Sometimes people do not want to hear the truth because they do not want their illusions destroyed.

Friedrich Nietsche.

God is dead.

Nietsche.

Nietsche is dead.

God.

Henk Reints MSc. (1957) is a Dutch graduated physicist (Eindhoven University of Technology, 1984). After graduation he rolled into a job in automation, where he stayed. But blood is thicker than water, and a few years ago he set himself the goal of understanding the universe conform Sir Isaac Newton's phrase:

Hypotheſes non fingo.

I do not fabricate assumptions.

At http://henk-reints.nl/u are presentations of his consistent view on the universe, derived from observed phenomena (HUDF, SDF, SDSS:DR16Q) only, without fabricating anything. To his opinion, standard cosmology has quite some serious flaws that are merely brainchildren, assumptions that were not derived from observed phenomena or other known truths and even are in contradiction with those.

Newton: $F_G = G\frac{mM}{r^2} = ma = m\,v^2/r = m\omega^2 r$

Kepler 3: $GM = \omega^2 r^3 = v^2 r \therefore v = \sqrt{GM/r}$

Density of a galaxy: $\rho(r) = \rho_0 e^{-fr}$ (based on brightness profile)

mass at distance r: $dm = 2\pi r\rho(r)dr = 2\pi\rho_0 r e^{-fr} dr$

all mass within r: $M(r) = \int_0^r dm = 2\pi\rho_0 \int_0^r xe^{-fx} dx$

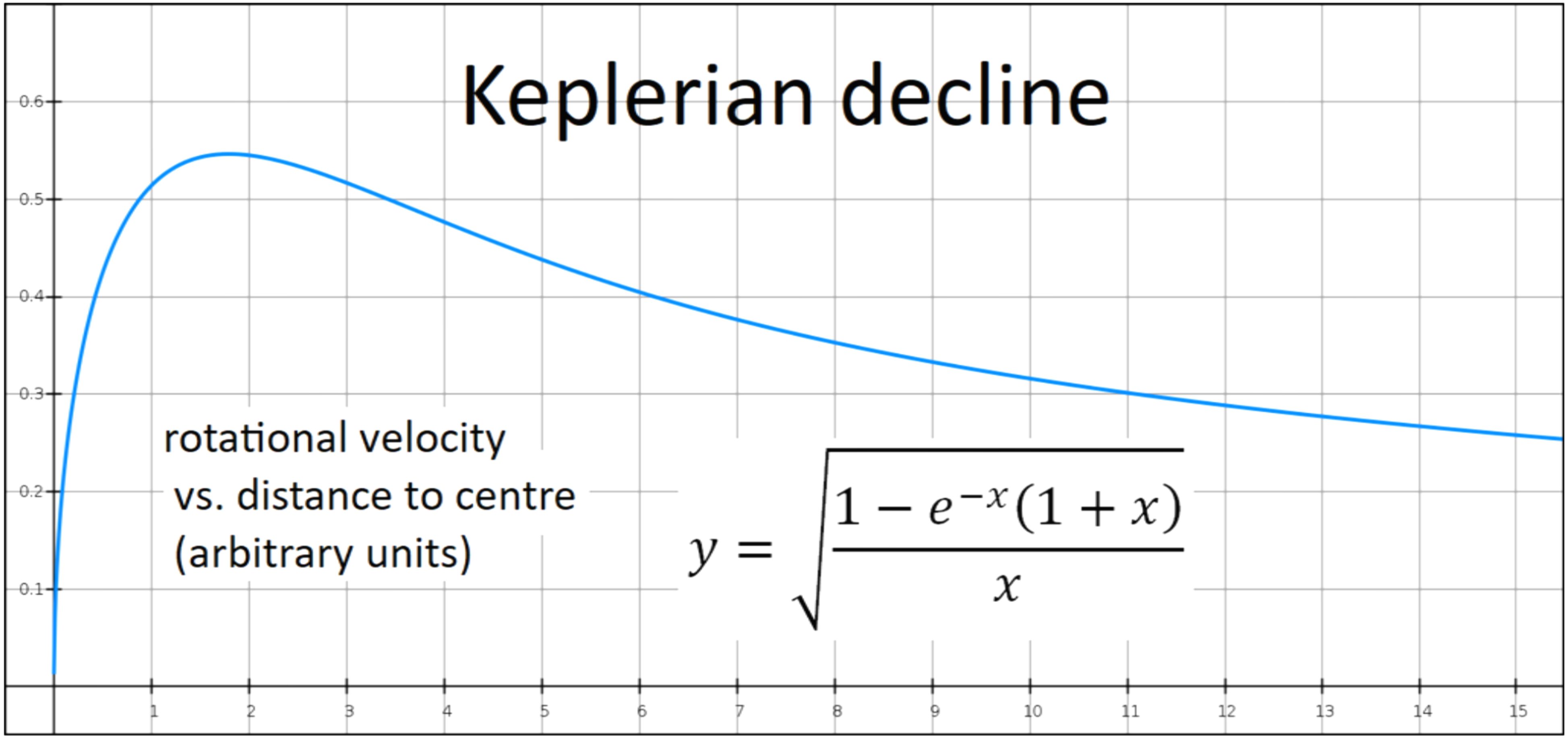
yielding: $M(r) = 2\pi\rho_0 \frac{1-e^{-fr}(1+fr)}{f^2}$

