An Interesting Journey of Discovery of Many Errors in Einstein's General Relativity Theory

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An interesting journey of discovery

This is a concise slide presentation of my foray into the Special and General Relativity Theories.

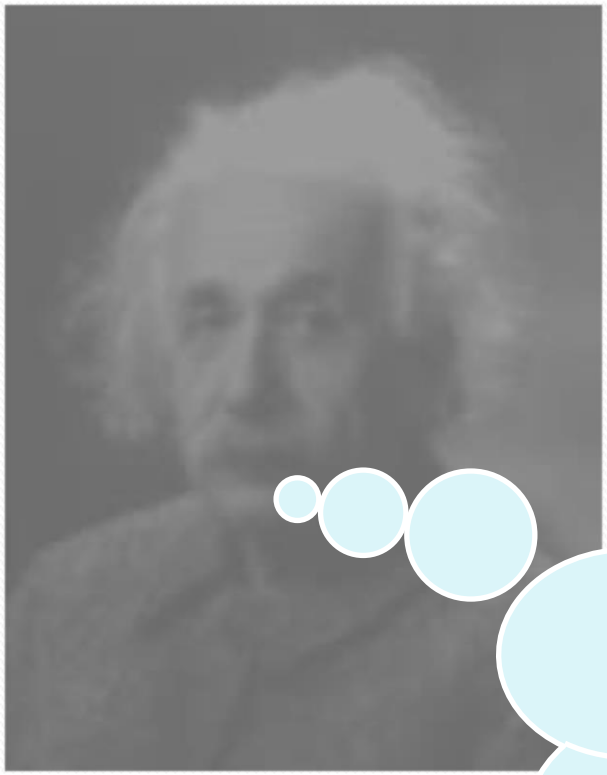
- Abstract:

The presentation deals with a discovery of errors in the Einstein's General Relativity Theory (GRT). The presentation starts with the confirmation of the correctness of Special Relativity Theory (SRT), but derives justification for a different dependence of gravitational mass on velocity than the inertial mass dependence on velocity. This leads to finding that photons cannot have a gravitational mass and thus can escape form "Black Holes". This finding contradicts the popular belief and the popular statements such as: "not even light can escape from Black Holes". The presentation then introduces a new metric whose validity has been confirmed by the standard GRT tests and applies it to create a new model of the universe, which is not based on the Big Bang assumption. Finally, the new universe model predictions are compared with observations and an excellent agreement is obtained thus confirming the assumptions on which the model is built.

Presentation outline

- **Introduction: the message from the ghost of Einstein**
- **Special Relativity Theory: the mass equivalence as a first hint of a problem**
- **The new metric for spacetime**
- **The test of light trajectory bending by gravity**
- **Motivation for modeling the universe**
- **Turning BB theory on its head**
- **Hubble telescope dates oldest star, 'Methuselah', at 14.5 billion years old**
- **The new universe model assumptions**
- **Supporting mathematical background**
- **Comparison with observations**
- **Hubble diagram**
- **Accelerating universe?**
- **More comparisons with observations**
- **Quantum of the repulsive Dark Matter**
- **Possible evidence for gravitational waves**
- **Conclusions**
- **Summary of some fundamental principles**
- **Closing remarks**
- **Recent claims and revisions of the BB theory**
- **Interesting similarities between various theories**
- **Links to posted papers related to this work**
- **Reference literature**

Ghostly appearance

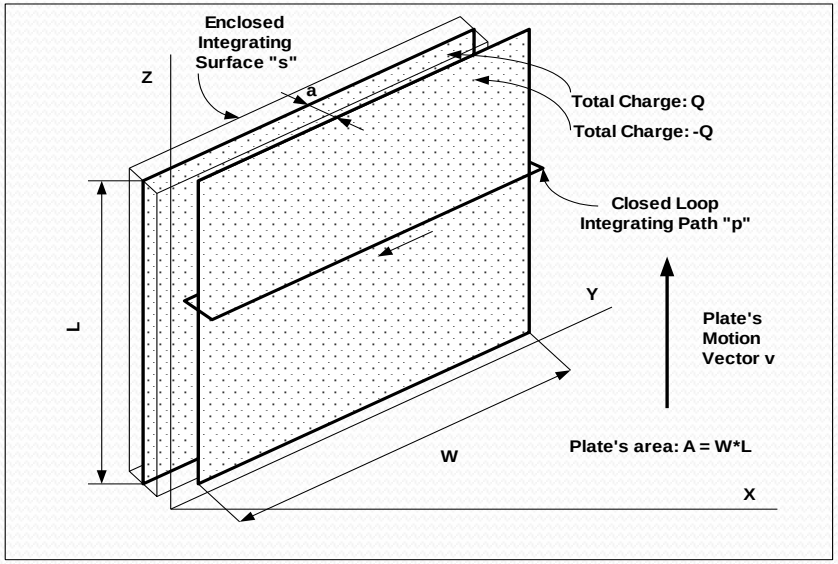


- One morning, my retirement time quickly approaching, I think it was in 2004, a ghostly image has appeared near my bed when I was waking up and said with a heavy German accent:

- Jerry, I have made an error in my General Relativity Theory and these fools are still following it, piling up on it without end in sight.
- You have to find the error and do something about it.

A hobby for approaching retirement

- Start by looking closer into the Special Relativity Theory



- Construct the simple electrically driven clocks, the parallel palate capacitor, and calculate the ticking rate (the time to plate's collision):

$$F = \frac{Q^2}{\varepsilon \cdot 2A} \qquad t_c^2 = \frac{a \cdot m_i}{F} \qquad t_c^2 = \frac{\varepsilon \cdot m_i \cdot a \cdot 2A}{Q^2}$$

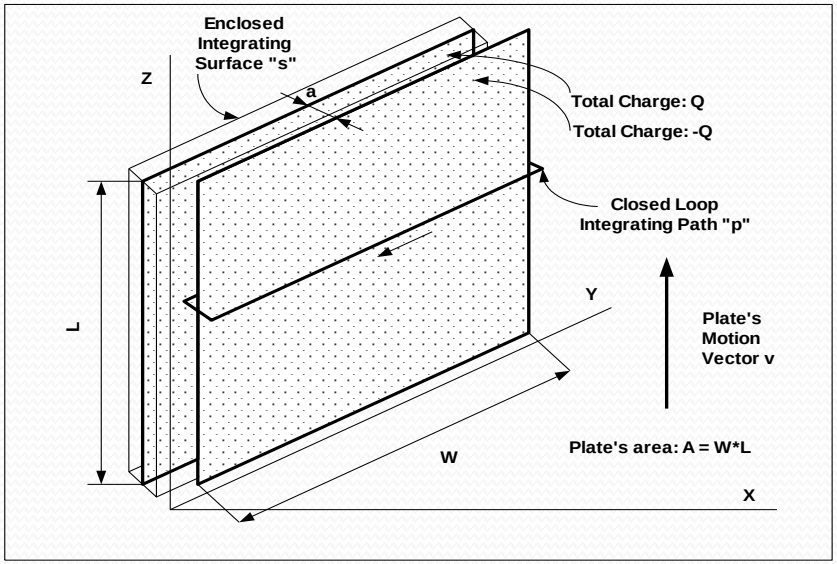
- Observe the same clocks when they are moving relative to the laboratory coordinate system:

$$F = Q \cdot \left| \vec{E} + \vec{v} \times \vec{B} \right| = \frac{Q^2}{\varepsilon \cdot 2A}\left(1 - \frac{v^2}{c^2}\right)$$

$$t_c^2 = \frac{\varepsilon \cdot \dfrac{m_i}{\sqrt{1 - v^2/c^2}} \cdot a \cdot 2A\sqrt{1 - v^2/c^2}}{Q^2 \cdot (1 - v^2/c^2)} = \frac{\varepsilon \cdot m_i \cdot a \cdot 2A}{Q^2 \cdot (1 - v^2/c^2)}$$

- That is great, the collision time follows the SRT with the time dilation effect. We can make simple thought experiments and study the workings of the theory.
- The force transformation to moving clocks was simple, since we have the Maxwell field equations and know that they are describing the reality correctly. We use them all the time in our work. This is the Electrical Engineering bible with an unshakeable belief in its correctness.
- Let's try now the same approach, but instead of using the electrically driven clocks use the gravitation driven clocks. For the force transformation to the moving system we now have to use the Einstein's field equations. These are complicated, but have been linearized for the weak fields, so this should work.

The first hint of the problem found



- Instead of charge we now have the gravitational mass. The time to plate's collision will be:

$$F = \frac{2\pi\kappa \cdot m_g^2}{A} \qquad t_c^2 = \frac{a \cdot m_i}{F} \qquad t_c^2 = \frac{m_i \cdot a \cdot A}{2\pi\kappa \cdot m_g^2}$$

- Using the linearized Einstein field equations, also known as GravitoElectroMagnetism, the time to collision for the moving clocks can be calculated:

$$\vec{\nabla} \times \frac{1}{2}\vec{B}_g = -\frac{4\pi\kappa}{c} \cdot \vec{j}_g \qquad \vec{\nabla} \cdot \vec{E}_g = -4\pi\kappa \cdot \rho_g \qquad \vec{F} = m_g\left(\vec{E}_g + \frac{1}{c}\vec{v} \times \vec{B}_g\right)$$

$$t_c^2 = \frac{\frac{m_i}{\sqrt{1-v^2/c^2}} \cdot a \cdot A\sqrt{1-v^2/c^2}}{2\pi \cdot \kappa \cdot m_g^2 \cdot \frac{(1-2\cdot v^2/c^2)}{(1-v^2/c^2)}} = \frac{m_i \cdot a \cdot A \cdot (1-v^2/c^2)}{2\pi \cdot \kappa \cdot m_g^2 \cdot (1-2\cdot v^2/c^2)}$$

- This result is a big problem. The gravitational clocks do not follow the SRT theory. This means that the linearized Einstein field equations are not correct. Therefore, the GRT is also not correct.
- The problem can be fixed if it is assumed that the gravitational mass depends on velocity differently than the inertial mass and that there is no gravitomagnetic force analogous to the Maxwell-Lorentz magnetic force for the moving mass. This also means that photons cannot be attracted by gravity [6]:

$$m_i = m(rst)_i \frac{1}{\sqrt{1-\frac{v^2}{c^2}}} \qquad m_g = m(rst)_g \sqrt{1-\frac{v^2}{c^2}} \qquad t_c^2 = \frac{m_i \cdot a \cdot A}{2\pi \cdot \kappa \cdot m_g^2 \cdot (1-v^2/c^2)}$$

- However, the GRT is based on the absolute mass equivalence. This warrants a further investigation [7].

