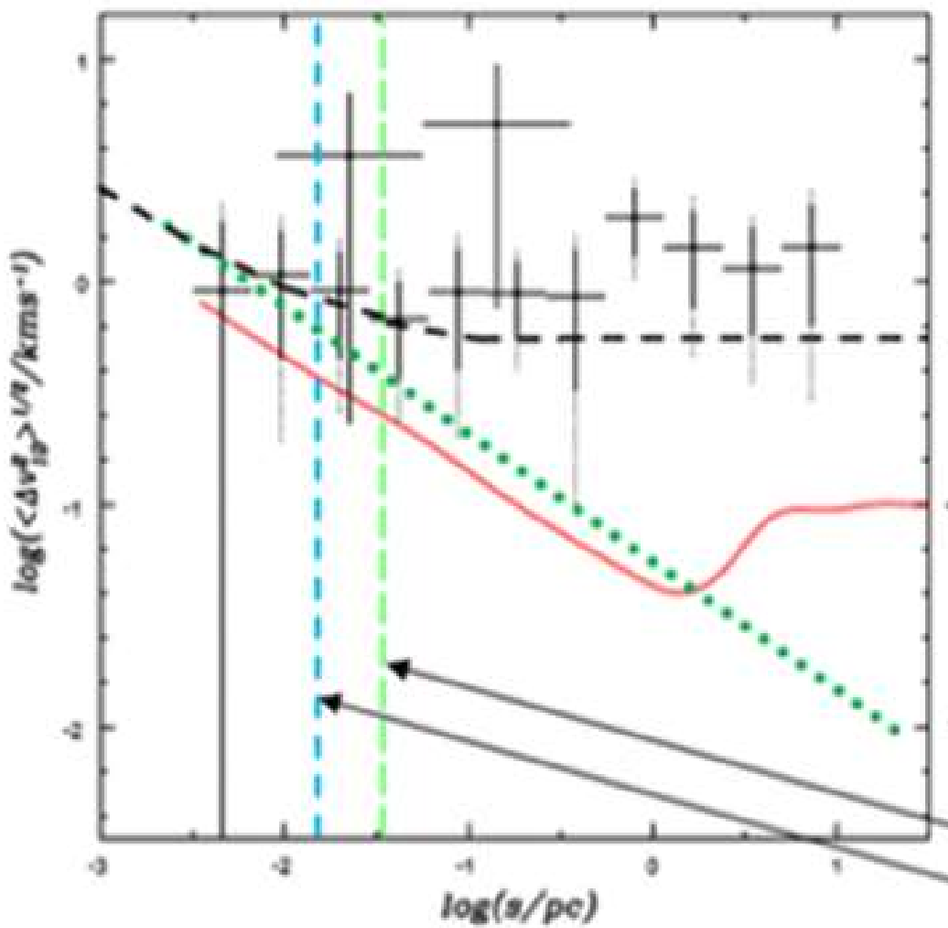
OUTWARD

COMBINED COSMIC ACCELERATIONS:

$$a_{CA} = a_{NF} + a_{SF} + a_{CF}$$

THEORY VERSUS MEASUREMENT

WIDE BINARY STAR GRAVITATIONAL CROSS-OVER



From Hernandez, et al. (2012). "Wide Binaries as a Critical Test of Classical Gravity".

Revised Schwarzschild solution assuming equal Solar masses, giving asymptote at 0.54 km/s

Binary relative velocity within the simulated Galaxy, (Jiang & Tremaine, 2009)