rotational velocity: $v = \sqrt{\frac{GM}{r}} = \sqrt{\frac{2\pi\rho_0 G}{f^2} \cdot \frac{1-e^{-fr}(1+fr)}{r}}$

substitute: $x \equiv fr \therefore r = x/f$

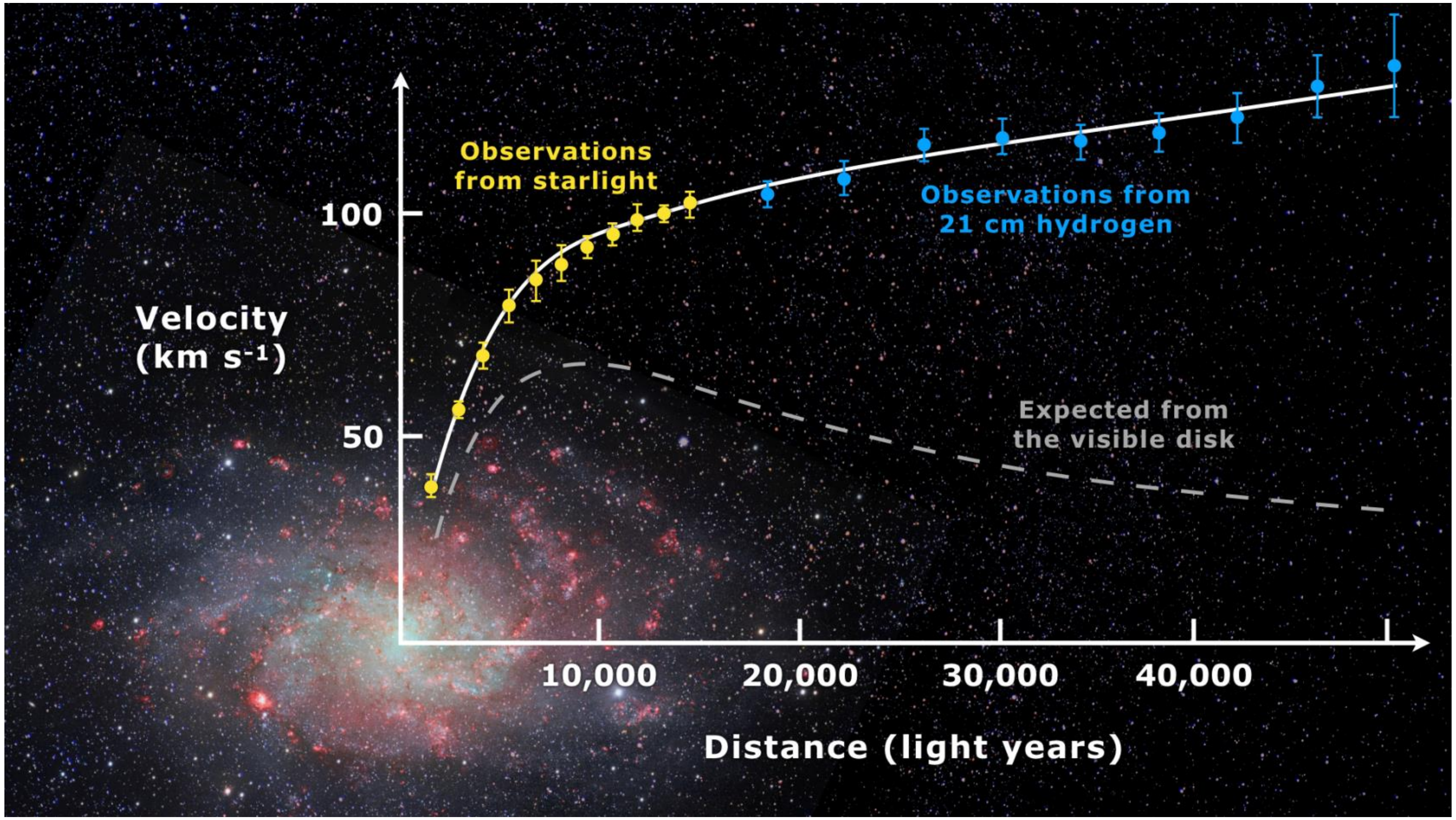
then: $v = \sqrt{\frac{2\pi\rho_0 G}{f} \cdot \frac{1-e^{-x}(1+x)}{x}}$

