

A Cosmic Lens May Explain the Hubble Flow

Glen W. Deen
820 Baxter Drive, Plano, TX 75025
phone (972) 517-6980, e-mail glen.deen@gte.net
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Abstract

Cosmic lenses obtain their refracting properties from the hypothesis that the speed of light is a slightly slower constant inside the lens than outside. The title of this paper expresses its original goal, but that goal was not achieved in this paper because the target galaxies chosen for the analysis are too near to the Milky Way Galaxy (MWG). The MWG's lens cannot project local group galaxy images if they are inside its focal distance. Instead, a model for a spherical cosmic lens is presented that is constrained by the observed distances to the galaxies M31 and NGC 5128. These galaxies were chosen because the angular orientations of M31 are almost exactly equal to those of the inverted mirror image of NGC 5128, and that fits my claim that NGC 5128 is the negative-time projection of M31's dark-matter halo. Another observation in support of this claim is that these two galaxy images are nearly 180° apart in the sky. The model initially converged to the following solution using Microsoft Excel's Solver: lens radius $R = 280.94$ pc, index of refraction $n = 1.00044563$, and the distance to the unseen real object responsible for projecting both images, $x_{o1} = 0.34475$ Mpc. But closer examination revealed that this was not a unique solution. The ambiguity should be resolved as other conjugate galaxy pairs are included in the analysis.

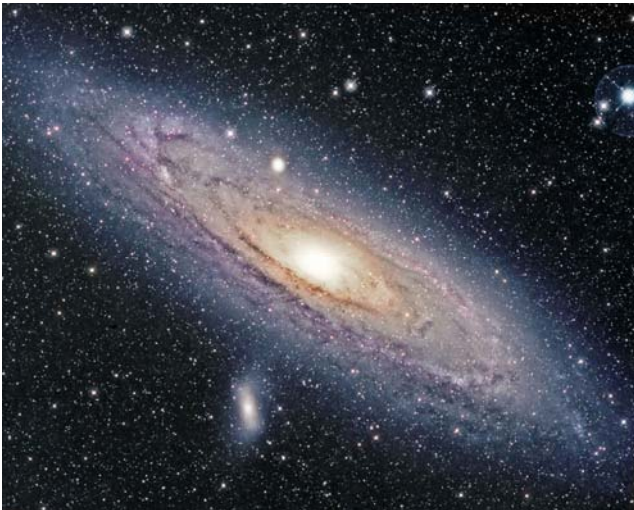


Figure 1 Andromeda Galaxy M31
(© www.galaxyphoto.com)



Figure 2 NGC 5128 Inverted Mirror Image
(© Anglo-Australian Observatory)

1. Hubble Flow Not Yet Explained

The initial thesis of this paper was that the Hubble flow, in which distant galaxy images appear to have recessional Doppler velocities proportional to their distances, might be caused by the image projections of an expanding cosmic lens that encloses the Milky Way Galaxy (MWG). An expanding lens should project images of expanding objects that expand at even greater rates than the object. We would expect that the expansion rates of the projected images should be proportional to their distances from the MWG, just as the Hubble Law predicts. The main problem for this paper with that thesis is that two

galaxies do not provide enough data to uniquely define the optical properties of the lens that projects their images. Another problem is that M31 is a member of the local group, and if it is inside the focal distance of the MWG's lens, then it is an inappropriate target for defining that lens's properties. The MWG lens properties should be discoverable by analyzing more distant galaxy targets than M31.

However, local group galaxies offer more certainty as to their conjugate relationships with each other, and so they should be used to discover what lens projects their images. One of the criteria for establishing a conjugate relationship between two images is the angle α , which is the celestial arc

A Cosmic Lens May Explain the Hubble Flow

distance between a galaxy and its presumed conjugate partner that should be a little less than 180° away in the sky. This angle can be exactly 180° only if the line of sight passes through the center of the lens, and that would be a very special case. One of the optical parameters of the lens to be determined would be the space coordinates of the center of the lens relative to the Sun. Besides the M31-NGC 5128 pair ($\alpha = 171.890^\circ$), I suggest including the Large Magellanic Cloud paired ($\alpha = 168.156^\circ$) with the dwarf spheroidal galaxy in Draco (DDO 208) and the Small Magellanic Cloud paired ($\alpha = 167.331^\circ$) with the dwarf spheroidal galaxy in Ursa Minor (DDO 189).

We can identify conjugate pairs of galaxies not only by their arc distances from each other but also by their relative sizes, their angular orientations, and their classes. The conjugate of a spiral or an irregular galaxy must be an elliptical or a lenticular galaxy, and

vice-versa. These four are the only classes of galaxies¹[1]. M31 shown in Fig. 1 is a spiral galaxy, and its presumed conjugate dark-matter partner NGC 5128 (Fig. 2), hereinafter called N5128, is a lenticular galaxy.

In Fig. 1, North is up, but Fig. 2 is an inverted mirror image of N5128. You can see that after those two rotations of N5128's image, the roll angle of both major axes is about 33° CW from the horizontal about the line of sight, and the inclination about the major axis of the north polar axis is about 18° towards the observer. That can't be a coincidence.

