

99th Annual AAAS-PD Meeting  
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# **Relativistic Formulation of Cosmic Acceleration vs. Cosmic Deceleration in the Local Universe**

## **ESSENTIAL CONSIDERATIONS:**

- Postulated Inwardly Unbounded Light Speed Within the Hubble Expansion
- Gives Deeper Theory: eg,  $\Lambda = 3H^2/c^2$

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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— $z < \sim 0.1$ )
- **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:

$$d\Delta t'/dt = -r_0 H/c$$

FROM SCHWARZSCHILD SOLUTION:

$$d\Delta t'/dt = -(GM/r_s c^2) + \dots$$

INDUCTIVE ADVANCES

SUB-FIELD TIME DILATION:

$$d\Delta t'/dt = -(GMcH)^{1/2}/c^2$$

Stipulated Steady  
Hubble Expansion.

DEEPER  
RELATIVITY  
PHYSICS

SUB-FIELD GRAVITATION:

$$\begin{aligned} a &= -c^2 d[d\Delta t'/dt]/dr = d(GMcH)^{1/2}/dr \\ &= -1/2 (GMcH)^{1/2}/r \end{aligned}$$

Agrees With  
TULLY-FISHER RELATION  
and  
MILGROM'S DEEP-MOND

## REVISED SCHWARZSCHILD SOLUTION

- THE SUB-FIELD METRIC MAY BE WRITTEN:

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

- APPLYING WITHIN THE SCHWARZSCHILD SOLUTION ALLOWS:

<u>Schwarzschild</u> <u>Solution</u>	<u>Sub-Field</u> <u>Counterpart</u>
$ds^2 = - \left(1 - 2GM/rc^2\right) c^2 dt^2$	$\left(1 - (GMcH)^{1/2}/c^2\right)^2$
$+ \left(1 - 2GM/rc^2\right)^{-1} dr^2$	$\left(1 - (GMcH)^{1/2}/c^2\right)^{-2}$
$+ r^2 d\Omega^2$	

## LOCAL UNIVERSE EXPANSION ACCELERATION ( $z < \sim 0.1$ )

Newtonian-Field:

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

Sub-Field:

$$a_{\text{SF}} = -((G[(4/3 \pi r^3) \rho_0] c H_0)^{1/2} / 2r) (r H_0 / c)^{1/2} = \underline{-1/2 (4/3 \pi G \rho_0)^{1/2} r}$$

Cosmic-Field:

$$a_{\text{CF}} = c^2 d(r H_0 / c) / dr (r H_0 / c) = \underline{r H_0^2} \quad \underline{\underline{= r c^2 \Lambda_0 / 3}}$$