hence: $\sqrt{\frac{f}{2\pi\rho_0 G}} \cdot v \equiv \boldsymbol{y} = \sqrt{\frac{\boldsymbol{1-e^{-x}(1+x)}}{\boldsymbol{x}}}$



This is how galaxy rotation is expected to be.

But Mother Nature does not obey:



Rotation curve of spiral galaxy Messier 33 (yellow and blue points with error bars), and a predicted one from distribution of the visible matter (gray line).
https://en.wikipedia.org/wiki/Galaxy_rotation_curve

Derivation of Keplerian decline used:

mass inside orbit: $M(r) = \int_0^r dm$

rotational velocity around it: $v = \sqrt{\frac{GM}{r}}$

And so did others:

786 RUBIN, FORD, STROM, STROM, AND ROMANISHIN

TABLE 4

MASS MODELS FOR NGC 4378

Disk Model			Bulge (c/a = 0.8) Plus Disk (c/a = 0.					
R (kpc) (1)	V (km s^{-1}) (2)	$\int M(r)$x1.1 (10" $M_\odot$) (3)	V (km s^{-1}) (4)	$\int M(r)$ (10" $M_\odot$) (5)	V_{I}* (km s^{-1}) (6)	V_{II} (km s^{-1}) (7)	$\int M_{\mathrm{I}}(r)$† (10" $M_\odot$) (8)	$\int M$ (1

It is an application of the shell theorem:

All mass inside orbit behaves as if concentrated at its centre

and all mass outside it can be ignored.

BUT…

Kepler's laws apply to **two-body** systems[1]

such as spiral galaxies.

The shell theorem applies to **spherically symmetrical** bodies

such as spiral galaxies.

[1] That is one single (light) body orbiting one single (heavy) body where all gravitation by other bodies is negligible.

WHO TAUGHT YOU TO APPLY THE *SPHERICAL* SHELL THEOREM TO A NEARLY *FLAT* DISK?

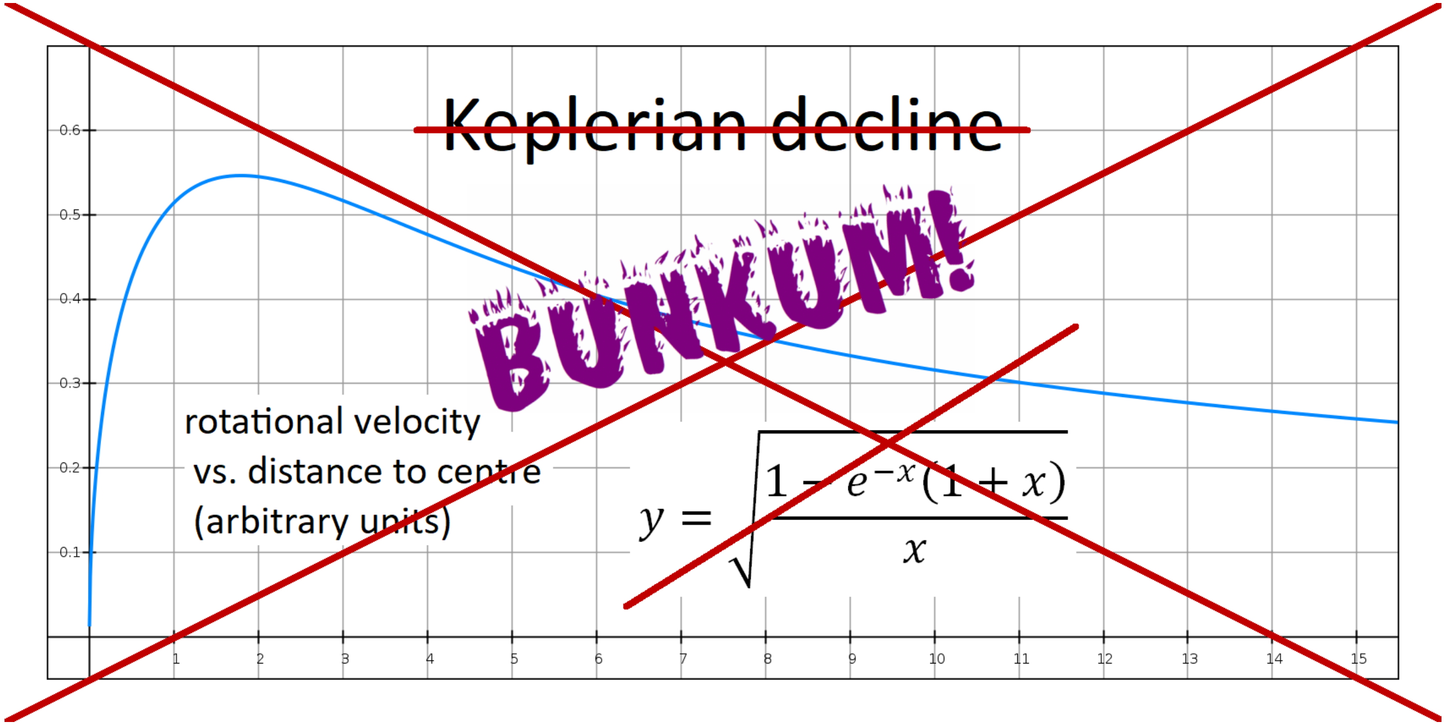
And did you haphazardly accept that nonsense without any objection?