Image magnification is inversely proportional to the distance ratio, which for N5128 to M31 is $3.7/0.76 = 4.9$. Their major diameter ratio is $190'/25.7' = 7.39$, but we are comparing the bright matter of M31 to the conjugate projection of its dark matter at N5128. N5128 may be 50% larger than we presently think.

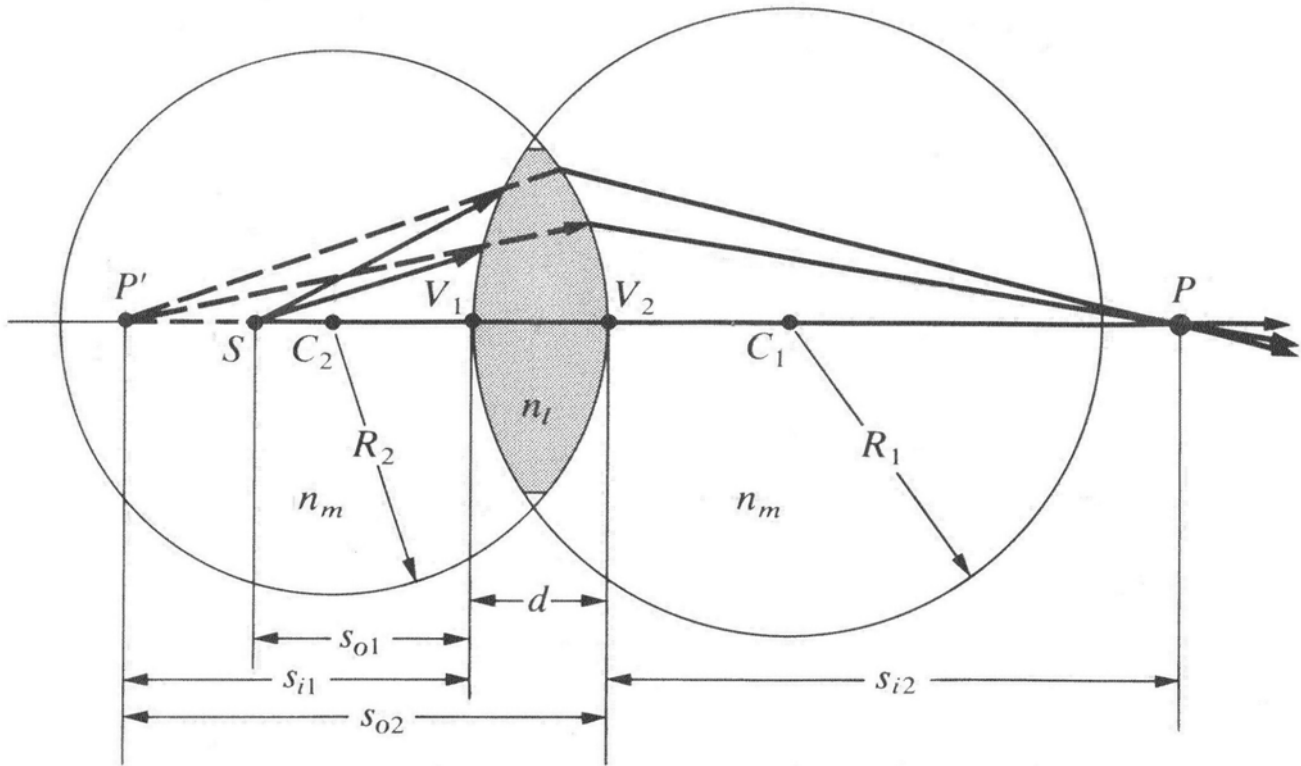


Figure 3 Thin Spherical Lens Diagram

2. The Round Ball Lens Formulas

Figure 3 shows the paraxial ray diagram for a thin spherical lens²[2] comprised of two polar caps cut from spheres of some refracting material having the same index of refraction but possibly differing radii such that their circles of latitude where they were sliced are identical and they are joined together at

their flat surfaces. The centers of the two spherical caps are C_1 and C_2 , their surface radii are R_1 and R_2 , and their vertices are V_1 and V_2 . The index of refraction of the lens is n_l , and that of the medium is n_m . The real object to be focused by the lens is located on the optical axis at S . Light rays traveling to the right from this object at S are refracted by the left and right surfaces of the lens and come to a