Metrics for the curved spacetime

- The calculations dealing with the centrally gravitating bodies in GRT are based on the Schwarzschild metric. The metric predicts the famous Black Holes with Event Horizons. Based on the previous finding this model is suspect because the Schwarzschild metric follows from the GRT.

$$ds^2 = \left(1-\frac{R_s}{r}\right)(cdt)^2 - \left(1-\frac{R_s}{r}\right)^{-1} dr^2 - r^2 d\Omega^2 \qquad d\Omega^2 = d\vartheta^2 + \sin^2\vartheta\, d\varphi^2 \qquad R_s = \frac{2\kappa M}{c^2}$$

- After a long search and much work, but limited only to static cases, I have derived a new metric, which satisfies all the tests of the GRT such as the Mercury perihelion advance, the Shapiro delay, the light bending effect by the gravitating bodies, the gravitational redshift etc.. The new metric satisfies even the most recent tests such as the Gravity Probe B experiment.
- In this metric the standard natural, observable, radius *r* is replaced by the physical, computed, radius ρ according to the formula: $d\rho = \sqrt{g_{rr}}\,dr$. The metric is as follows:

$$ds^2 = e^{\frac{2\phi_n(r)}{c^2}}(cdt)^2 - e^{\frac{-2\phi_n(r)}{c^2}} dr^2 - \rho(r)^2 e^{\frac{2\phi_n(r)}{c^2}} d\Omega^2 \qquad d\rho(r) = e^{\frac{-\phi_n(r)}{c^2}} dr \qquad \phi_n(r) = -\frac{\kappa M}{\rho(r)}$$

- This metric also describes the curved space-time, but as can be seen form the formula it does not lead to such pathologies as Black Holes. The Schwarzschild metric is the first order approximation.
- The Black Holes do not exist in reality, this is a mathematical artifact of a bad model that should not be extrapolated past its validity limits (large r). Therefore, Einstein field equations do not describe the reality correctly and should be abandoned.
- The ghost of Einstein was right.

Light bending effect for different metrics

- The new MTG metric

$$ds^2 = e^{-R_s/\rho}(cdt)^2 - e^{R_s/\rho}dr^2 - \rho^2 e^{-R_s/\rho}\left(d\vartheta^2 + \sin^2\vartheta d\varphi^2\right)$$

$$ds = 0 \qquad \vartheta = \pi/2 \qquad \delta\int_L dt_{ph} = 0 \qquad \delta\int_L \frac{cdt}{\sqrt{g_{tt}}} = 0$$

$$\frac{d\varphi}{d\rho} = \frac{\rho_p}{\rho\sqrt{\rho^2 e^{-R_s/\rho_p} - \rho_p^2 e^{-R_s/\rho}}}$$

$$-\frac{d\varphi}{dx} = \frac{1}{\sqrt{1-x^2}} + \frac{a}{2}\frac{1}{\sqrt{1-x^2}}\frac{1-x^3}{1-x^2} \qquad x = \rho_p/\rho \qquad a = R_s/\rho_p$$

$$\Delta\varphi = a\int_0^1\left(1+\frac{x^2}{1+x}\right)\frac{dx}{\sqrt{1-x^2}} = 2a = 2\frac{R_s}{\rho_p(r_p)}$$

To find the light bending angle, considering without limitation only the equatorial plane, it is necessary to set the metric light element *ds* to zero. However, this is not enough, another condition is needed, which is related to the photon time of flight as observed by a distant observer.

The time of flight should be minimized according to the Fermat's principle. It is also necessary to consider the time dilation effect as the photons traverse the various regions of different gravitational field intensities, which affects their velocity.

- The Schwarzschild metric of GRT

$$ds^2 = g_{tt}(cdt)^2 - g_{tt}^{-1}dr^2 - r^2\left(d\vartheta^2 + \sin^2\vartheta d\varphi^2\right) \qquad g_{tt} = 1 - \frac{R_s}{r}$$

$$ds = 0 \qquad \vartheta = \pi/2 \qquad \delta\int_r cdt = 0$$

This principle does not hold true for photons (waves) moving in a 2+1 light cone spacetime where *ds*=0, $\theta=\pi/2$.

$$\frac{d\varphi}{dr} = \frac{r_p}{r\sqrt{r^2(1-R_s/r_p) - r_p^2(1-R_s/r)}}$$

$$-\frac{d\varphi}{dx} = \frac{1}{\sqrt{1-x^2}} + \frac{a}{2}\frac{1}{\sqrt{1-x^2}}\frac{1-x^3}{1-x^2} \qquad x = r_p/r \qquad a = R_s/r_p$$

$$\Delta\varphi = a\int_0^1\left(1+\frac{x^2}{1+x}\right)\frac{dx}{\sqrt{1-x^2}} = 2a = 2\frac{R_s}{r_p}$$

In GRT, however, the time dilation effect of photon travel time along the photon trajectory, as observed by a distant observer, is neglected. This is a fundamental problem and an error of the GRT light bending effect derivation. This error thus falsely forces the theory to agree with the experiment.

The hallmark of the GRT is a scientific fraud.
It is unbelievable that this error has not been recognized earlier by the experts working in this field for their entire professional lives and is repeated in all the GRT textbooks.
This looks like a cover-up to save the "beautiful" theory.

The remaining tests of gravity theory

- The advance of Mercury perihelion, the Shapiro delay, the gravitational redshift, and the geodetic precession as recently measured by the Gravity Probe B, are all also correctly predicted by the new metric. This has been published elsewhere.

- Having thus obtained the new metric, that satisfies all the tests and that does not predict such absurdities as Black Holes, I have decided to test it further and use it for modeling the universe. This work is described in the rest of the presentation.

Gravitation and the Dark Matter Model of the Universe

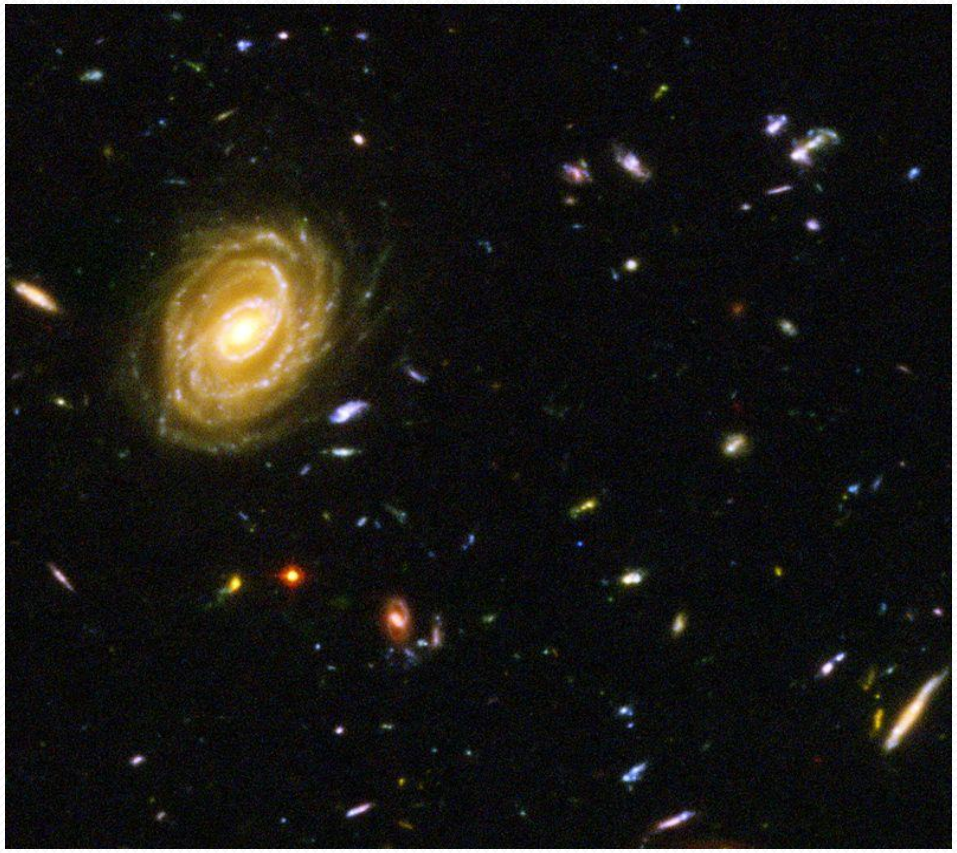
Motivation for the work

- There are many objections to the Big Bang (BB) model of the universe. The critique can be found for example in the: *Proceedings of the First Crisis in Cosmology Conference* [2].
- There are also well know and renown critics of the BB theory such as Fred Hoyle and several others [3] who put forward very compelling arguments against this theory.
- In the recent publication [1] a description of the measurement of a star's age in our Milky Way galaxy halo indicates that the star is 13.2 billion years old. This age is very close to the claimed age of the universe: 13.7 billion years. This does not seem reasonable.
- It seems almost impossible that our galaxy and its oldest star had enough time to condense the hydrogen gas into the first generation of stars, ignite them, burn the hydrogen, explode the stars, then condense the remnants into the second generation of stars, and finally aggregate these stars into the present day galaxies with the galaxy halos.
- Considering further that the BB model postulates the universe's sudden superluminal inflation, it is reasonable to think that other galaxies, similar to our own but far away from us, have also their halos and the same old stars in them. However, we observe these galaxies fully developed, so our galaxy must be older by the time it takes for the light to travel from these distant galaxies to Earth, about 5~10 Gyr. So, the estimated age of our galaxy should thus be about 20~40 Gyr.
- It is therefore apparent that a more reasonable model of the universe, which agrees better with observations, needs to be developed and this is the goal of this work.

- Some of the typical responses to the obvious critique:
  - Cr: The first law of thermodynamic is violated. Creation of something from nothing.
  - A: BB does not address creation, only the evolution. The laws of physics do not hold as we approach t=0.
  - Cr: Faster than speed of light inflation.
  - A: GR does not apply at the beginning. The space itself is expanding faster than c.

Quotation From The Daily Galaxy: March 15, 2014

Fifteen Old, Massive Galaxies Found in the Early Universe -- "They Shouldn't Even Exist"



- Yet another enigma has been discovered about the early Universe: galaxies that seem to come out of nowhere. Most of the galaxies that have been observed from the early days of the universe were young and actively forming stars. Now, an international team of astronomers have discovered galaxies that were already mature and massive in the early days. The finding raises new questions about how these galaxies formed so rapidly and why they stopped forming stars so early.
- Fifteen mature galaxies were found at a record-breaking average distance of 12 billion light years, when the universe was just 1.6 billion years old. Their existence at such an early time raises new questions about what forced them to grow up so quickly.
- What a surprise? The new model of the universe supports naturally the existence of such galaxies.

