Verification of a Dark Matter Finding

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Abstract

A 'Finding' is the result of an investigation. Many scientists are looking for dark matter and upon its discovery cosmologists must follow a process of verification because the search is for an undefined entity. A 'finding' is something found or observed during the search for dark matter. It is possible a finding is not the correct undefined entity so the search must continue until the finding is verified to be the correct undefined entity thereby ending the search with a solution. In other words, this search must continue for another possible solution, through any number of findings being reported until one finding is properly verified.

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1 Introduction

A 'Finding' is the result of an investigation. In this paper, a finding is something found or observed during the search for dark matter. Dark matter is undefined other than by an observation of an unexpected observed behavior. Many scientists are looking for dark matter and upon its discovery cosmologists must follow a process of verification because the search is for an undefined entity. It is possible a finding is not the correct finding. The search must continue until a particular finding is verified to be the correct finding, thereby ending the search. The verification process determines when the search for another possible solution is done.

The verification process entails including the dark matter finding, whatever it might be, in the original scenario and confirming the original observed deviation has been removed by including this finding, claimed to be the cause of the deviation when this finding was not included in the predicted behavior.

2 definition of dark matter

Excerpt from Wikipedia:

Dark matter is a form of matter thought to account for approximately 85% of the matter in the universe and about a quarter of its total energy density. Its presence is implied in a variety of astrophysical observations, including gravitational effects that cannot be explained by accepted theories of gravity unless more matter is present than can be seen. For this reason, most experts think that dark matter is abundant in the universe and that it has had a strong influence on its structure and evolution. Dark matter is called dark because it does not appear to interact with observable electromagnetic radiation, such as light, and so it is undetectable by existing astronomical instruments.

(excerpt end)

my comment:

Dark matter is undefined but is found only where a behavior cannot be explained "unless more matter is present than can be seen." Given that simple criteria for a required explanation, there are 2 simple alternatives: 1) more unseen matter is needed. or 2) an unseen force other than gravity is involved. Cosmologists have simply neglected pursuing (2).

The solution in (2) will be pursued below.

reference link: Dark matter

3 Observed need for dark matter

There is an anomaly in spiral galaxy rotation

Continue excerpt from Wikipedia:

Early mapping of Andromeda with the 300 foot telescope at Green Bank and the 250 foot dish at Jodrell Bank already showed the H-I rotation curve did not trace the expected Keplerian decline. As more sensitive

receivers became available, Morton Roberts and Robert Whitehurst were able to trace the rotational velocity of Andromeda to 30 kpc, much beyond the optical measurements.

The primary claim for dark matter is it explains the unexpected velocities observed in a spiral galaxy rotation.
(excerpt end)

my comment:

The 'expected keplerian decline' is a mistake because the expectation is stellar motion like planets in our solar system.

Excerpt of interview with Vera Rubin in 2006:

Our 1970 paper included optical observations out to 120 arcmin but did not include the superposed image of M31, or the 1975 radio observations shown in the figure. This composite of the galaxy and velocities emphasizes the extent of the optical image and the "flatness" of the velocities. We found it puzzling that stars far from the center traveled as fast as those much closer to the center. However, we chose not to extend the curve beyond the final measurement by using a decreasing Newtonian inverse square velocity, the common practice at that time. Instead, we wrote "extrapolation beyond that point is clearly a matter of taste."

Isaac Newton showed that the force on a mass at radius r from the center of a symmetrical mass distribution is proportional to the mass interior to that r. High-school students learn that in a gravitationally bound system like our solar system, a planet moves in a closed orbit, such that $MG = V^2 r$ where M is the mass of the Sun, G is the gravitational constant, and V and r are the velocity of a planet and its distance from the Sun. In M31, the same relation between mass, velocity, and distance holds. A flat rotation curve (V = constant) implies that mass increases linearly with distance from the center. Enormous amounts of nonluminous matter extend far beyond the optical image of M31.

(excerpt end)

reference link: Seeing dark matter in the Andromeda galaxy

my comment:

High-school students learn of planet orbits but perhaps they should learn the barycenter (the center of gravity) is critical, to avoid the serious mistake of assuming simple 'keplerian' orbits around the Sun is correct for a galaxy.

Our solar system has less than a dozen bodies involved with this barycenter.

A galaxy like M31 has billions of stars in its disk.

This is a mistake to assume billions of stars distributed within distinct arms in the disk move about a galactic barycenter just like the 8 planets in simple ellipses in a limited system of Sun and 8 planets.