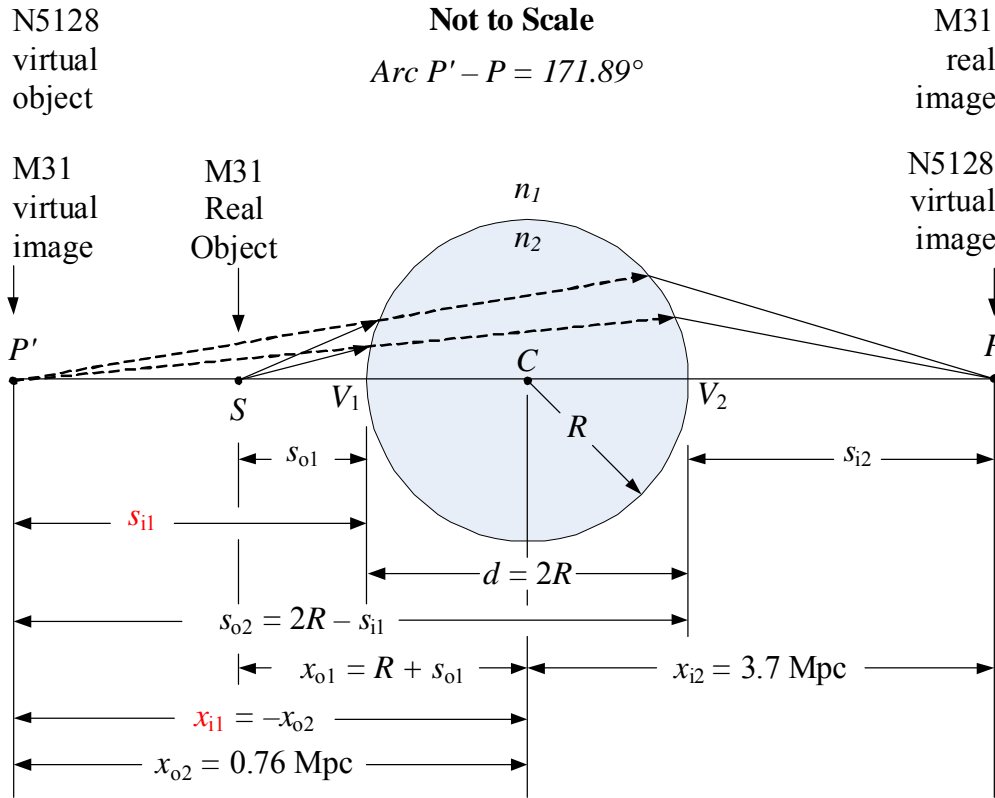
A Cosmic Lens May Explain the Hubble Flow

focus as a real image at P on the right.

The dashed rays outside the lens on the left side that come to a point at P' are extensions of the refracted rays inside the lens, and they are not refracted, (*i.e.*, they are straight, not bent) at the first surface on the left because from the standpoint of the second surface on the right, P' is where these rays appear to come from as if the lens medium extended all the way out to P' . The image formed at P' is a virtual image because the dashed rays outside the lens are not physically present in that space and because light rays appear to diverge from it going

from left to right. P is a real image because light rays converge to it on the right side of the lens moving left to right.

The real image at P can only be visible from the left if a screen is placed at the image plane to reflect the image, and it is the kind of image we are familiar with when we watch movies or slide shows. But in the cosmos, real images are invisible when viewed from the inside because photons are moving away from the observer. This begs the question as to how such cosmic images can be seen. This question will be answered in section 4 Cosmic Lens Theory.



For a round ball lens, refer to Figure 4. It is the same as Figure 3 except the two centers and the two radii are combined into one.

We let $R = R_1 = -R_2$ because by convention R_2 is negative since the center is on the left. Also we can let

- $d = 2R$, distance between lens vertices
- $n_m = n_1$, index of refraction of medium
- $n_l = n_2$, index of refraction of lens
- s_{o1} = distance to unseen real galaxy
- s_{i1} = distance to virtual image of M31
- s_{o2} = distance to virtual object N5128
- s_{i2} = distance to virtual image of N5128

The distances s_{oj} and s_{ij} are measured from the lens vertices, and s_{i1} is a negative number by convention because it is a virtual image on the left, so it is printed in red ink in Figure 4 to remind us of its negative sign. The distances x_{oj} and x_{ij} are measured from the center of the lens. The Sun is probably not at the center of this lens because the arc distance from M31 to N5128 is 171.89° and not 180.00° . But since we don't know where the Sun is relative to the center, we assume it is at the center. That makes the observable distances to the galaxy images $x_{i1} = -0.76$ Mpc to the virtual image of M31 and $x_{i2} = +3.7$ Mpc to the virtual image of N5128.

A Cosmic Lens May Explain the Hubble Flow

Hecht's equation (5.11)³[3] can be written as follows:

$$\frac{n_1}{s_{o1}} + \frac{n_2}{s_{i1}} = \frac{n_2 - n_1}{R} \quad (1)$$

The outside index of refraction $n_1 = 1$, and the other variables are unknown. But $x_{i1} = -0.76$ Mpc is one of the observations, and $s_{i1} = x_{i1} + R$ is dependent on R . Also we can solve the above equation for n_2 as a function of the other three variables.

$$n_2 = \frac{n_1 \left(\frac{1}{R} + \frac{1}{s_{o1}} \right)}{\frac{1}{R} - \frac{1}{x_{i1} + R}} \quad (2)$$

That means R and s_{o1} are the only remaining variables that are deemed to be independent. We need one more equation to reach a solution with two unknowns. That equation is Hecht's (5.13)[3].

$$\frac{n_1}{s_{i2}} + \frac{n_2}{s_{o2}} = \frac{n_1 - n_2}{R_2} = \frac{n_2 - n_1}{R} \quad (3)$$

This is the same as Eq. (1) except for the subscript changes on the source variables in the denominators of the left-hand side and the sign reversal in the numerator that is cancelled by another sign reversal in the denominator ($R = -R_2$) of the right-hand side. The reason for the source subscript changes is that the virtual image of M31 at s_{i1} (refracted at V_1) becomes the virtual object for N5128 at s_{o2} , (refracted at V_2) both of which are located at P' . Also, s_{o1} for V_1 is analogous to s_{i2} for V_2 . So in comparing Eq. (3) with Eq. (1) we notice that the following variable subscript changes occur: $s_{o1} \rightarrow s_{i2}$ and $s_{i1} \rightarrow s_{o2}$.