Turning theory on its head

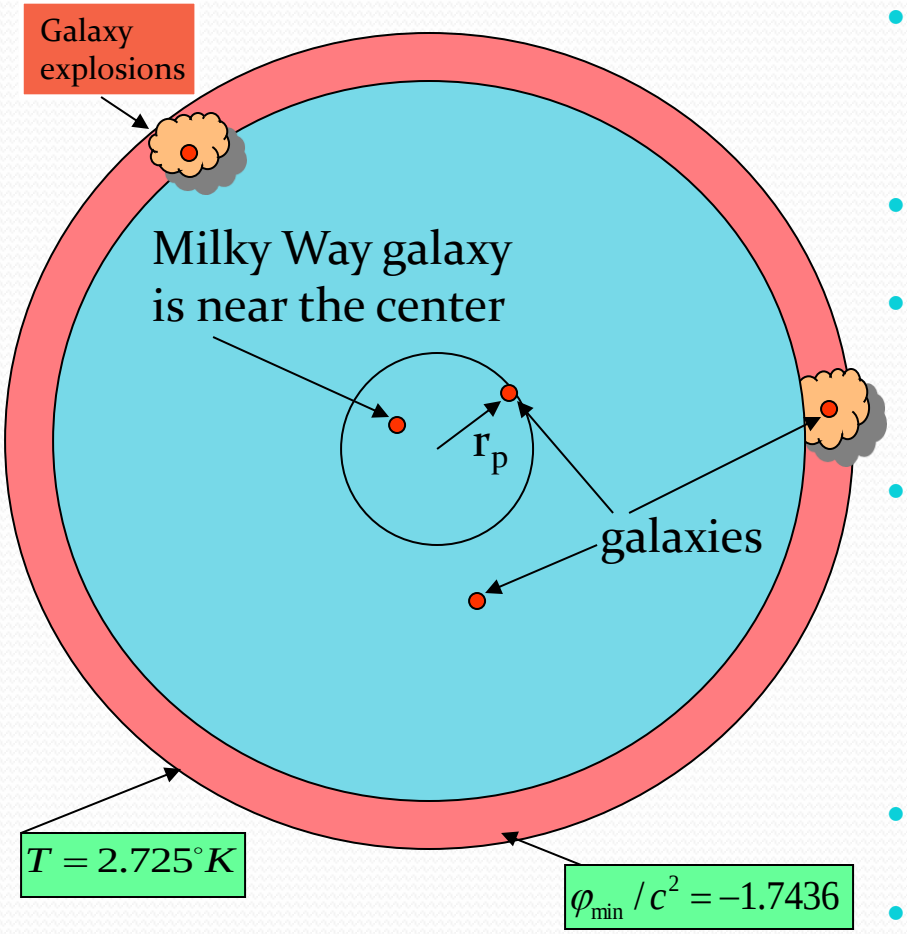
*Astronomer **Anna Frebel** of the Massachusetts Institute of Technology is part of a team that reported the discovery this week of a star that is almost as old as the universe. She specializes in the early universe, the beginning of the chemical evolution, and the formation of the first stars and galaxies.*

- Astronomers have found a tiny star at the edge of our galaxy, which may send them back to the drawing board to explain how stars are formed.
- "Accepted theory predicts stars with low mass and extremely low quantities of metals, shouldn't exist because the clouds of material from which they formed could never have condensed", says Caffau.
- "But the work shows low mass stars can form at very low metallicity."
- Scientists use the amount of metallic elements within a star, known as metallicity, to determine its age. The smaller the proportion of metals in its composition, the older it's thought to be.
- Based on its metallicity, SDSS102915+172927 is about 13 billion years old, making it one of the oldest stars ever found.
- It was discovered in the constellation of Leo the lion in the galactic halo, a region of the Milky Way populated by ancient stars.
- Caffau and colleagues believe the star is probably not unique.
- "We have identified several more candidate stars that might have metal levels similar or even lower," she says.

Hubble telescope dates oldest star, 'Methuselah', at 14.5 billion years old

- The Hubble space telescope has enabled astronomers to identify the oldest known star whose age we can reliably estimate.
- With a birthdate around 14.5 billion years ago and a margin for error of 0.8 billion years (depending on how youthful the star wishes to appear to others), HD 140283 has been given the slightly more memory-friendly name "the Methuselah star", a reference to the oldest person to ever live according to the Bible.
- Previous estimates of the star's age had it celebrating it's super sweet sixteen billion but, as NASA point out, the fact that the universe's age has been calculated at around 13.8 billion presented some obvious problems. The revised estimate and accompanying wiggle room allow for the Methuselah star, cosmology and stellar physics to carry on coexisting comfortably.
- Hubble was useful in achieving this by allowing the astronomers to more accurately measure the distance of the star from Earth using trigonometric parallax -- a syllable-heavy way of describing how a star's position appears to change depending on the position of the observer. By comparing observations from opposite points in Hubble's orbit around Earth it was possible to work out a better approximation of the star's distance from us. The distance was then combined with information about the star's intrinsic brightness to estimate its age with around five times the precision.
- "You get an age of 14.5 billion years, with a residual uncertainty that makes the star's age compatible with the age of the universe," said Howard Bond of the Space Telescope Science Institute. "This is the best star in the sky to do precision age calculations by virtue of its closeness and brightness."

The new universe model basic assumptions



- The universe is a finite sphere of "dark matter" (DM=transparent), that is compressible, has a very large stiffness, and a very small mass density. This results in an inward pointing pressure gradient.
- The dark matter is attractive to itself but repulsive to visible matter. The DM "ether" is back.
- The gravity waves propagate in this matter as longitudinal pressure waves with the physical velocity c. The light propagates in this matter as transversal waves with the same velocity c.
- The galaxies move as defects do in a crystal. They float from the center (Milky Way is still relatively near the center of the universe) to the edge where they disintegrate and generate the immense Gamma Ray Bursts (GRB). This radiation is then reflected back to the universe where it contributes to the generation of new visible matter. (F. Hoyle)
- No light can travel or the visible matter can exist outside of the universe's edge. (What is outside?)
- The reason why we must use the dark mass is that it gravitates while the energy, waves, do not [6].

Supporting math background

$$c = \sqrt{P/m} \qquad (PV = N \cdot k_B T / g_{tt})$$

$$ds^2 = g_{tt}(cdt)^2 - g_{rr}dr^2 - \rho^2 g_{tt}\left(d\vartheta^2 + \sin^2\vartheta \cdot d\varphi^2\right)$$

$$g_{tt} = \exp(2\varphi_v) \qquad g_{tt}g_{rr} = 1 \qquad d\rho = \sqrt{g_{rr}}dr = e^{-\varphi_v}dr$$

Due to the DM compressibility it is considered that: $\rho = \rho(r)$, where r is the observed radius.

$$\varphi_v(r) = -\frac{4\pi\kappa}{c^2\rho(r)}\int_0^{\rho(r)} m(\rho)\rho(r)^2 d\rho$$

$$L = e^{2\varphi_v}\left(\frac{cdt}{d\tau}\right)^2 - e^{-2\varphi_v}\left(\frac{dr}{d\tau}\right)^2 \qquad \delta\int_\tau L(t,r)d\tau = 0$$

$$\frac{dt}{d\tau} = e^{-2\varphi_v} \qquad \left(\frac{dr}{d\tau}\right)^2 = c^2 - c^2 e^{2\varphi_v}$$

$$\frac{dr}{dt} = c\, e^{2\varphi_v}\sqrt{1 - e^{2\varphi_v}}$$

$$\frac{dr}{dt} \cong c\sqrt{-2\varphi_v} = \sqrt{\frac{8}{3}\pi\ \kappa\ m_0}\ r = H_0 r$$

$$H_0 = 68.0 km\ s^{-1} Mpc^{-1} \qquad m_o = 0.8686 \cdot 10^{-26} kgm^{-3}$$

- Relation between the pressure and the DM density:
- The DM dominates the visible matter, therefore, the visible matter metric is static and the galaxies are only small test bodies in that space-time. The galaxies move for the most part independently of each other since the repulsive force of DM compensates the mutual attractive force of the visible matter after a certain distance.
- The repulsive "buoyancy" force (similar to the Archimedes force) acting on the galaxies follows the standard Newton gravitational law. The gravitational potential is thus calculated from the standard formula but with r -> $\rho(r)$.
- The galaxies are in a free fall to the edge of the universe. The Lagrange formalism is used to describe the radial motion. The Lagrangian and the first integrals of corresponding Euler Lagrange (EL) equations are easy to obtain from the metric as shown:
- Eliminating $d\tau$ from the first integrals leads to the formula for the galaxy recession velocity; dt is observable, $d\tau$ is not.
- For the relatively short distances the formula for the Hubble law follows and the DM mass density is found.

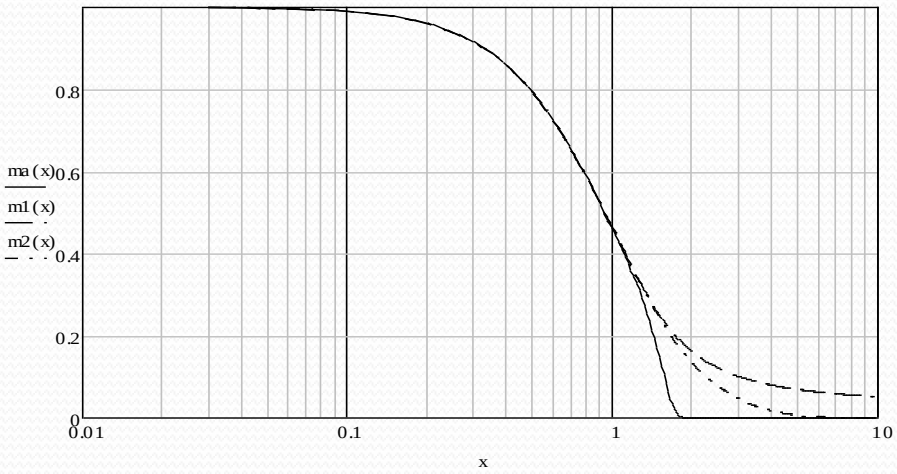
Supporting math background

$$\frac{dP}{d\rho} = -\frac{4\pi\ \kappa\ m(\rho)}{\rho^2}\int_0^{\rho} m(\rho)\rho^2 d\rho \qquad c = \sqrt{P/m}$$

$$m_n(\rho) = \exp\left(-A_0\int_0^{\rho} m_n(\xi)\left(\xi - \xi^2/\rho\right)d\xi\right) \qquad m_n(\rho) = m(\rho)/m_0$$

$$A_0 = 4\pi\kappa m_0 / c^2$$

$$m_a(\rho) = \exp\left(-\frac{\rho^2}{\rho_h^2} + \frac{3}{10}\frac{\rho^4}{\rho_h^4} - \frac{4}{35}\frac{\rho^6}{\rho_h^6} + \frac{61}{1260}\frac{\rho^8}{\rho_h^8} - \frac{4507}{231000}\frac{\rho^{10}}{\rho_h^{10}} + \ldots\right)$$



- The mass density as a function of the physical radius is calculated from the standard formula for the pressure similarly as in an ocean [8].
- Substituting for the pressure the following integral equation for the normalized dark mass density is obtained:
- The closed form solution is not known, so either iterations or an approximating function has to be developed [12] .
- The solid line curve shows the numerically calculated normalized approximating function for the dark mass density as a function of the normalized physical radial distance.

  $x = \rho/\rho_h \quad \rho_h = 2c/H_0 \quad \rho_h \neq c/H_0$
- The other two curves are the first two iterations of solution of the integral equation for the DM mass density (dashed and dot-dashed lines) again as functions of the same normalized physical radius.