4 Search for Dark Matter

excerpt from CERN:

Many theories say the dark matter particles would be light enough to be produced at the LHC. If they were created at the LHC, they would escape through the detectors unnoticed. However, they would carry away energy and momentum, so physicists could infer their existence from the amount of energy and momentum "missing" after a collision. Dark matter candidates arise frequently in theories that suggest physics beyond the Standard Model, such as supersymmetry and extra dimensions. One theory suggests the existence of a "Hidden Valley", a parallel world made of dark matter having very little in common with matter we know. If one of these theories proved to be true, it could help scientists gain a better understanding of the composition of our universe and, in particular, how galaxies hold together. (excerpt end)

my comment:
References to "beyond the Standard Model" or "extra dimensions" or "parallel world" demonstrate this search is just conjecture (or science fiction fantasy). The definition should be something based in classical physics where evidence by experiment is required.

5 Alternative to dark matter found in 2010

Cosmologists had a choice in 2010 when scientists observed the M31 rotation curve could be explained by the galactic magnetic field meaning the stars were not moving like planets driven only by gravity around the solar system barycenter.

excerpt from "Magnetic Fields and the Outer Rotation Curve of 31" the 2010 paper from Astrophysical Journal Letters.

observations of the rotation curve of M31 show a rise of the outer part that can not be understood in terms of standard dark matter models or perturbations of the galactic disc by M31's satellites. Here, we propose an explanation of this dynamical feature based on the influence of the magnetic field within the thin disc. We have considered standard mass models for the luminous mass distribution, a NFW model to describe the dark halo, and we have added up the contribution to the rotation curve of a magnetic field in the disc, which is described by an axisymmetric pattern. Our conclusion is that a significant improvement of the fit in the outer part is obtained when magnetic effects are considered. The best-fit solution requires an amplitude of [about] 4 microG with a weak radial dependence between 10 and 38 kpc.

(excerpt end)

my comment:

The rotation curve cannot be understood using dark matter. The best fit is obtained using the galactic magnetic field.

Upon the M31 study's finding cosmologists could abandon the barycenter assumption and replace it with the magnetic field.

reference to paper: link: "Magnetic Fields and the Outer Rotation Curve of M31

reference to video link: Video of paper's presentation
Upon the M31 study's finding cosmologists could abandon the barycenter assumption and replace it with the magnetic field.

6 Same alternative to dark matter explained in 2018

A paper in 2018 concluded the galactic magnetic field drives the galactic rotation and no undectable dark matter is required.

Below is the reference to the 2018 paper explaining there is no dark matter.
excerpt from its conclusion: An observation that is "anomalous" is one that is inconsistent with accepted hypotheses. In real science this requires the replacement of the falsified hypothesis, not an eighty-five year hunt for invisible entities that will preserve it. The work being presented here demonstrates that the root cause of the now vast collection of observed "anomalous" galactic stellar rotation profiles is the electrical nature of the Birkeland Currents on which those galaxies have been or are being formed.

pdf-link: Birkeland Currents and Dark Matter

7 Alternative to dark matter found in 2015

An important conclusion after a study of IC342, a large obscured, nearby spiral galaxy:

excerpt from reference:

"Spiral arms can hardly be formed by gravitational forces alone," continues Rainer Beck. "This new IC 342 image indicates that magnetic fields also play an important role in forming spiral arms."

(reference end)

web-link: Magnetic fiels in spiral galaxy arms

Wherever there is a claimed need for dark matter, there is a magnetic field being ignored.

8 Finding dark matter and its verification

Suppose either
a) CERN actually detects an event with something "missing" as an important finding though as of January 1, 2020 nothing has been found, or
b) someone else reports a finding of a dark matter candidate.

After CERN or anyone else does an experiment with a result assumed to be this undefined dark matter then the finding must be verified to be the correct solution. Currently, that verification test is undefined.

The first test should be confirming this finding solves the notable problem of a spiral galaxy rotation curve which is not as expected by the current model. Dark matter is the accepted explanation for this deviation in rotation, even though dark matter has no description in terms of physics to be measurable and testable.

A finding becomes a candidate for the dark matter solution. However the candidate must be tested and verified before becoming the accepted solution.

9 Verification

When the spiral galaxy model integrates this dark matter finding then the model's predicted rotation curve should now match the observed curve.