The observations are $x_{i2} = 3.7$ Mpc and $x_{o2} = 0.76$ Mpc, and we also have $s_{i2} = x_{i2} - R$ and $s_{o2} = x_{o2} + R$. Now we can make those substitutions in Eq. (3) and solve it for R .

$$R = \frac{(n_2 - n_1)x_{o2}x_{i2}}{n_2x_{o2} + n_1x_{i2}} \quad (4)$$

The simultaneous equations (2) and (4) can be solved analytically by substitution. Although I did that later, at first I found it to be easier to solve them numerically using Microsoft's Excel Solver to vary the input variables R and s_{o1} simultaneously until the R computed by Eq. (4) was equal to the trial value of the input variable R .

When I let Excel Solver do that work I found the following values for the unknown variables:

$$R = 280.94449 \text{ pc} = 0.00028094449 \text{ Mpc}$$

$$s_{o1} = 0.3444662 \text{ Mpc}$$

$$n_2 = 1.000445629$$

The focal distance for this lens is:

$$f_1 = \frac{1}{\frac{1}{s_{o1}} + \frac{1}{s_{i1}}} = \frac{1}{\frac{1}{0.3444662} + \frac{1}{-0.76 + 0.0002809}}$$

$$= 0.63021 \text{ Mpc}$$

The real object at S in Fig. 4 is inside this focal distance. That is why we who are inside the lens cannot see the actual object but only its virtual image at P' . It's like when we use a magnifying glass. The magnified image is a virtual image.

The apparent validity of the Solver-determined solution is illustrated in Figure 5. The radius error is the comparison of the computed radius from Eq. (4) with the input value independently selected by Solver.

$$Error = \frac{R_{computed}}{R_{input}} - 1, \quad (5)$$

expressed in parts per million. The error is seen to be an approximately linear function of R with a well-defined solution. But that is wrong because this error function was plotted with a constant value for $s_{o1} = 0.3444662$ Mpc.

After Fig. 5 was plotted I realized that s_{o1} is not really an independent variable because x_{o1} can be expressed in terms of x_{i2} and x_{o2} , both of which are observed values, and R . In using the Excel Solver technique, I had written $x_{o1} = s_{o1} + R$, and s_{o1} had been deemed to be an independent input variable. Instead, we should write $s_{o1} = x_{o1} - R$, and we can obtain the following expression for x_{o1} by solving Eq. (3) for n_2 after setting $n_1 = 1$ and substituting $s_{i2} = x_{i2} - R$ and $s_{o2} = x_{o2} + R$ and setting that expression equal to the right-hand side of Eq. (2) after substituting $x_{i1} = -x_{o2}$ and $s_{o1} = x_{o1} - R$ and finally solving the resulting equation for x_{o1} .

$$x_{o1} = \frac{x_{i2}(x_{o2} + R)}{2x_{i2} + x_{o2} - R} \quad (6)$$

$$s_{o1} = \frac{x_{i2}(x_{o2} + R)}{2x_{i2} + x_{o2} - R} - R \quad (7)$$

If R is small compared to x_{o2} , then x_{o1} (and by implication s_{o1}) depends strongly on x_{i2} and x_{o2} and so it cannot be an independent variable. Using the observed values of $x_{i2} = 3.7$ Mpc and $x_{o2} = 0.76$ Mpc, we find that for a small R ,

$$x_{o1} \approx \frac{x_{i2}x_{o2}}{2x_{i2} + x_{o2}} = \frac{(3.7)(0.76)}{2(3.7) + 0.76} = 0.344608 \text{ Mpc}$$

That means R can be anything so long as it is small

compared to x_{o2} , and we conclude that two galaxy distances alone are not sufficient to define the radius of a cosmic lens.

The index of refraction n_2 can be expressed in terms of x_{o1} , x_{o2} , and R by substituting $s_{o1} = x_{o1} - R$ and $x_{i1} = -x_{o2}$ into Eq. (2).

$$n_2 = \frac{n_1 x_{o1} (x_{o2} - R)}{x_{o2} (x_{o1} - R)} \quad (8)$$

With these equations we have eliminated the need for Excel Solver because we have only one independent variable, R . Eq. (6) is used to calculate the value of x_{o1} as a function of R , and that value is substituted into Eq. (8) to get the refraction index n_2 after setting $n_1 = 1$, then the radius error in Eq. (5) can be computed from the computed radius determined by Eq. (4). Figure 6 shows a plot of the lens radius error as a function of R with s_{o1} determined as a function of R . Compare this with Fig. 5 in which s_{o1} was set to a constant value. The radius error is nearly as close to zero as the computer can get in Fig. 6. The plot may seem like a quasi-continuous function but that is only because large increments of one pc were taken in the assumed values of R . When smaller increments are taken, the function oscillates wildly as shown in the region around 281 pc where smaller increments were taken. The Solver “solution” can now be understood to be any one of many possible solutions. By way of illustration the following is a partial list of R values in parsecs for which the radius error was computed to be zero: 243.814375000, 246.533160782, 255.969019222, 280.944488681. The last value is the one solver found by chance when it varied R and s_{o1} simultaneously.