Supporting math background

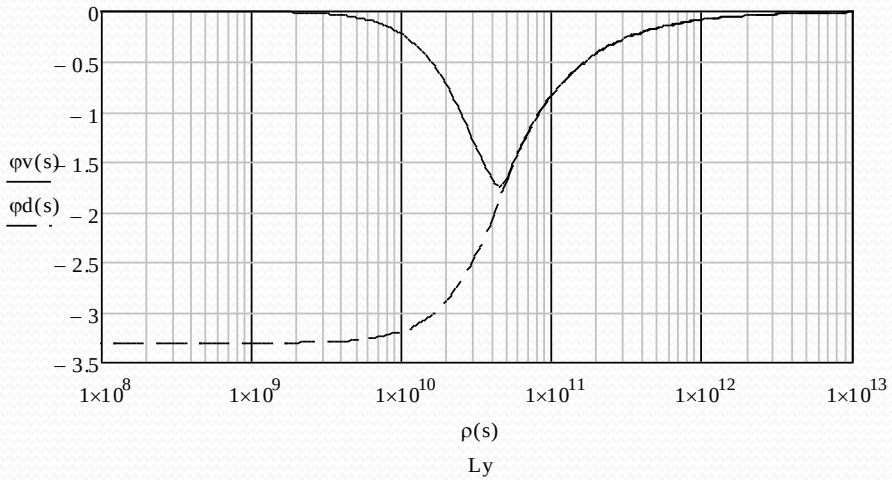
$\rho_h = 28.76 \cdot 10^9\, Ly$ $\quad r_h = 18.84 \cdot 10^9\, Ly$ $\quad \rho_h = 2c / H_0$

$\rho_{mx} = 44.03 \cdot 10^9\, Ly$ $\quad r_{mx} = 22.11 \cdot 10^9\, Ly$ $\quad \rho_h \neq c / H_0$

$M_{du} = 1.290 \cdot 10^{54} kg$ $\quad P_0 = 7.80 \cdot 10^{-10} Pa$

$$\varphi_v(r) = -\frac{4\pi\kappa}{c^2 \rho(r)} \int_0^{\rho(r)} m(\rho)\rho(r)^2 d\rho$$

$$\varphi_d(\rho) = A_0 \int_0^{\rho} m_a(\xi)\left(\xi - \xi^2 / \rho\right) d\xi - 3.303$$

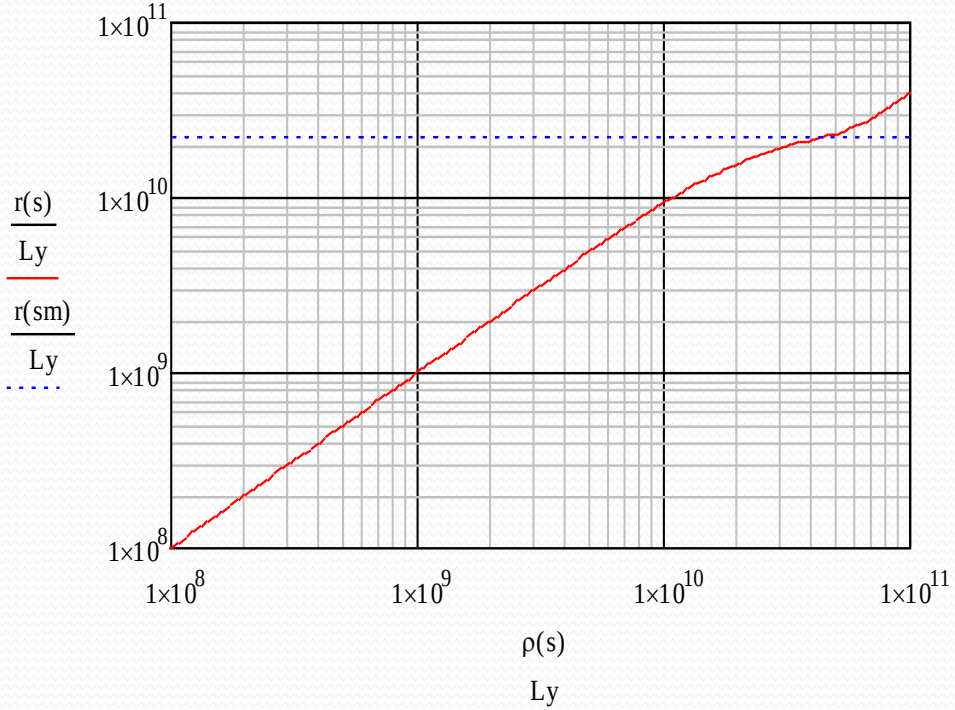


- Once the dark matter mass density is known it is easy to find the maximum universe's radius, the total universe's DM mass, the pressure at the Earth's location, and the potentials for the visible and the dark matter.
- The formula for the normalized visible matter potential as a function of the physical radius:
- The formula for the normalized dark matter potential as a function of the physical radius:
- The graphs of the dependencies of normalized gravitational potentials for the visible matter (solid line) and the dark matter (dashed line) as functions of the physical radius. The integration constants were adjusted such that the potentials at infinity are zero.
- The visible matter has a deep potential minimum at the universe's edge where the debris of galaxies accumulate and form a semi dense shell, perhaps even a shell of ionized hydrogen plasma or a shell of elementary particles such as neutrons that decompose and radiate cosmic neutrinos.

Supporting math background

$$\rho = \rho(r)$$

$$d\rho = \sqrt{g_{rr}}\,dr = e^{-\varphi_v}\,dr \qquad r(\rho) = \int_0^{\rho} \exp(\varphi_v)\,d\rho$$



- The relation between the natural and the physical radius follows from the metric.
- Knowing the visible matter potential as a function of the physical distance the natural distance, which is the observable parameter, can be calculated. The blue dotted line represents the edge of the universe where the visible matter potential has its minimum.
- The DM gravitation compresses the natural radius close to the edge of the universe.
- We are living in the natural space-time, so everything would be compressed if we were located at the edge of the universe including our bodies. However, we would not observe this, since our measuring sticks would also be compressed.
- The space-time distortion can be observed only from the remote distances such as our Earth, that is presently located approximately $26.5 \cdot 10^6\, Ly$ away from the universe's center.

Supporting math background

$$Z(\rho) = \frac{\sqrt{1 - v_r^2 / c_r^2}}{1 - v_r / c_r} - 1 = \frac{\exp(\varphi_v)}{1 - \sqrt{1 - \exp(2\varphi_v)}} - 1$$

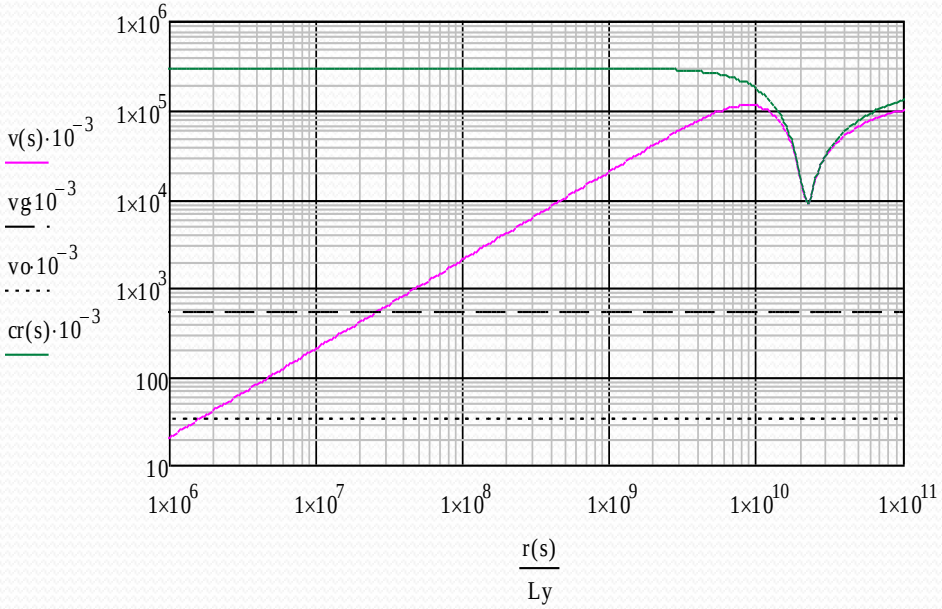
$Z_{mx} = 10.35$

$$r(\rho) = \int_0^{\rho} \exp(\varphi_v) d\rho$$

$$\tau_{\max} = \frac{1}{c} \cdot \int_{\rho_g}^{\rho_{mx}} \frac{d\rho}{\sqrt{\exp(-2\varphi_v(\rho)) - 1}}$$

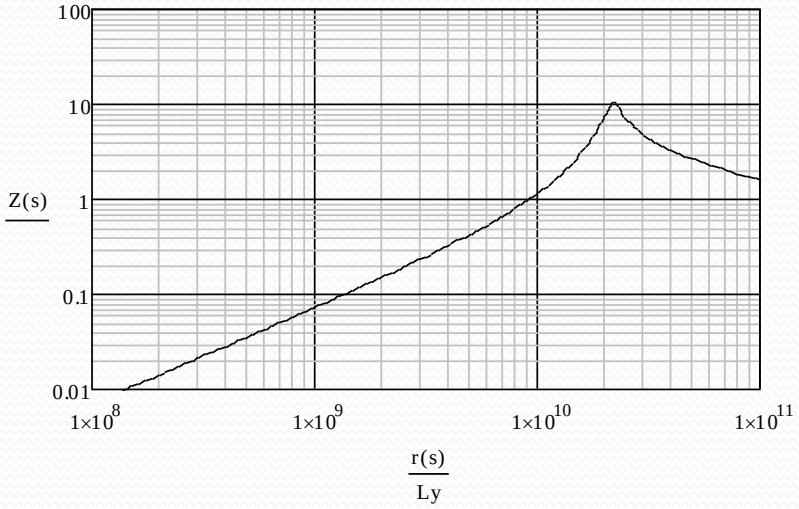
$\tau_{\max} = 100.0\ Gyr$

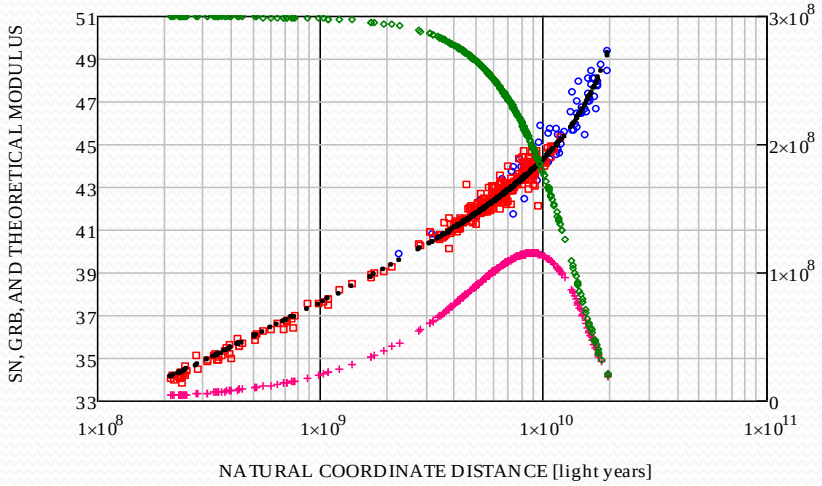
$\tau_{10bLy} = 84.7\ Gyr$



- From the visible matter potential it is also simple to calculate the observed Doppler Z shift as a function of the natural radial distance. The graph is shown on the next slide.
- All the interesting universe's parameters are, therefore, calculated from the single measured Hubble constant including the time to the Milky Way galaxy destruction.
- The graph of the numerically computed galaxy recession velocity in km/sec as a function of the natural coordinate radius in light years measured from the center of the universe (purple line); the limiting vacuum speed of light (green line); the current Milky Way recession velocity: 552 km/sec obtained from the CMBR (dashed line); and the Milky Way galaxy recession velocity: 34.18 km/sec, during its formation 40 Gyr ago (doted line). The galaxies disintegrate approaching the edge of the universe at the radius of: 22.11 bLy.