INWARD

OUTWARD

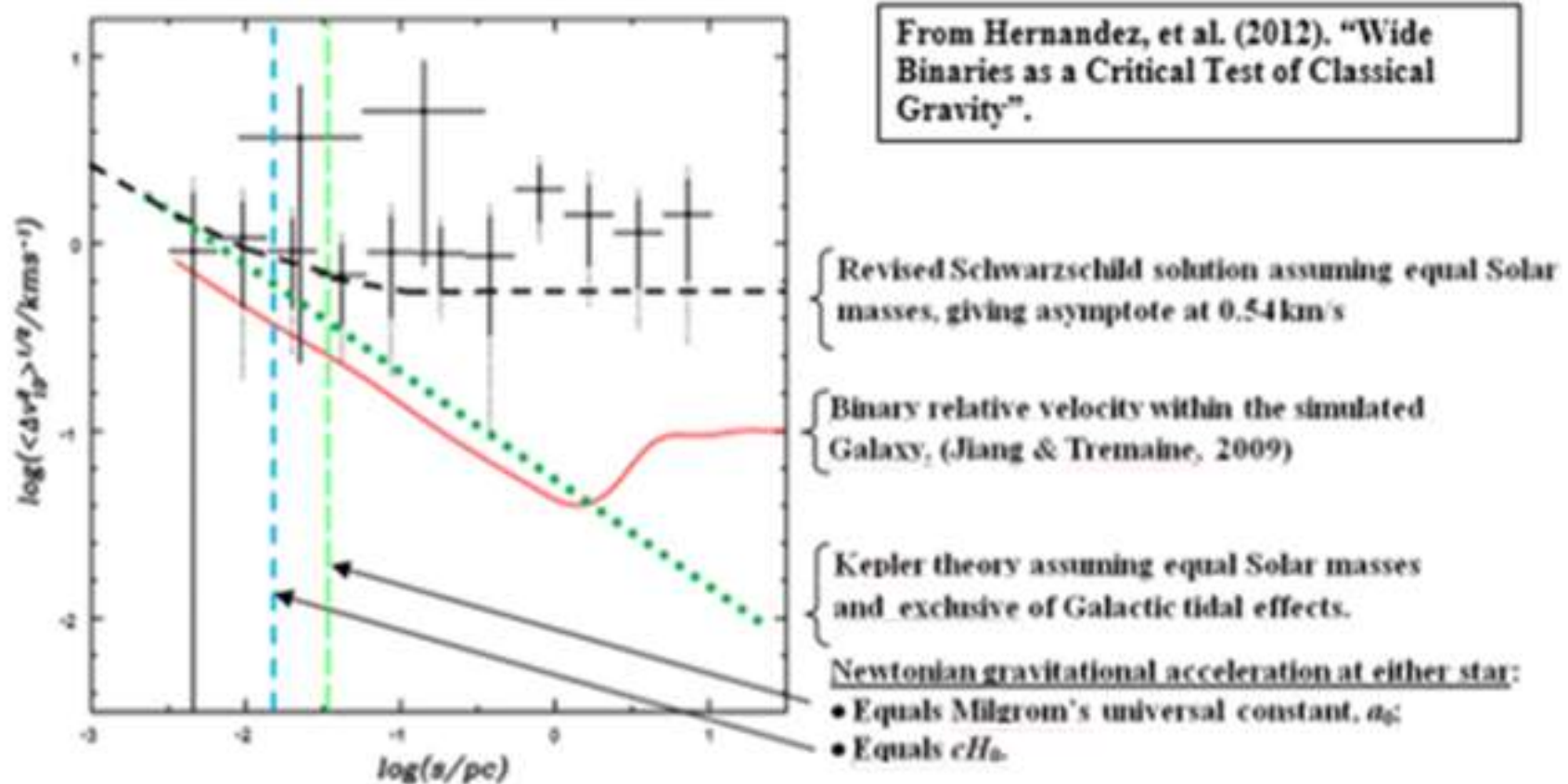
NET COSMIC ACCELERATION:

$$\begin{aligned} a_{\text{CA}} &= a_{\text{NF}} + a_{\text{SF}} + a_{\text{CF}} \\ &= \underline{[-4/3 \pi G \rho_0 / H_0^2 - 1/2 (4/3 \pi G \rho_0 / H_0^2)^{1/2} + 1] r H_0^2} \quad \underline{\underline{= [\bullet] r c^2 \Lambda_0 / 3}} \end{aligned}$$