3. A Numerical Puzzle

The solution found by letting Excel Solver zero the radius error in Eq. (5) [using Eq. (4) to compute R] by systematically iterating self-selected input values for R and s_{o1} and using Eq. (2) to define the index of refraction seemed to be satisfactory in terms of a reasonable result that satisfies the equations. But there is a risk in using the Solver technique. If there are in fact many discrete values of R that will satisfy the equations, Solver will be just as happy finding any one of the many valid solutions. Fig. 5 suggests that the solution is well behaved, but in fact the radius error values were computed in that case by varying R while s_{o1} was held fixed at its “solution” value. With all that in mind, the randomness of the radius error in Fig. 6 is understood to be the result of numerical difficulties when s_{o1} is defined by Eq. (7).

Figure 7 is exactly the same computation as Figure 6 except that the range of R in Fig. 7 is in the solar system, going from 5 to 120 astronomical units (AU), while the range in Fig. 6 is from 242 to 286 parsecs, some two million times larger. Also notice that the error in Fig. 6 is given as parts per trillion (10^{12}), whereas the error in Fig. 7 is given as parts per million.

The error function in Fig. 7 is a smooth saw tooth pattern, and I have no idea why that should be so. Furthermore, the function crosses the zero axis at the distances that correspond to the outer planet orbit semi-major axes. That can’t be a coincidence, but I don’t know what it means. It is a numerical puzzle that begs to be explained.

A Cosmic Lens May Explain the Hubble Flow

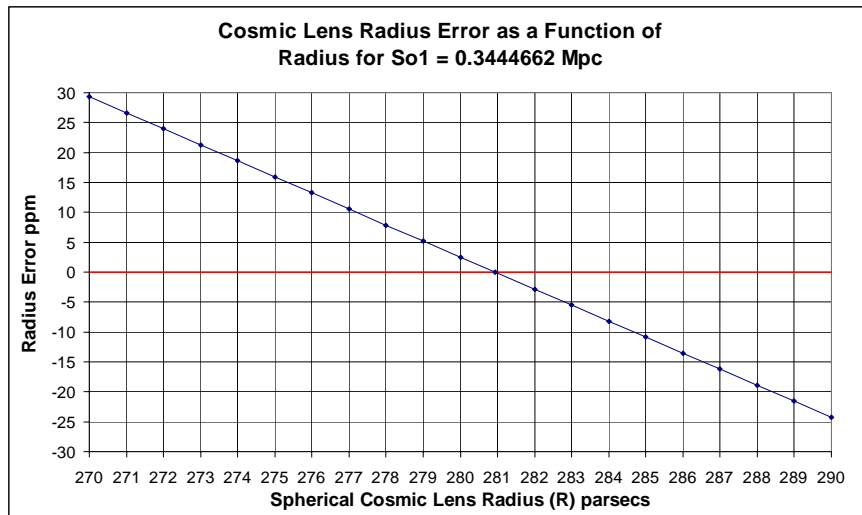


Figure 5 Lens Radius Error as a Function of Radius R for a Constant Object Distance s_{o1}