This finding and its integration in the model must be verified.

This integration will be difficult because the spiral galaxy model assumes the stars are in orbits like planets in our solar system. All the planets have at their ellipse's focus the barycenter of the solar system. Even the Sun wobbles around this barycenter. Each body has an individual orbit described by Kepler for the solar system of planets. Dark matter is assumed to change the matter/gravity distribution for the barycenter to explain the motion of the stars in a spiral galaxy because the stars move wrong, unlike planets.

The description for dark matter is often paraphrased as "we added up all the visible mass and that amount does not explain the motion so there is missing matter we call dark matter. This description is explicitly about the sum of all viible mass to determine the center of gravity of that distribution, or the location of the barycenter.

After the study of M31 in 2010 (described above) cosmologists could drop dark matter but did not. Dark matter remained an unsolved mystery with many seeking the solution to that mystery.

Cosmologists chose instead to disregard that pivotal finding and stay with dark matter and the barycenter model. newline

Updating this model for dark matter to verify the finding as the correct solution requires a substantial effort. The current barycenter model must get the dark matter finding integrated with the 1 trillion stars assumed to be in M31. The galaxy model must make its predictions based on each individual star's rotation in M31 about the barycenter, or this simultaneous center of gravity of everything in the spiral galaxy disk including dark matter). The motion of all stars could be affected also by globular clusters outside the disk or even satellite galaxies. This revised galaxy model must be tested to verify itl correctly predicts the observed rotation curve.

A simple description of the task:

1) plot the precisely measured orbits of the trillion stars. These are the 'visible matter' in the disk. For an approximation, gas clouds and dust clouds could be ignored.

This detail is nearly impossible given the limitation of our imaging technology over the distance and some stars are obscurred. Also, the time required to determine each orbit with the required precision is also impossible. The Sun's orbit is estimated at 225 million years. That time is required to verify the orbit parameters after the completion of one orbit. Approximations will be required so claims of a successful change to the model can be debated.

2) determine the distribution in the disk, the location and amount of dark matter required for the updated barycenter of the trillion stars,

3) determine the distribution in each individual orbit, the location and amount of dark matter required for the updated barycenter of the trillion stars,

4) verify the orbits of the trillion stars will now follow this changing barycenter location, the instantaneous center of gravity in the disk,

5) if the measured motions do not match those predicted, then repeat steps 2-3-4 again. 6) repeat as many times as necessary until the correct distribution of dark matter has been identified.

For a trillion stars, many iterations are required to verify the first galaxy.

The critical problem involves the approximations of the individual orbits. The distribution of dark matter must be approximations as well. The result is dark matter cannot be verified in a spiral galaxy.

For the next spiral galaxy, all these steps must be repeated because dark matter is a proposed physical entity having a distribution which must be defined for each galaxy.

There are two alternatives

1) spend very much effort trying to make the barycenter model work and verify the galaxy model using a barycenter is correct for that context,

or

2) admit the spiral galaxy rotates primarily by the galactic magnetic field and discard the barycenter model for a spiral galaxy because clearly the barycenter model applies only to planetary systems.

It will be difficul or impossible to achieve (1) for some number of spiral galaxies.

The failure to successfully complete (1) must result in the selection of (2).

Otherwise dark matter remains an unsolved mystery despite any number of findings.

The selection of (2) means cosmologists must admit there is no dark dark matter in spiral galaxies.

Eventually, even after the successful observation of dark matter (like being attempted by CERN) the barycenter model for a spiral galaxy rotation must be discarded. It is impossible to verify a finding with that model.

10 Conclusion

A spiral galaxy rotates by the force of the galactic magnetic field.

Three separate studies reached that conclusion of no dark matter because a magnetic field was present causing the observed behavior.

Dark matter is the excuse for ignoring a magnetic field.

the barycenter model for a spiral galaxy rotation, based on only gravity and observed matter, must be discarded.

The claim of dark matter being 85% of the universe must be discarded as well.

Valid physics is a defined object or behavior that is measurable and repeatable by experiment.

Currently dark matter is undefined and untestable. Dark matter is not valid physics.

Once dark matter is found by a test resulting in a possible 'finding' that newly defined entity must be tested and verified.

Given the main reason for its proposed existence, any 'finding' cannot be verified in the spiral galaxy's measurable behavior by using the model which ignored the real cause of rotation..

Dark matter does not exist and its proposal is not valid physics and should not have persisted so long.