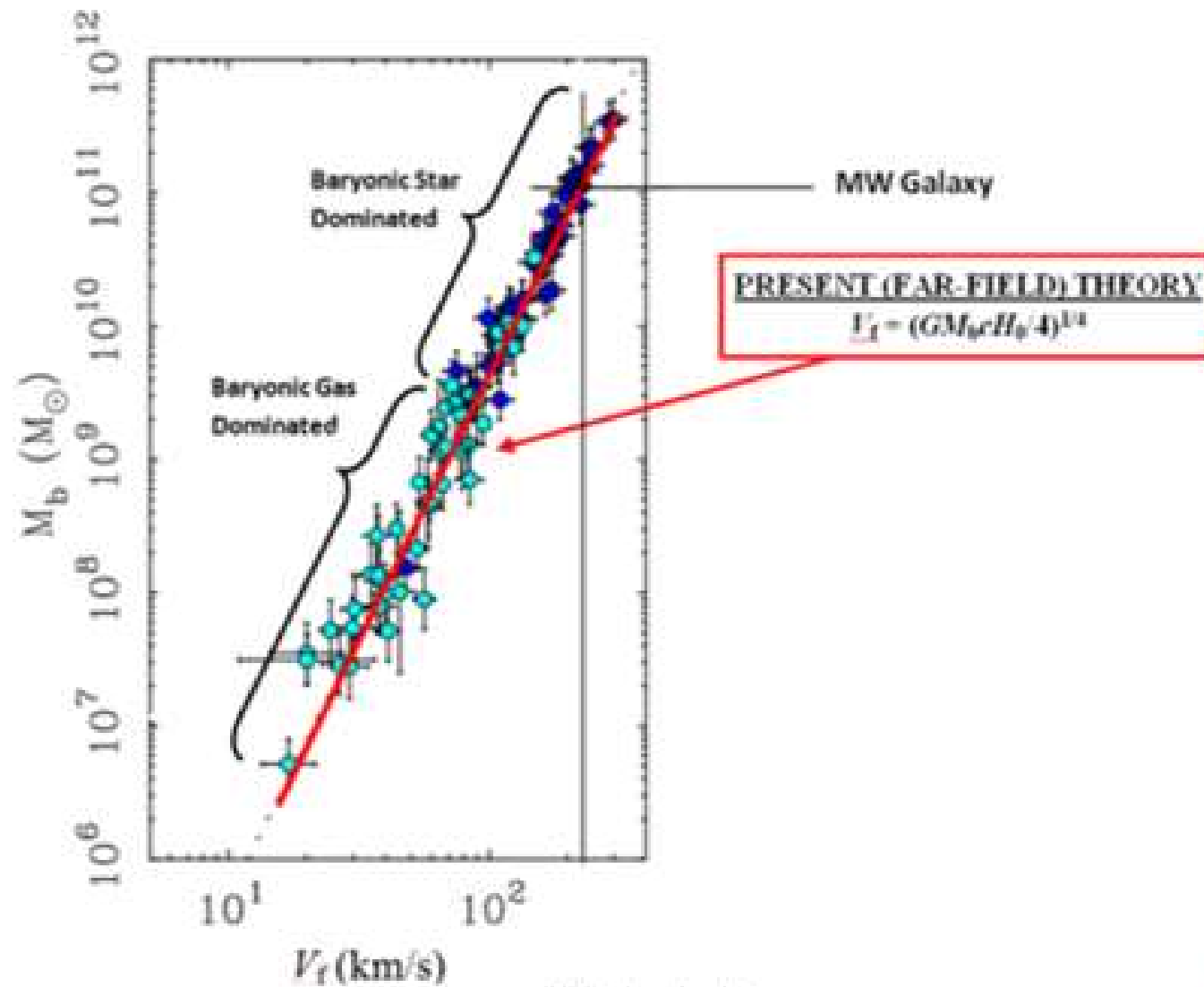
# **THEORY VERSUS MEASUREMENT**

# WIDE BINARY STAR GRAVITATIONAL CROSS-OVER

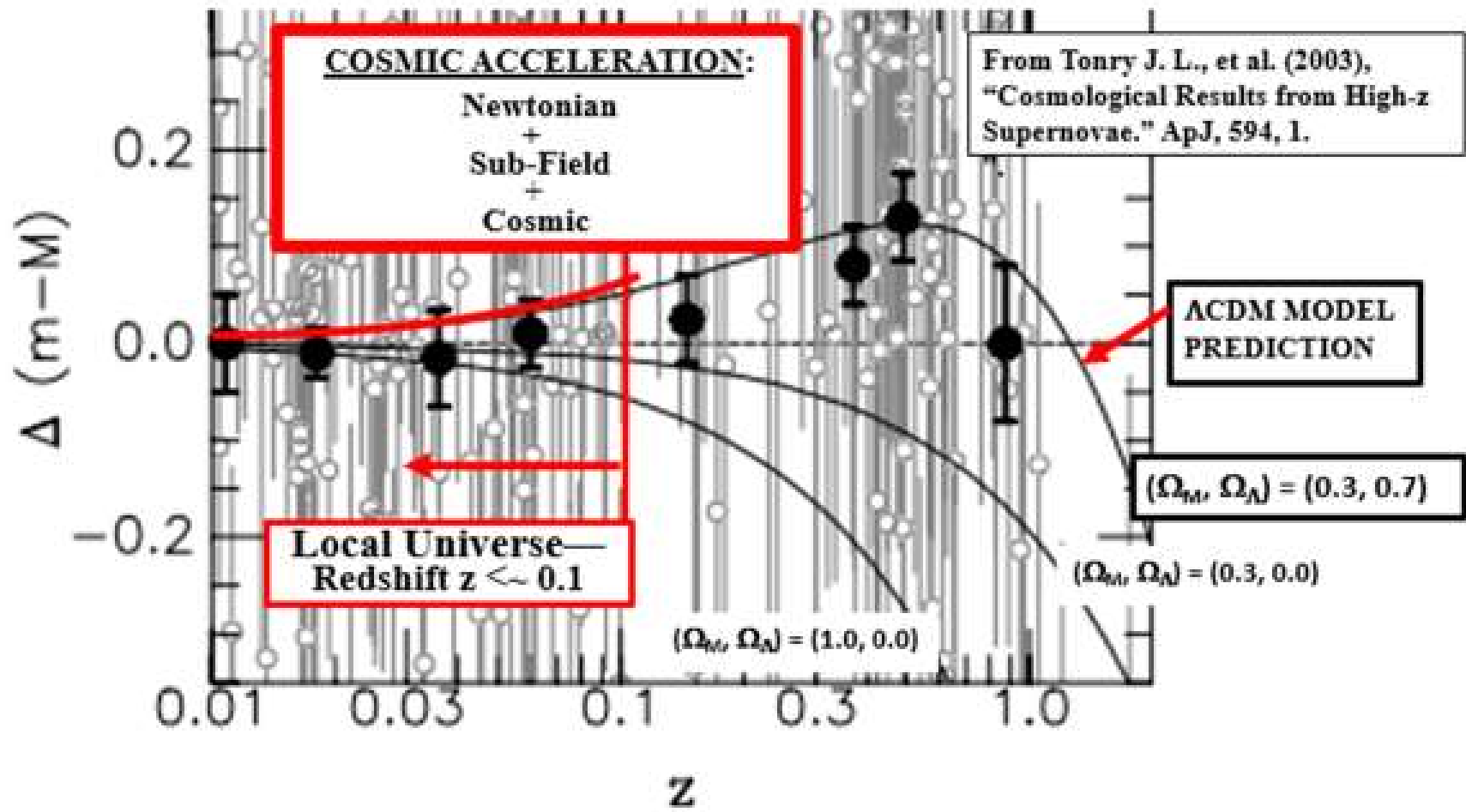


# SPIRAL GALAXY FAR-FIELD ROTATION

## BARYONIC TULLY-FISHER RELATION



**THEORETICAL SNIa RESIDUAL MAGNITUDES**  
**vs. REDSHIFT MEASUREMENTS ( $z \lesssim 0.1$ )**



# CONCLUSIONS

- **NEAR SINGULAR (INWARD) LIGHT VELOCITY WITHIN THE HUBBLE EXPANSION GIVES DEEPER THEORY--EG:**
  - Gravitational Subfield :  $a_{SF} = -\frac{1}{2} (GMcH)^{1/2}/r$
  - Cosmological Constant Defined :  $\Lambda = 3 H^2/c^2$
- **EMPIRICAL SUPPORT:**
  - Wide-Binary Star Rotation Flattening
  - Spiral Galaxy Rotation Flattening
  - Local Universe Cosmic Acceleration/Deceleration ( $z \leq 0.1$ )
- **COSMIC TIME-DILATION IS ESSENTIAL TO THE ACCELERATION OF HUBBLE SPACE EXPANSION**