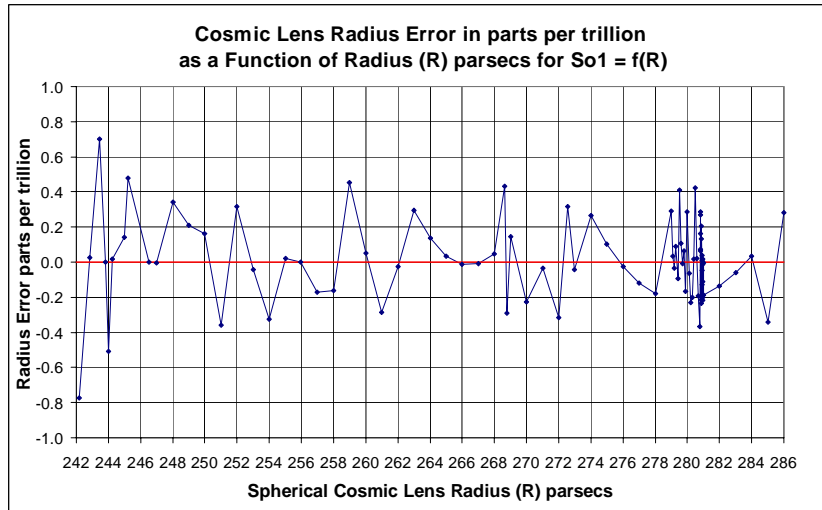


Figure 6 Lens Radius Error as a Function of R for $s_{o1} = f(R)$

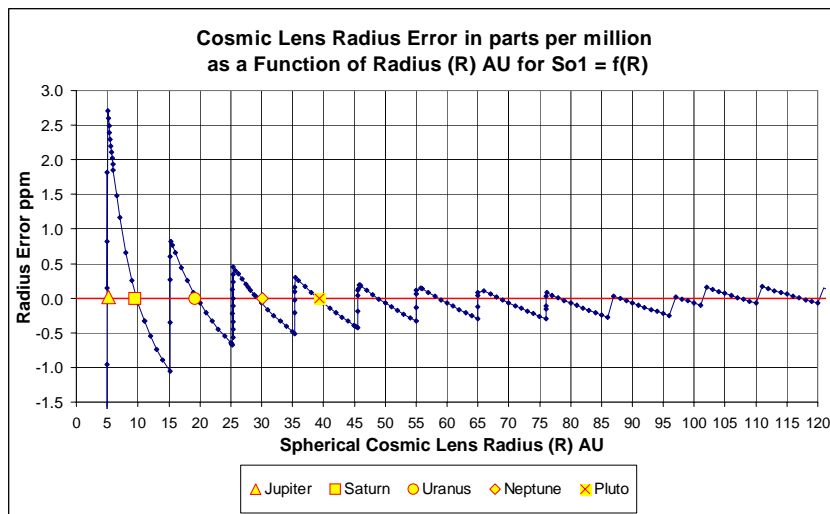


Figure 7 Lens Radius Error as a Function of R for $s_{o1} = f(R)$

4. Cosmic Lens and Dark Matter Theory

The fact that the universe appears to be infinite in extent may be due simply to a “hall of mirrors” effect of repetitious re-projections of projected images. This section attempts to explain what a cosmic lens is and how it can project a virtual image of an otherwise invisible real object behind the object (in the same direction) and how such a projected virtual image can become the object for a more distant projected image in the opposite direction that itself can be re-projected at a greater distance, such that there is no limit to the number of reprojected daughter images of the original real object.

A cosmic lens is a hypothetical structure that is defined as a spherical volume of space centered on a gravitating object in which the speed of light is a slower constant inside the lens than the constant light speed that exists outside the lens because the mass density of the ether is greater inside than outside⁴[4]. The Earth is assumed to have such a lens, and its astronomical effect is called atmospheric refraction of starlight in which star images are displaced slightly towards the zenith as a function of their altitude above the horizon.

The Sun is assumed to have such a lens, and one of its astronomical effects for earthbound observers is called annual parallax. If true, this means that all stellar annual parallax measurements are open to question because the light rays from stars are not straight; they are refracted at the lens vertex. (Another effect may be the Pioneer 10 anomalous acceleration⁵[5].) Every star is assumed to be at the center of its own cosmic lens. Galaxies are assumed to have such lenses, and one of their astronomical effects for outside observers is called gravitational lensing.

According to my theory, the most striking effect of cosmic lensing is the hypothetical “hall of mirrors” effect⁶[6]. It is not yet clear how much of this effect can be attributed to the Sun’s cosmic lens and how much to the MWG’s cosmic lens. In this effect a virtual image of every real galaxy object is projected by the cosmic lens in the same direction, behind the actual object, and at a greater distance. Virtual images are readily visible. When you look at an object through a magnifying glass, you are looking at a magnified projected virtual image of the object, not the actual object itself. In this paper we consider the great spiral galaxy in Andromeda, M31, which has a known distance of 0.76 Mpc. My theory says that this is the distance to M31’s virtual image.

We computed the gravitational distance to the actual galaxy that is the real object for this projection with Eq. (6) and found it to be about 0.3446 Mpc. The actual galaxy is smaller and nearer than its projected virtual image, and the actual galaxy object is invisible because it is outside the lens but inside its focal distance of 0.630 Mpc. What we observe is its virtual image that is projected behind it. This virtual image of M31 becomes like a real object at 0.76 Mpc that projects a real image of the spiral much farther away at 3.7 Mpc on the opposite side of the lens.

Projected real images are invisible from the inside unless they are reflected by a projection screen—impossible in intergalactic space—because photon rays converge at the real image plane moving away from the observer. However, I claim that the spiral galaxy’s dark-matter halo becomes visible as a virtual image at 3.7 Mpc where its invisible real image comes into focus because time runs backward in dark matter. That means photon rays converge on the dark-matter halo in positive time, instead of radiating away from it, which is why dark matter is dark in positive time. So at 0.76 Mpc in the direction of M31, photons appear to radiate away from the virtual image of the spiral towards us observers, as if it were a real object, while at the same time and place photons appear (in our imagination, since we can’t see them) to converge upon the virtual object of M31’s dark-matter halo in positive time at 0.76 Mpc. These photon rays radiate from a virtual image of the dark-matter halo at 3.7 Mpc on the opposite side of the sky. We observe this virtual image of M31’s dark-matter halo, and we have identified it as the lenticular galaxy NGC 5128 (N5128), also known as the radio source Centaurus A. By the same token, this virtual image at 3.7 Mpc becomes like a real object that gets projected even farther away back towards the general direction of M31.

The reason this effect works, if it does indeed work at all, must be because all stars and galaxies contain dark-matter (also known as mirror-matter) versions of themselves that are concentric with their ordinary-matter counterparts and occupy the same space with them.

Dark matter is known from its gravitational effects on galaxies to be many times more abundant than light matter. I propose that dark matter is mirror matter, as suggested by Robert Foot⁷[7], but I go further and suggest that time runs backward in dark matter. In my theory dark matter has negative mass and negative temperature in positive time. Light

A Cosmic Lens May Explain the Hubble Flow

matter has left-handed subatomic particles, and dark matter has right-handed subatomic particles. Light matter and dark matter do not interact with each other except by the force of gravity. This means they can occupy the same space without “touching” each other.