Comparison with observations





- Astronomers measure the luminosity modulus, which is the difference between the apparent and the intrinsic star luminosity, as a function of the luminosity distance d_L, which includes the Z shift. The modulus and Z shift are directly measured, however, $\rho(r)$ is model dependent.

  $\mu_s = m_{sa} - M_{si} \qquad d_L = \rho(r)(Z+1)$

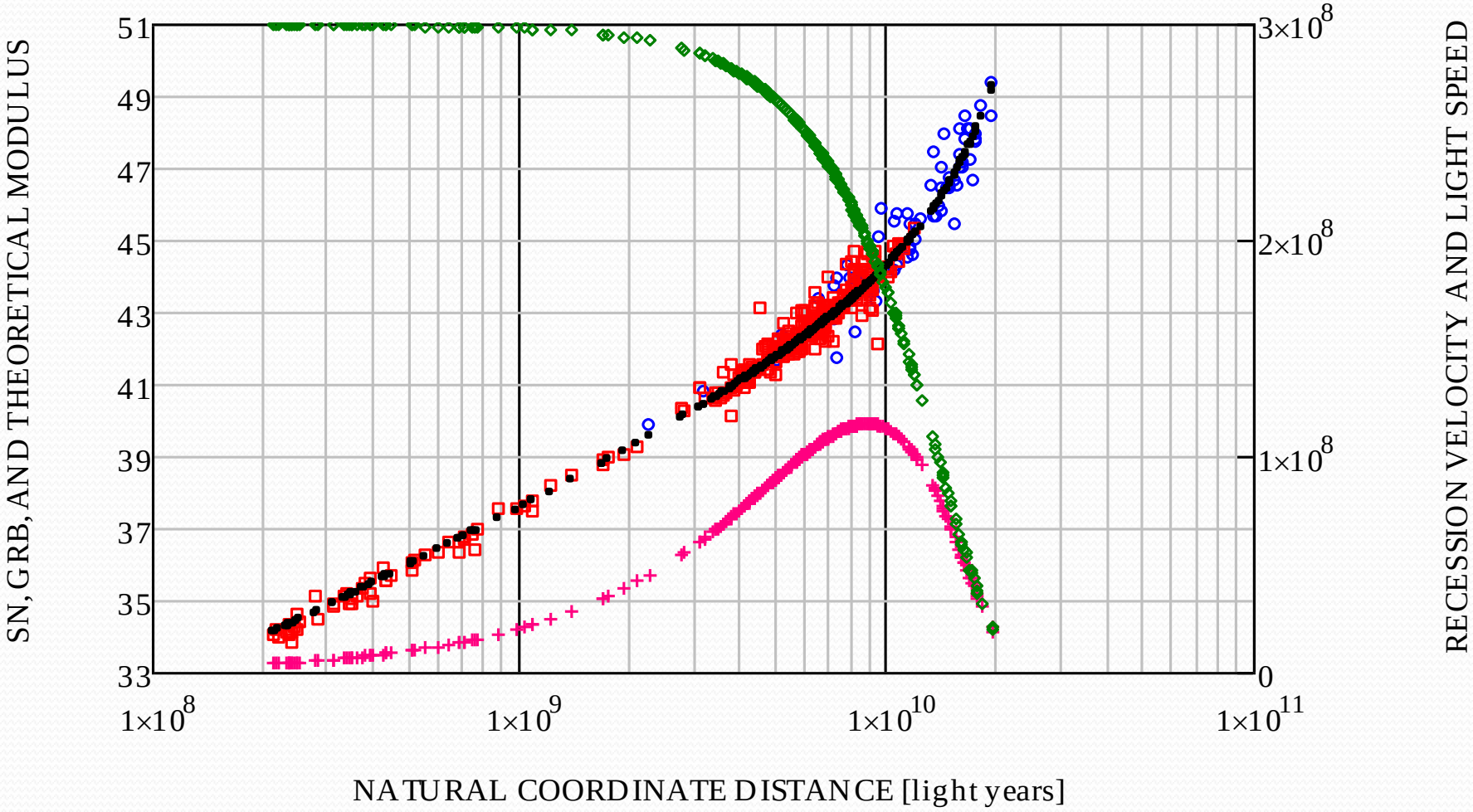
- The formula that is used by astronomers is:

  $$\mu_s(r) = 5\log_{10}\left(\frac{\rho(r)(Z+1)}{10\,pc}\right) \qquad r(\rho) = \int_0^{\rho} \exp(\varphi_v)\,d\rho$$

- Measured 304 Supernova (red squares) and 69 GRB (blue circles) data points of modulus μ_s plotted together with the corresponding theoretical values of modulus (black dots) as functions of the natural radial distance. The recession velocity is also shown on the same graph (purple pluses) with the speed of light (green diamonds). The DM density at the origin corresponds to the Hubble constant:

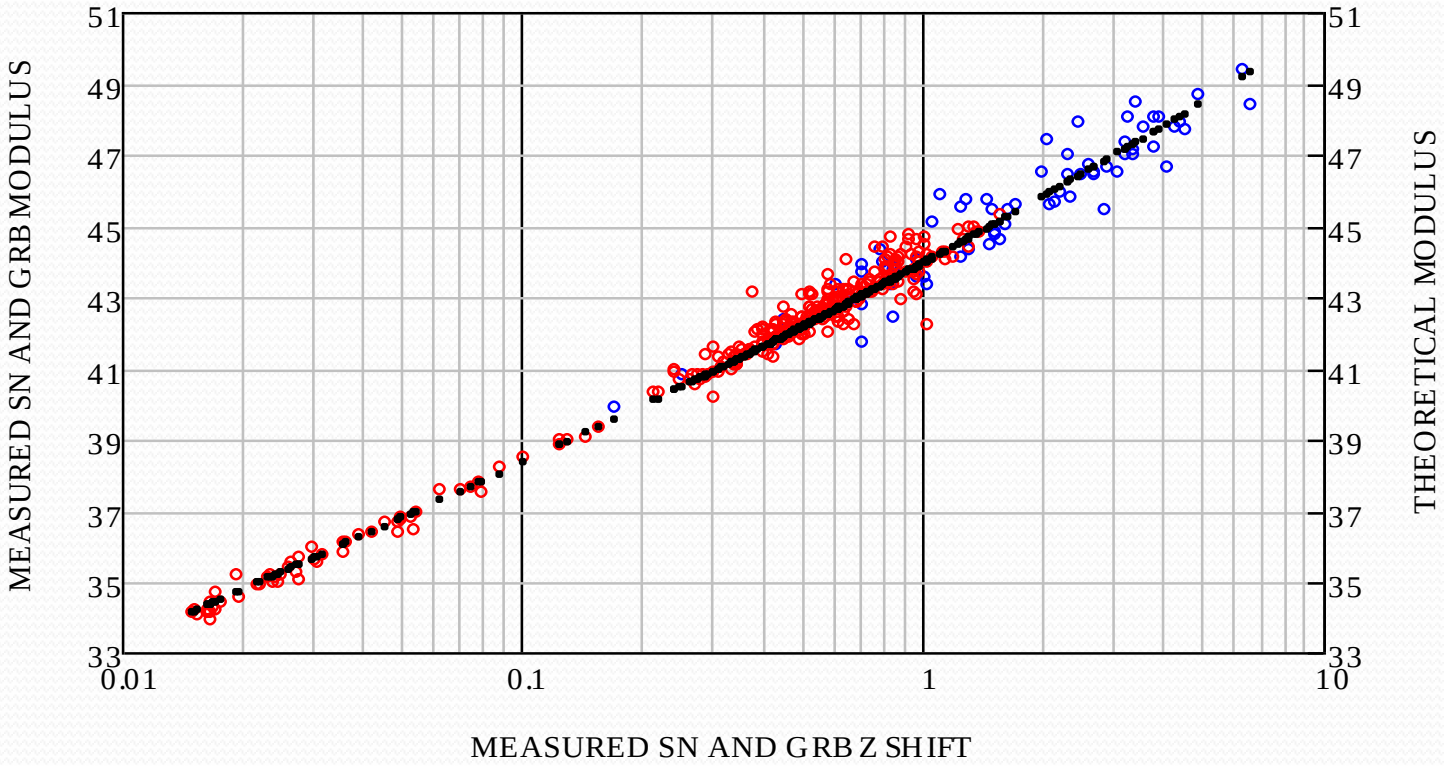
  $H_0 = 68.0 km\ s^{-1} Mpc^{-1}$

A closer look at the fit of the theory



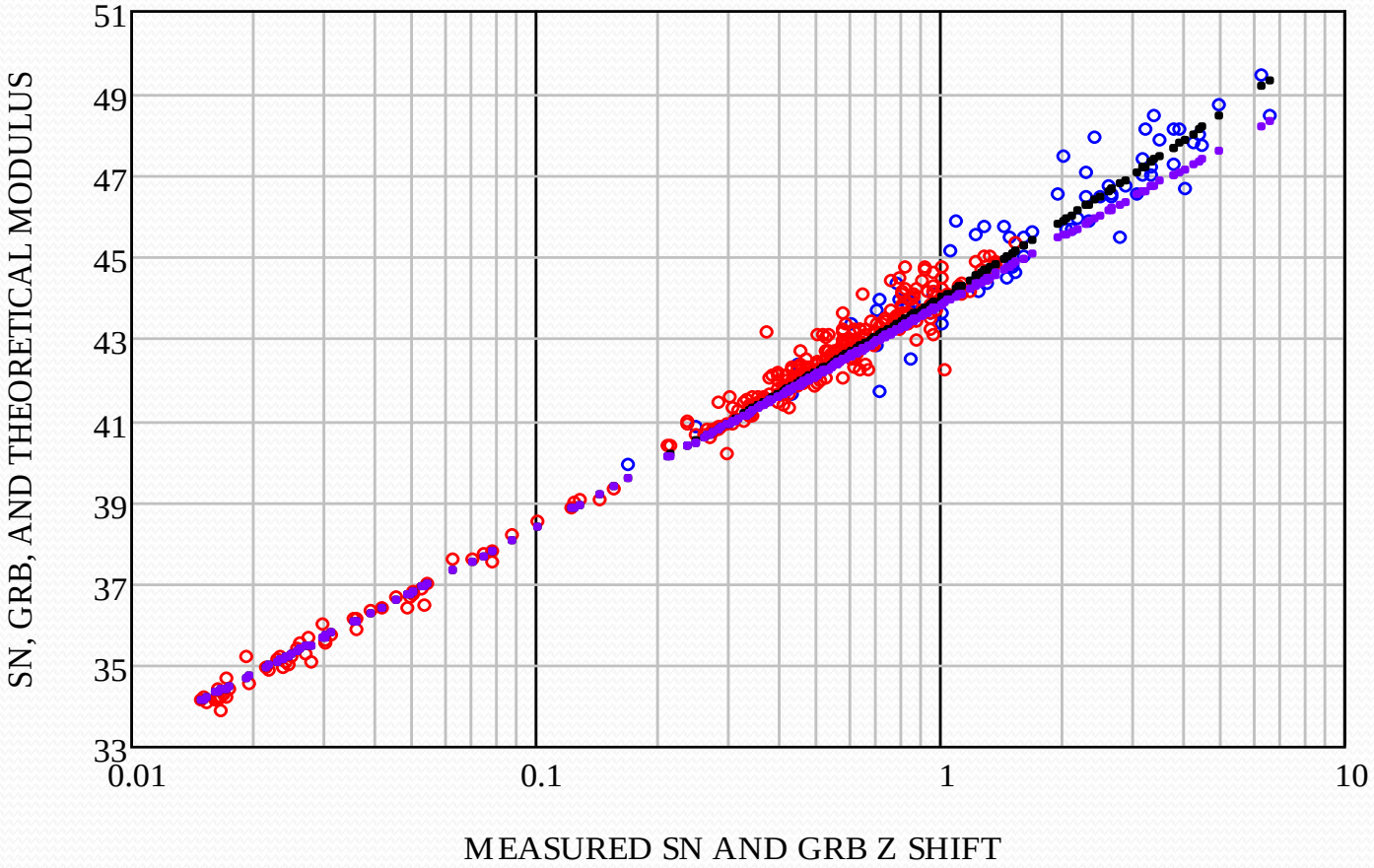
- The theory that has only one parameter to adjust to observations, the Hubble constant, fits the data remarkably well. This is in a stark contrasts to the BB theory that must adjust at least 3 additional parameters to obtain a good fit in the region up to 10 bLy. This suggests that the BB theory is not the correct theory of the universe.