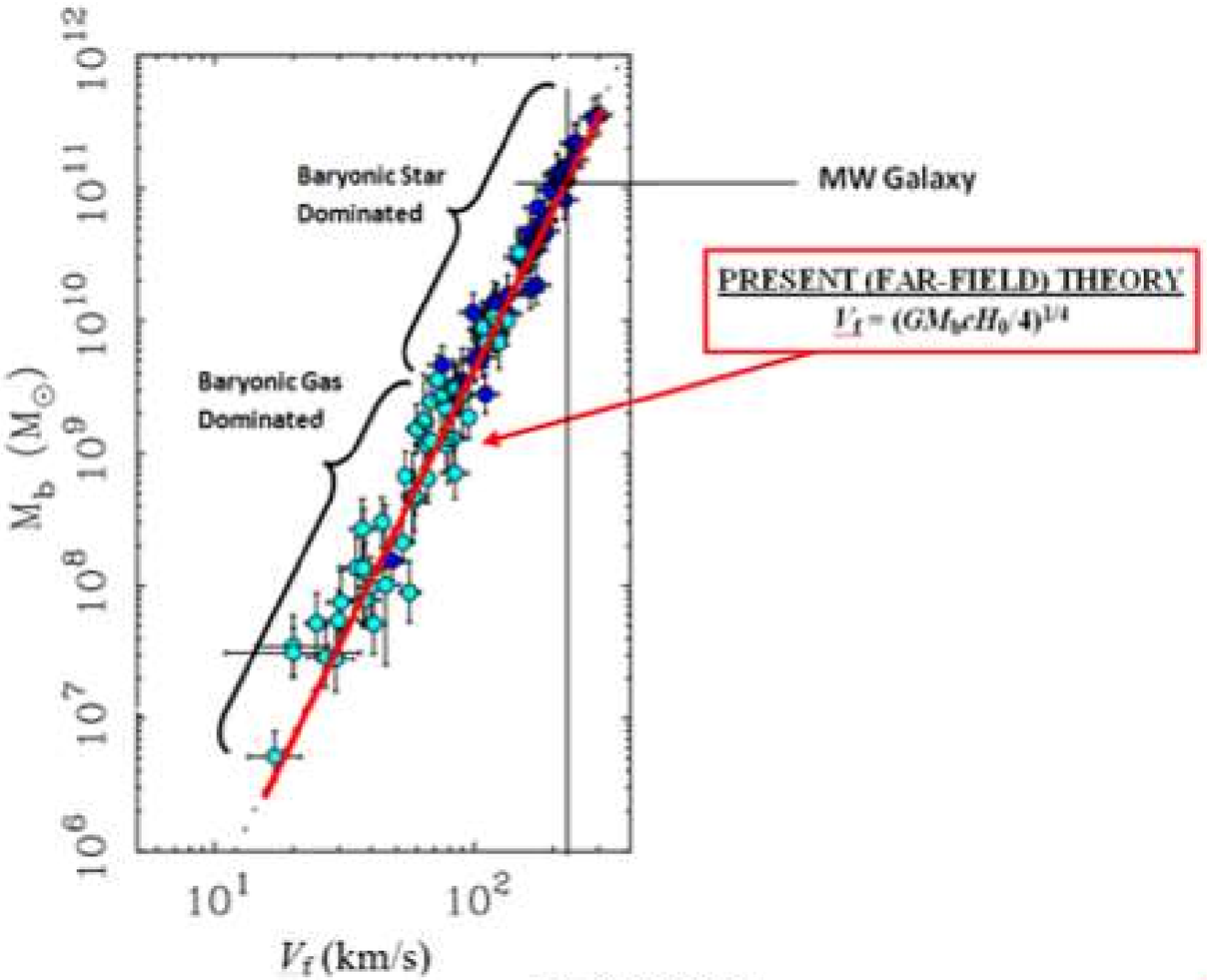
Kepler theory assuming equal Solar masses and exclusive of Galactic tidal effects.

Newtonian gravitational acceleration at either star:

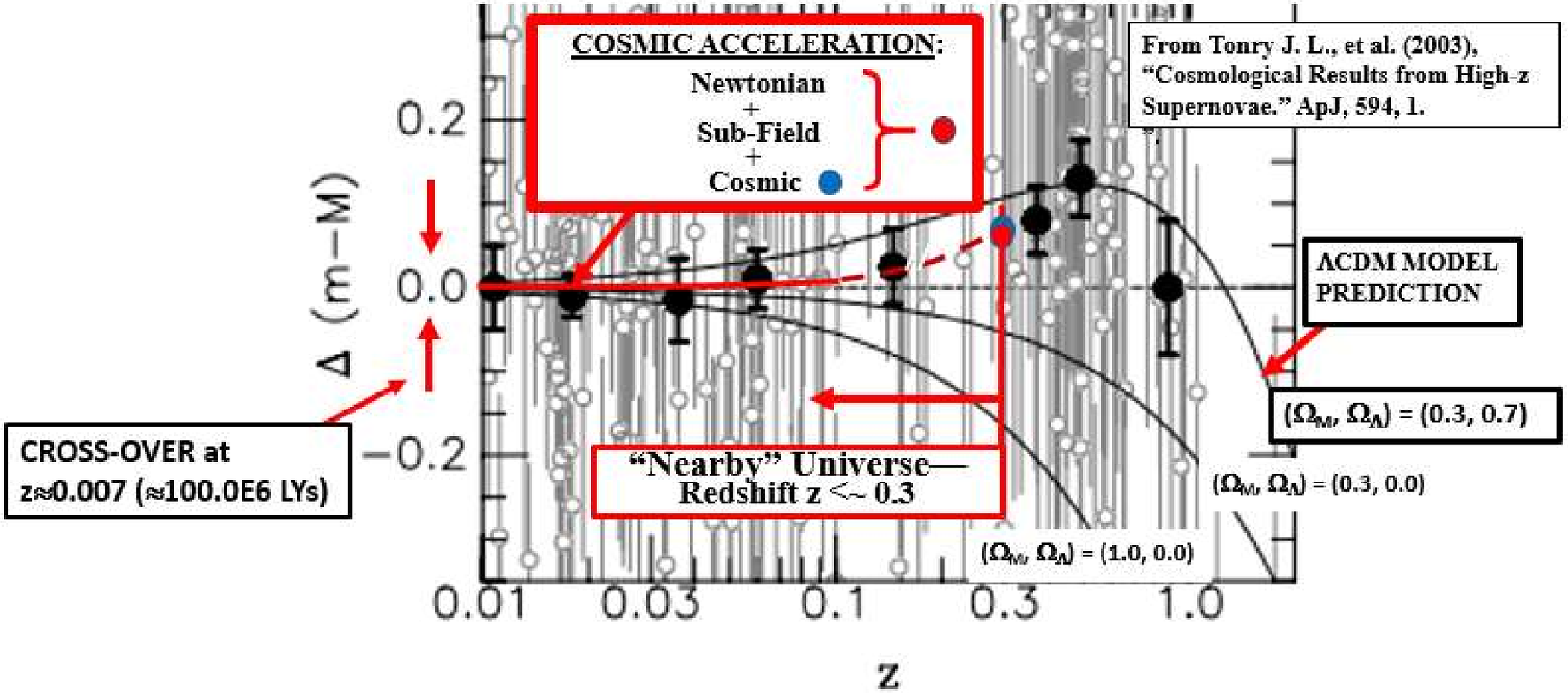
- Equals Milgrom's universal constant, a_0;
- Equals cH_0.

SPIRAL GALAXY FAR-FIELD ROTATION

BARYONIC TULLY-FISHER RELATION



THEORETICAL SNIa RESIDUAL MAGNITUDES vs. REDSHIFT MEASUREMENTS



CONCLUSIONS

- **NEAR SINGULAR (INWARD) LIGHT VELOCITY WITHIN THE HUBBLE EXPANSION GIVES DEEPER THEORY--EG:**
  - **Pure Cosmic Acceleration : $a_{CF} = rH_0^2$**
  - **Subfield Cosmic Deceleration : $a_{SF} = -1/2\ ([4/3\ \pi G\rho_0]cH_0)^{1/2}r^{1/2}$**
  - **Cosmological Constant Derived : $\Lambda = 3H^2/c^2$**
- **EMPIRICAL SUPPORT: <u>ACCORD WITH</u>---**
  - **Wide-Binary Star Rotation Flattening**
  - **Spiral Galaxy Rotation Flattening**
  - **"Nearby" SNIa Measurements ($0.01 < z <\sim 0.3$)**
- **COSMIC TIME-DILATION IS ESSENTIAL TO THE ACCELERATION OF HUBBLE SPACE EXPANSION**