We can only see dark matter through the time-reversing effect of a cosmic lens projection following an even number of spherical lens refractions. When we view a star or a galaxy through such a projection, such as N5128, we only see its dark matter. Conversely, we can only see ordinary matter directly (inside our lens with us) or in singly refracted virtual images, such as M31, and virtual images having odd numbers of spherical lens refractions.

Cosmic time has only two directions: forward (our native cosmic time direction) and backwards. According to my theory galaxies can be classified in two classes: spiral galaxies like the MWG and M31 and irregular galaxies are comprised primarily of ordinary matter where cosmic time runs in the direction we call positive. On the other hand, elliptical and lenticular galaxies such as N5128 are comprised primarily of dark matter where time runs backwards. We cannot see them directly because they are virtual objects (photons converge upon them). We see them only because lenses project virtual objects across the sky as virtual images. Support for this idea is found in the fact that the universe is observed to contain roughly equal numbers of these two broad classes of galaxies, and that elliptical galaxies contain almost no dark matter⁸[8] while spiral galaxies are surrounded by a huge halo of dark matter. Elliptical galaxies are rendered bright by the time-reversal effect of lens projection, and their “dark matter” is the small, unseen spiral core deep inside them.

Like galaxies, stars can be grouped into two broad classifications called populations. Population I stars like the Sun are ordinary-matter stars that are identified by their high concentrations of elements heavier than hydrogen. In my theory Population I stars all have an outflowing stellar wind, and their cosmic time direction is positive. Population II stars are identified by their low concentrations of heavy elements, and in my theory they all have an inflowing stellar wind in positive time because their native cosmic time direction is negative.

Cosmic time direction is a local phenomenon with every star, and the direction of the stellar wind, outward or inward, is an indicator of the star’s cosmic time flow direction. The evidence in support of this idea is the behavior of pulsating stars such as

Cepheid variables. I claim that these stars oscillate (expand and contract) with periods of a few days because they periodically reverse their own cosmic time flow direction and hence their stellar wind direction. Cepheids expand as they inhale the ether wind from the space around them, and they contract as they exhale their ether wind into the space around them. The direction of the force of gravity is always inward no matter which way the stellar wind blows, inward or outward. The mechanism for the oscillations involves a time delay imposed on a process that continually strives to achieve equilibrium but always overshoots as a result of the time delay, and the details of the process are beyond the scope of this paper. As we observe a Cepheid variable star’s light curve as a function of time, we always see only its ordinary matter component for an odd number of refractions, no matter which direction cosmic time is flowing at the particular moment for the star’s atomic particles. (We see only its dark matter component for an even number of refractions.)

Spiral galaxies like the MWG are comprised primarily of Population I stars in their spiral arms. Elliptical and lenticular galaxies are comprised almost exclusively of Population II stars. Population I stars are old stars that are growing older. I suggest that Population II stars are young stars that are growing younger from our point of view because time runs backwards in them. Native residents of Population II stars would say that our time runs backwards.

Population I stars gain heavy elements as they age from neutron absorption by their atomic nuclei, and I suggest that Population II stars lose heavy elements as they grow younger from neutron emission in positive time. An interesting implication of this idea is that Cepheid variable stars are ageless because they alternatively grow older, then younger, then older, then younger, and so on as they oscillate.

We observe that every spiral galaxy is embedded within and surrounded by a huge dark-matter halo from its gravitational effects on the rotation curves (velocities *vs.* radius from the center) of stars in the spiral arms. I claim that such dark-matter haloes are actually invisible concentric dark-matter elliptical or lenticular galaxies that share the same space and are much larger than the spirals and have many more stars.

When our cosmic lens projects a real image of a spiral galaxy such as M31, the Andromeda Galaxy, in the opposite direction, we cannot see that real image because its photons converge towards it. Instead, we see the virtual projection of its dark-

A Cosmic Lens May Explain the Hubble Flow

matter counterpart as the lenticular galaxy N5128. The invisible dark-matter lenticular halo that is concentric with M31's spiral receives photons that converge upon it in positive time. These photons appear to be emitted from the virtual object at N5128's position. The time-reversed conjugate of a real image is a virtual object, and vice-versa. This lenticular galaxy will be projected by the cosmic lens back towards M31 as a more-distant spiral galaxy that is another view of M31 as viewed from a different angular point of view and at a different time in its career, so we do not recognize it because it is as a younger or older version of M31. This process of a spiral galaxy projecting an image of an elliptical galaxy that projects an image of another spiral that projects another elliptical at greater and greater distances continues without limit. Hence, the universe is like a hall of mirrors in which a finite number of actual galaxies are projected in infinite repetitions all over the sky.

The best evidence for distant "galaxies" being actually projected images of nearer galaxies (or of nearer projected images) is the fact that, according to Robert Abraham of the University of Toronto and Patrick McCarthy of the Carnegie Institution⁹[9], "the universe is laden with massive galaxies that formed while the universe was just one billion years old, an era when such mature galaxies were not expected to exist." Abraham and McCarthy are the co-principal investigators for the Gemini Deep Survey. They and their colleagues used the Gemini North 8-meter telescope on Mauna Kea. "By keeping the telescope's aperture open for unprecedented stretches of time—about 27 to 30 hours per exposure—researchers were able to detect both old galaxies without a hint of star birth within them, as well as young galaxies teeming with stellar formation." According to the "hall of mirrors" theory, these mature galaxies are not as far away as they appear, and hence not as young as they should be at that distance, according to the big bang theory, because they are projected images of much nearer, and therefore presumably much older galaxies.