Hubble diagram
the direct comparison with observations



- Measured 304 Supernova (red circles) and 69 GRB (blue circles) data points of luminosity modulus [4,9] plotted together with the corresponding theoretical values of the modulus (black dots) as a function of the Doppler Z shift. The measured data is, of course, model independent.
- The fit of the repulsive DM theory to measured data is stunning. Based on this result is difficult to believe that the BB theory is correct and that the universe expansion is "accelerating".

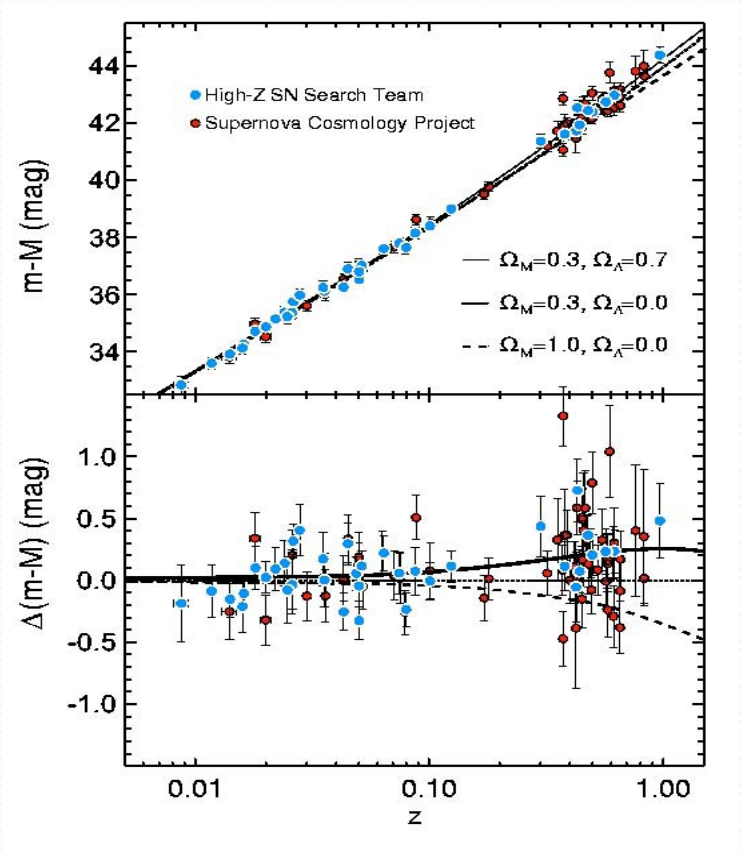
Hubble diagram using the GRT (BB) model
This is a direct comparison with observations

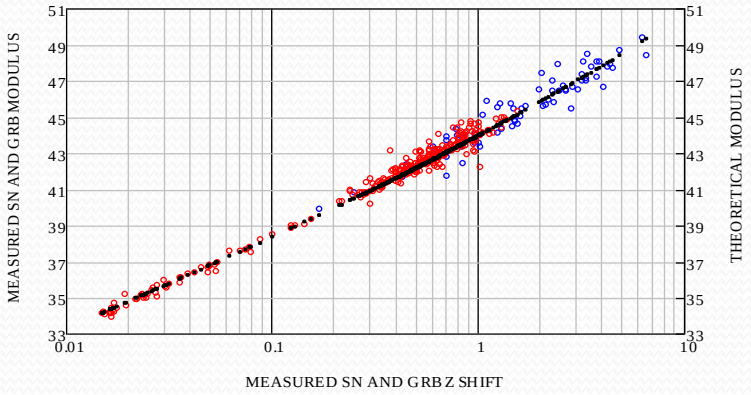


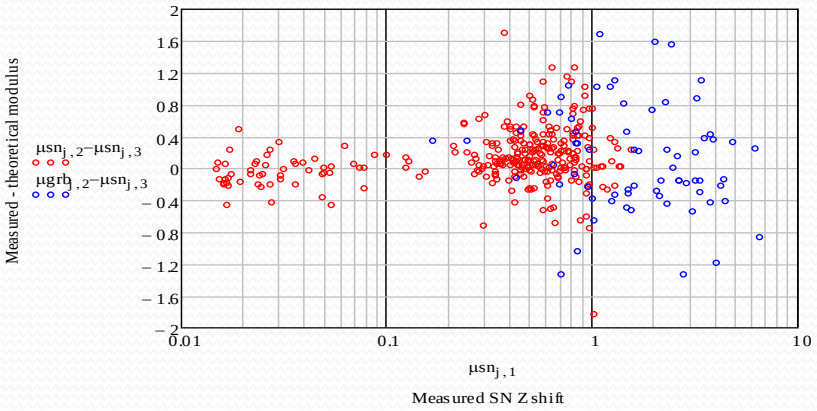
- When the Big Bang model is used for the evaluation of the same data, it is abundantly clear that at large distances the data fit to the GRT Big Bang theory is not good (purple dots). Only the variable μ has been modified according to GRT with $\rho(r)$ replaced by r in the formula: $\mu_s(r) = 5\log_{10}[r(Z+1)/10\,pc]$. This ultimately leads to an erroneous conclusion of accelerating universe expansion in a flat space-time.

Accelerating universe ? Perhaps not

- In the side-by-side comparison of the SN data evaluated by the different theories of universe it is difficult to see any universe acceleration after more SN and GRB data has been added. The comparison actually favors the repulsive DM model. The graphs were obtained from the presentation posted on the internet by the Nobel prize winner A. Riess.

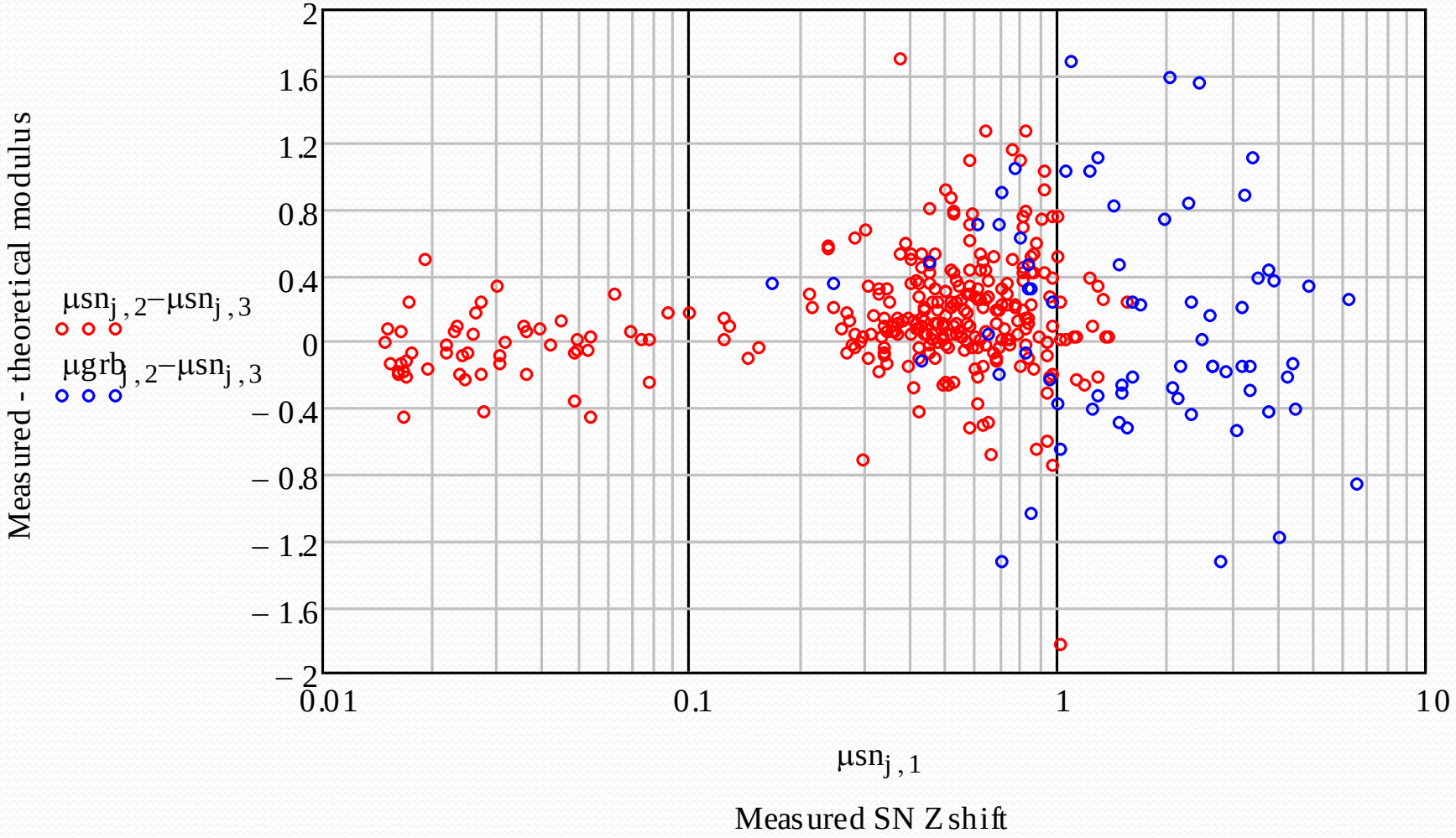






A closer look at the difference data

- It is difficult to be convinced that there is any systematic deviation form zero



BB model required parameters

Parameter	Value	Description
t_0	$13.75 \pm 0.11 \times 10^9$ years	Age of the universe
H_0	$70.4^{+1.3}_{-1.4}$ km s^{-1} Mpc^{-1}	Hubble constant
$\Omega_b h^2$	0.0260 ± 0.00053	Physical baryon density
$\Omega_c h^2$	0.1123 ± 0.0035	Physical dark matter density
Ω_b	0.0456 ± 0.0016	Baryon density
Ω_c	0.227 ± 0.014	Dark matter density (norm. to m_o)
Ω_Λ	$0.728^{+0.015}_{-0.016}$	Dark energy density (norm. to m_o)
Δ_R^2	$2.441^{+0.088}_{-0.092} \times 10^{-9}$, $k_0 = 0.002$Mpc^{-1}	Curvature fluctuation amplitude
σ_8	0.809 ± 0.024	Fluctuation amplitude at $8h^{-1}$Mpc
n_s	0.963 ± 0.012	Scalar spectral index
z_*	$1090.89^{+0.68}_{-0.69}$	Red shift at decoupling
t_*	377730^{+3205}_{-3200} years	Age at decoupling
τ	0.087 ± 0.014	Re-ionization optical depth
z_{reion}	10.4 ± 1.2	Red shift of re-ionization

More information is found here: http://en.wikipedia.org/wiki/Lambda-CDM_model

This value of H_o does not fit the data that well.

h is a fudge factor or a normalizing factor defined as: $H_o/h = 100$ km/s/Mpc.

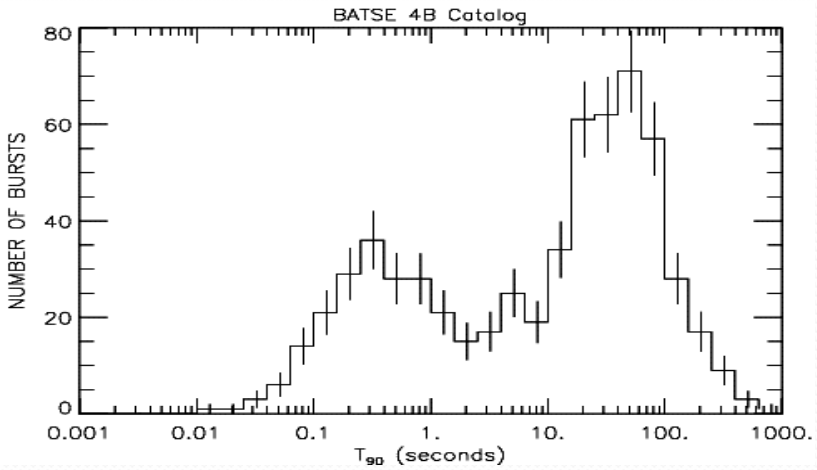
The energy that consists of quasi particles moving with the speed of light does not have gravitating mass, it has only inertial mass; $m_g(\text{photon}) \neq E/c^2$.

This value seems to agree with the Z_{mx}.

More comparisons with observations not in the BB model

- The impacts of galaxies to the shell of debris at the edge of the universe is warming the shell up. From the CMBR temperature of 2.725 °K one can calculate the number of galaxies that explode per day. Only 1% of galaxy mass is assumed to be converted to heat, the rest is debris or is radiated back to the universe as GRBs. This result agrees well with observation of one GRB per day.

$$N_{GRB/day} = \frac{\xi}{\eta}\frac{8}{15}\pi^6\left(\frac{k_B T_b}{hc\sqrt{g_{tt}}}\right)^4 \frac{\rho_{mx}^2\, h\, t_d}{M_G} = 0.88$$



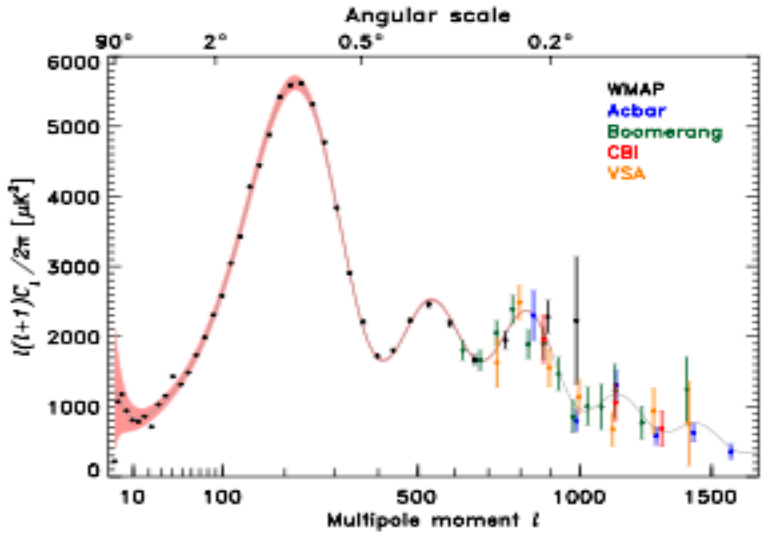
- The GRBs detected on Earth are the explosions of galaxy centers, since they are very massive, approximately 4 million Suns. The explosions of individual galaxy stars are not visible. The duration of GRBs is easily calculated from the mass of the galaxy central stars. These are not black holes with Event Horizons, they are very compact masses with a physical radius of 1/4 of the Schwarzschild radius [5].

$$\tau_{grb} = \frac{Compacted\ \ radius}{c\sqrt{g_{tt}}} = \frac{\kappa\, M_S\, 4.0\cdot 10^6}{2c^3\sqrt{g_{tt}}} = 56.34\cdot \sec$$

- The existence of GRBs disprove the existence of BH and replaces them with compact stars.
- The statistical distribution of the long and short GRB pulse durations as published in the BATSE 4B catalog [11] is shown in the graph:
- The smaller peak corresponds to explosions of Quasars that did not have enough time to develop to full size galaxies before reaching the shell of debris at the end of the universe.

More comparisons with observations not in the BB model

- The galaxy explosions at the universe's edge are creating disturbances that propagate along the surface of the shell of debris or particles forming circles that have been observed and measured.
- The data is from the NASA WMAP measurement of angular dependence of the CMBR power spectrum ripples [10] :



- **The dark matter repulsive force is shielding the attractive force of the visible matter. This results in a sphere of gravitational influence.**

$$\rho^2 \frac{d\varphi_v}{d\rho} = \kappa M_s - 4\pi\kappa \int_0^{\rho_i} m(\rho)\rho^2 d\rho = 0$$

- For the single star the size of our Sun the diameter is: 802 Ly, which roughly corresponds to the Milky Way galaxy thickness believed to be: 1000 Ly.

$$d_{iS} = 2\sqrt[3]{\rho_h^2 \frac{\kappa M_S}{2c^2}} = 802 \cdot Ly \qquad d_{i1000kg} = 6.0357 \cdot 10^6\, km$$

- Similarly, for the Milky Way diameter, which is believed to be: 100,000 Ly, the same formula can be used with the result of: 115,700 Ly.

$$d_{iG} = 2\sqrt[3]{\rho_h^2 \frac{\kappa M_S 3 \cdot 10^6}{2c^2}} = 1.157 \cdot 10^5 \cdot Ly$$

- When all the galaxy mass is considered condensed to one star the sphere of the gravitational influence is 40 times the galaxy diameter. The galaxies thus do not interact but may form strings.

Quantum of the repulsive DM mass and the CMBR temperature

$$E = m_0 V_0 c^2 = h\frac{c}{\lambda}$$

$$V_0 = \xi\left(\frac{\lambda}{2}\right)^3 \qquad \frac{\lambda}{2} = \sqrt[4]{\frac{hc}{2m_o\xi}} \qquad \text{diamond cell} \quad \xi = 2.940$$

$$m_{q\lambda} = m_0\xi\left(\frac{\lambda}{2}\right)^3 = \sqrt[4]{\frac{\xi\, m_0 h^3}{8c^3}}$$

$$m_{q\lambda} = 1.368619\cdot 10^{-38} kg = 7.68\ meV$$

$$H_0 = 68.0 km\ s^{-1} Mpc^{-1}$$

$$m_0 = \frac{3H_0^2}{8\pi\kappa} = 0.8686\cdot 10^{-26} kgm^{-3}$$

$$m_{q\lambda} = 7.68\ meV$$

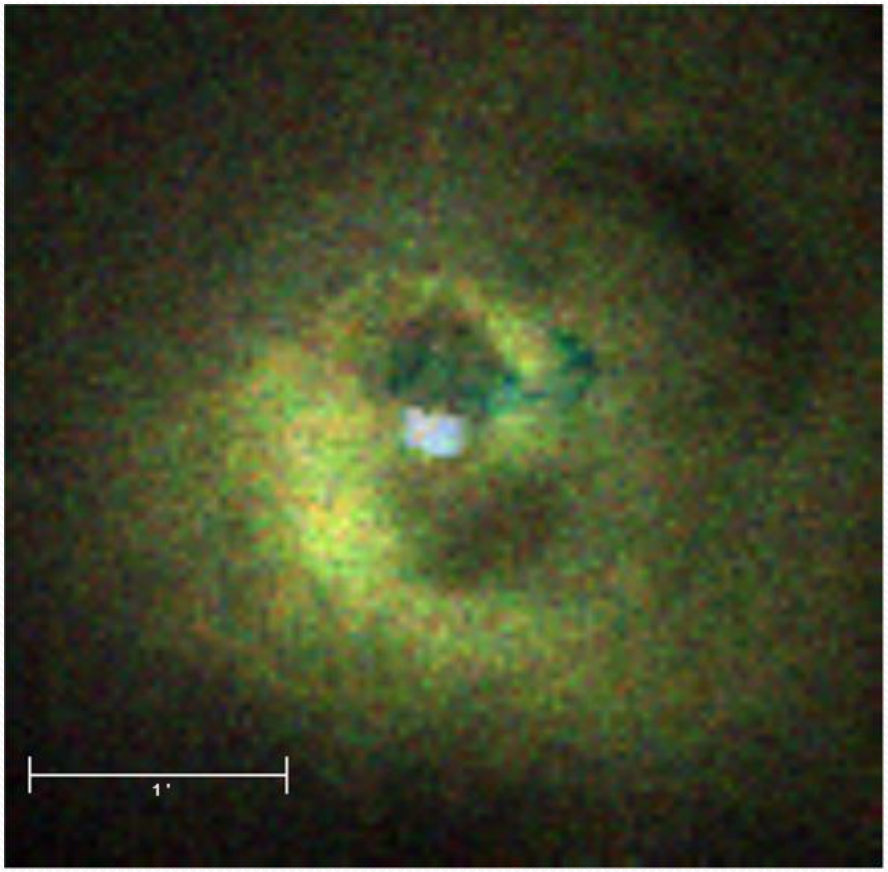
$$T_{cmbr} = \frac{m_{q\lambda} c^2 g_{tt}}{k_B} = 2.727^o K$$

$$T_0 = 2.7255^o K$$

$$H_0 = \frac{8}{3}\sqrt{\frac{\pi\,\kappa\, c^3}{h^3}}\left(\frac{k_B T_0}{c^2 g_{tt}}\right)^2 \qquad H_0 = 67.922 kms^{-1} Mpc^{-1}$$

- Since the DM space has a mass it may be thought of as a crystal-like structure consisting of primitive cells containing mass giving vibrations. The DM mass can thus be quantized.
- Equating the mass of the cell volume V_0 with the energy of the cell, the DM mass quantum is derived.
- The parameter $\xi = 3$ can be thought of as the cell packing density or as a spatial degeneracy (an exclusion principle?).
- The DM mass quantum is thus similar to charge in the Maxwell's EM field theory, therefore, it is the same everywhere in the universe. The value of this mass is close to some of the published neutrino masses.
- Once the DM mass quantum is found it is simple to convert it to energy and the energy to a temperature. The metric coefficient: $g_{tt} = 0.030586$ is found from the gravitational potential at the edge of the universe.
- Nice agreement with the measurement supports the theory.
- It is interesting that the DM mass density and, therefore, the Hubble constant are directly related to the CMBR temperature. These two parameters are typically considered mutually independent and H_0 is not accurately known.
- Since the CMBR temperature is precisely measured, the Hubble constant can now also be precisely determined.