The transit times for photons from virtual images to our eyes are not the inferred distances to these images divided by the speed of light as the big bang theory calculates. The transit times are the true (nearby) gravitational object distances divided by the speed of light, and these object distances are much closer than the image distances. For example the inferred distance of 3.7 Mpc to the image of the lenticular galaxy we identify as N5128 is about 10 times farther away than the gravitational distance to the dark-matter lenticular halo of the physical spiral

galaxy that projects the virtual image we call M31.

According to my theory, cosmic lenses expand because stars are continuous fountains of ether, the underlying physical stratum of space that accounts for its physical properties including its permittivity and its permeability. Some physicists call ether the quantum foam. The ether behaves like an incompressible fluid; so cosmic lenses blow up like water balloons inside a swimming pool as stars spew more ether into the lens volume. This ether flow comes from the stars' own dark-matter components.

In positive time, according to my theory, the invisible dark-matter components of stars act like ether sinks so that ether wind appears to flow inward, draining the space surrounding them where it collects right-handed neutrons emitted from the dark-matter atomic nuclei as it flows through them. This inward ether flow and the collected right-handed neutrons are reflected at a mirror-like membrane at the center of the star where the right-handed neutrons reverse their handedness to left-handed and blow outward into the surrounding space through the ordinary-matter component. This reversal in direction from inward to outward is a consequence of linear momentum conservation since the handedness reversal of the neutrons amounts to reversing their mass signs from negative to positive. As the left-handed neutrons pass upward through the ordinary matter shell, some of them are absorbed by atomic nuclei, which increases their atomic weights. Subsequent beta decays increase their atomic numbers. Those free neutrons that manage to pass through the star's ordinary matter shell without getting absorbed will experience beta decay, depositing hydrogen plasma into the stellar atmosphere and releasing thermal energy.

Thus from our viewpoint, our universe borrows mass-energy from the "other" universe where time runs backwards. (There is only one universe, but it looks different to observers with left-handed atoms than it does to observers with right-handed atoms.) Since what we call negative time is the native time flow direction for the "other" universe, its inhabitants believe that they are borrowing mass-energy from us. Payback time occurs when a star reverses its own cosmic time flow direction. Thus we see how Population I stars gain heavy atomic nuclei and Population II stars lose them. Every Population I star has an invisible concentric Population II component, and vice-versa. In positive time, the Population II component emits right-handed neutrons that get carried downward by the ether wind and are reflected as left-handed neutrons that bounce upward and get absorbed by

A Cosmic Lens May Explain the Hubble Flow

the Population I component or decay into hydrogen plasma. Both processes release thermal energy. Although much of the dark matter occupies the same space as bright matter, right-handed neutrons cannot be absorbed by left-handed nuclei. It is necessary for the neutrons to have their handedness reversed by being reflected by the central membrane before they can transfer mass-energy to the Population I component. This membrane acts like a mirror.

If the lens that projects the image of a fixed real object expands its radius, it follows that the distance to the projected image will also expand. If these projected images become virtual objects that are expanding, it follows that the expanding lens will expand the distances to the images projecting from these moving virtual objects even more. This is expected to produce the Hubble flow, but that remains to be demonstrated.

References

- ¹ [1] Gerard de Vaucouleurs, “Revised Classification of 1500 Bright Galaxies,” *The Astrophysical Journal Supplement Series*, volume **8** (1963), p. 32.
- ² [2] Eugene Hecht, *Optics*, 2nd Edition, Addison-Wesley, 1987, p. 138, Fig. 5.17 (b).
- ³ [3] Eugene Hecht, *ibid*, p. 137.
- ⁴ [4] Glen Deen, “Intrinsic Redshifts, Cosmic Lenses, and Dark Matter,” Natural Philosophy Alliance Conference, June 9, 2003.
- ⁵ [5] Glen Deen, “Reproducing the Pioneer 10 Anomaly with a Cosmic Lens,” Natural Philosophy Alliance Conference, May 22, 2007.
- ⁶ [6] Glen Deen, “Is the Universe like a Hall of Mirrors?” Natural Philosophy Alliance Conference, May 26, 2005.
- ⁷ [7] Robert Foot, “Mirror matter-type dark matter” [arXiv:astro-ph/0407623v1](https://arxiv.org/abs/astro-ph/0407623v1) Int.J.Mod.Phys. D13(2004) 2161-2192; Also *Shadowlands: Quest for Mirror Matter in the Universe* (Upublish, 2002)
- ⁸ [8] Aaron Romanowsky, *et al.*, “A Dearth of Dark Matter in Ordinary Elliptical Galaxies”, *Science* 19 September 2003: Vol. 301. no. 5640, pp. 1696 – 1698, abstract at <http://www.sciencemag.org/cgi/content/abstract/301/5640/1696>
- ⁹ [9] Tariq Malik, “Galaxies in Young Cosmos More Massive and Mature than Expected”, 2004, http://www.space.com/scienceastronomy/gemini_survey_040105.html