Possible evidence of gravity waves



- The gravity waves (GW), the dark matter pressure waves in this model, seem to be observed in Perseus: NGC 1275, as detected by the Chandra X-ray telescope.
- However, due to the repulsive force between the visible and the dark matter there is a mutual screening effect that causes the dark matter density depletion near the visible stars and also a significant attenuation of GWs at the distances larger than the sphere of the gravitational influence.
- It is thus clear that the extragalactic gravity waves definitely cannot be detected here on Earth.
- The gravity wave detectors such as LIGO may perhaps be successful in detecting the GWs that are generated only nearby in our Milky Way galaxy, but the LIGO is constructed to detect only the transversal tensor waves.
- **To this day no gravity waves were detected.**

Conclusions

- In this presentation a model of the universe where the DM is deformable thus permitting the propagation of disturbances with the speed of light was developed. The model provides equations for the recession velocity of galaxies and a number of other parameters such as the total DM mass of the universe, the size of the universe, the maximum galaxy recession velocity, the maximum observable luminosity modulus, and the maximum observable red shift. All of these parameters are determined by only three constants: the Hubble constant, the gravitational constant, and the speed of light (if CMBR temperature is used instead of H_o, then k_B and h are also needed).

- The recession of galaxies in this model resembles the motion of defects in a solid matter that seem to float from the bulk to the surface, the universe's edge, where they disintegrate. It is therefore reasonable to conclude that the disintegration of the galaxy centers is the cause for the long duration GRB pulses. The short duration GRB pulses seem to result from the disintegration of Quasars. The pulse duration was calculated from the mass and the size of the typical galaxy central bodies and a good agreement with observations was obtained. It was also concluded that the galaxy central masses cannot be the Black Holes but are very compact massive objects without the event horizons [5,7]. The GRB radiation back to the universe's bulk may be the cause for the creation of the new matter through the universe, which then condenses to new stars and galaxies, repeating endlessly the cycle of destruction and creation.

Conclusions

- The CMBR temperature seems to also correlate well with the number of the destroyed galaxies per day and with the Hubble constant. The detected CMBR radiation pattern is thus the image of the universe's edge region and not the remnant of the BB. The developed alternative model provides values for the luminosity modulus as function of the radial distance from the center of the universe. This function was compared with the extensive data available from the GRBs, and the Supernova Cosmology project, and an excellent agreement between the theory and observations was obtained. Finally, the model also provided a rough estimate for the size of the average galaxy and determined its approximate relation to the Hubble distance and the mass of the galaxy's central body. Agreement of the theory with observations thus suggest that the model is correct. It is, therefore, clear that the new model presents a good alternative for and a considerable challenge to the main stream BB theory. The new model also avoids the number of implausible and very strange assumptions, which the BB model must have; the sudden creation of all the universe's visible matter from a single point singularity, a sudden superluminal space inflation but only between the galaxies not within the individual atoms of matter, the endless universe expansion with galaxies accelerating without force again only in places where it seems to fit the narrative, and finally; the universe's mass disappearance to nothingness after its conversion to radiation. All of these strange assumptions including the few others that are also well known are discussed elsewhere [2] in the published literature.

Summary of some fundamental principles

- Any theory to be a viable representation of reality must be self consistent, without prediction of singularities or any similar nonphysical absurdities. It must also explain, with a reasonable precision, all the known phenomena in its domain of applicability.
- For example: the waves, energy (quasi-particles) moving with the speed of light, do not have the gravitating mass, only the inertial mass. Waves do not transport matter.
- The Einstein formula $E = m_i c^2$ is, therefore, valid only for the inertial mass, not for the gravitational mass. Every theory that claims otherwise such as GRT is wrong!
- The waves always need a medium for their propagation, hence the dark, transparent, matter must exist. The fields are distortions of this medium. This can be also related to the causality principle and the finite propagation speed of cause and effect.
- The natural space-time we are living in is a material medium that has a mass density, a pressure, and can be distorted by the gravitating bodies. The supporting evidence for this claim is the light bending phenomenon. The coordinates are not the space.
- The gravitational attraction acting between the visible matter resembles the behavior of defects in a crystal that tend to attract each other and form various clusters such as atoms, molecules, stars, or on a large scale galaxies.
- The universe is finite in space but may be infinite in time. It is also significantly curved at large distances, so it is definitely not flat as claimed by the "main stream science".
- All Hubble parameters, including the total DM mass of the universe, DM mass density, the size of the universe, etc., depend on the CMBR temperature.
- On a philosophical note; there seems to be a limit to a knowable universe. This may be a surprise to some, it is certainly a surprise to me. Also, many interesting things could have developed during the "infinite" time and may now exist somewhere in the universe waiting for us to be discovered. "Everything possible has already been done, somewhere."

Closing remarks

- The observational astronomy has really made a great progress during the past few decades mainly due to the unprecedented revolution in engineering and technology. It is fascinating to analyze the new data.

- Thanks to the internet much of this information is now available to the general public to study, to formulate new theories, and what is most important, to compare how the various theories fit the data. This process will eventually eliminate the present day dogma of the "main stream science", which is cultivated at many universities and safeguarded by the editors and reviewers of the main stream journals.

- It is gratifying to discover how the one aspect of the universe actually works, how awesome it is, and at the same time it is humbling to realize how much we still do not know.

Scoring table for the theories

Comparison of theories of universe	Big Bang Theory	Repulsive DM Theory
Number of adjustable parameters	6	1
Fit of SN and GRB data to the theory	Poor	Excellent
Size of the universe	Unknown, infinite	Finite
Universe's horizon	Yes	No
Radius of the observable universe	46 E+9 Ly	22.11 E+9 Ly
Age of the universe	13.7 E+9 years	Unknown, infinite
Mass of the universe	No credible data	1.29 E+54 kg
Maximum observable Z shift	10.4	10.35
CMBR temperature	2.7255 K	2.7255 K
Hubble constant	70.0 km/s/MPc	68 km/s/MPc
Critical mass density	5.0 E-27 kgm^-3	8.686 E-27 kgm^-3
Hubble constant	Independent variable	Calculated from CMBR
Universe expansion	Yes	No
Accelerated expansion	Yes	No
Curvature of the universe	Probably flat	Curved
GRB occurrence frequency	No credible explanation	Calculated from CMBR
GRB pulse duration explanation	Not explained	Calculated from the central star mass
Galaxy size	Not predicted from BB	Estimate calculated
Galaxy recession	Continues forever	Finite
Maximum galaxy lifetime	Not predicted from BB	140 E+9 years
Explanation of circular correlation of ripples	Poor	Good
Theory performance score	**9/21**	**20/21**

Recent claims and revisions of the BB theory

- Steven Hawking's paper:
- Information Preservation and Weather Forecasting for Black Holes
  S. W. Hawking DAMTP, University of Cambridge, UK

Abstract

It has been suggested [1] that the resolution of the information paradox for evaporating black holes is that the holes are surrounded by firewalls, bolts of outgoing radiation that would destroy any in-falling observer. Such firewalls would break the CPT invariance of quantum gravity and seem to be ruled out on other grounds. A different resolution of the paradox is proposed, namely that gravitational collapse produces apparent horizons but no event horizons behind which information is lost. This proposal is supported by ADS-CFT and is the only resolution of the paradox compatible with CPT. The collapse to form a black hole will in general be chaotic and the dual CFT on the boundary of ADS will be turbulent. Thus, like weather forecasting on Earth, information will effectively be lost, although there would be no loss of unitarity.

- Black Holes as we have known them do not exist.

Recent claims and revisions of the BB theory

Image: Wiki Commons

- **Our entire universe might exist inside a massive black hole, say physicists. Are we living inside a black hole?**
- A few scientists think it's the best theory to explain the pre-Big Bang reality.
- This radical theory would imply that our universe is just one of many. It would suggest that our universe is ultimately contained within a much larger universe — a mother universe, if you will — which harbors the black hole we're currently living in. It's a wild theory, but it's one that is slowly but surely garnering consideration from physicists. (How about my theory, perhaps it is not wild enough?)
- One such physicist is Dr. Nikodem Poplawski of the University of New Haven in Connecticut. He argues that singularities, like the ones that exist at the centers of black holes, have a physical limit, a point where they can be crunched no further. Such a point would have to be massive, perhaps the weight of a billion suns or more. But once that limit is reached, the immense compacting processes at the heart of all singularities must halt.
- http://www.mnn.com/earth-matters/space/stories/our-entire-universe-might-exist-inside-a-massive-black-hole-say

Interesting similarities of various theories

- We are not living inside of a Black Hole, the Black Hole (no spacetime) is what is outside of our universe. They have it inverted inside-out.

- The hot firewall that Hawking and others postulate that must exists around each Black Hole is actually an interior envelope of the universe and has the temperature of Cosmic Background Radiation 2.7255 ^{0}K.

- The mainstream almost got it right. Perhaps in next 100 years they will finally converge to reality and to the truth.

Links to posted papers related to this work

Not refereed:

http://gsjournal.net/Science-Journals-Papers/Author/201/Jaroslav,%20Hynecek

http://www.worldnpa.org/site/member/?memberid=1741&subpage=abstracts

http://vixra.org/abs/1406.0138

Refereed:

http://ccsenet.org/journal/index.php/apr/search/results

http://physicsessays.org/browse-the-journal.html

http://www.highbeam.com/Search?FilterByPublicationID=436947&FilterByPublicationName=Physics+Essays&searchTerm=hynecek+jaroslav

Recorded presentations:

http://www.worldsci.org/php/index.php?tab0=Events&tab1=Display&id=600

http://www.worldnpa.org/site/event/?eventid=540

http://www.worldnpa.org/site/event/?eventid=495

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2. *Proceedings of the First Crisis in Cosmology Conference* (CCC-I), Monaco, Portugal, 23-25 June 2005, http://www.cosmology.info/press/2005.06.30-CCC-I_followup.pdf.
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11. http://www.batse.msfc.nasa.gov/batse
12. E. Kamke, *Differentialgleichungen,* Leipzig 1959, eq. 6.76.

Thank you for the attention.