SHAME ON YOU!

No understatements please.

This is ***not*** a ***rather silly mistake***,

but an ***EXTREME INEPTITUDE!***



In Dutch:

Kepleriaans verval is

amateuristisch

PRUTSwerk!

A cosmologist who believed in Keplerian decline is taken away.

In a spiral galaxy, *Keplerian decline* should not be expected at all!

NEVER EVER!

Ex falso sequitur quod libet.

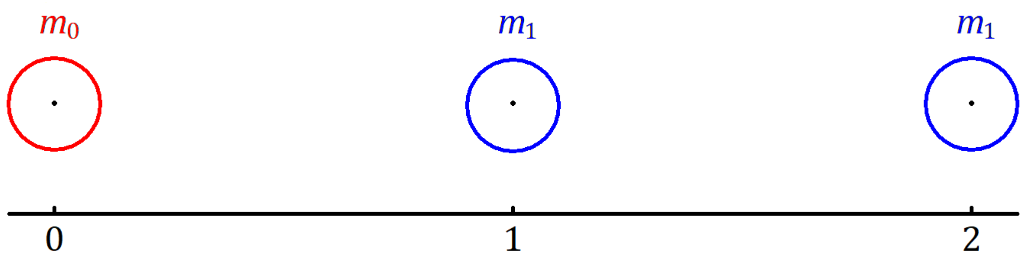
Let's do some

proper physics

and

proper maths!

Linear example:

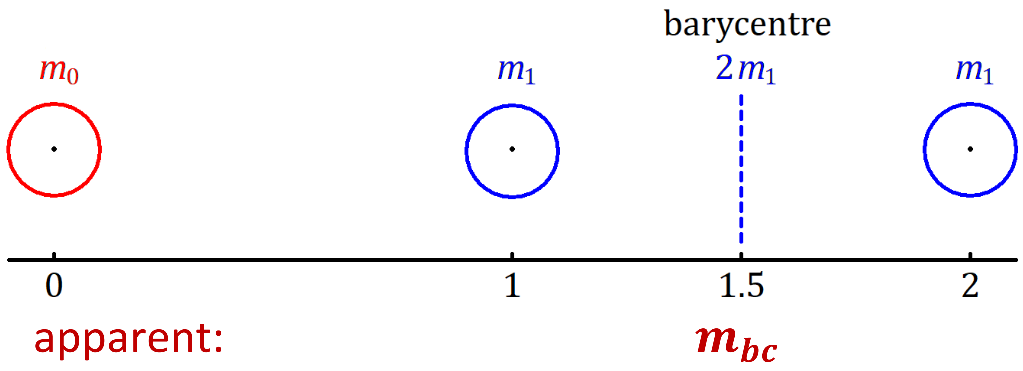


$\boldsymbol{m_0}$ is gravitationally attracted by two stationary masses $\boldsymbol{m_1}$ as shown.

Please calculate the force it feels.

YOU!  NOW!

You've got 1 minute.



Actual situation: $$F_{G,tot} = \frac{Gm_0m_1}{r_1^2} + \frac{Gm_0m_1}{r_2^2} = Gm_0m_1\left(\frac{1}{r_1^2} + \frac{1}{r_2^2}\right)$$

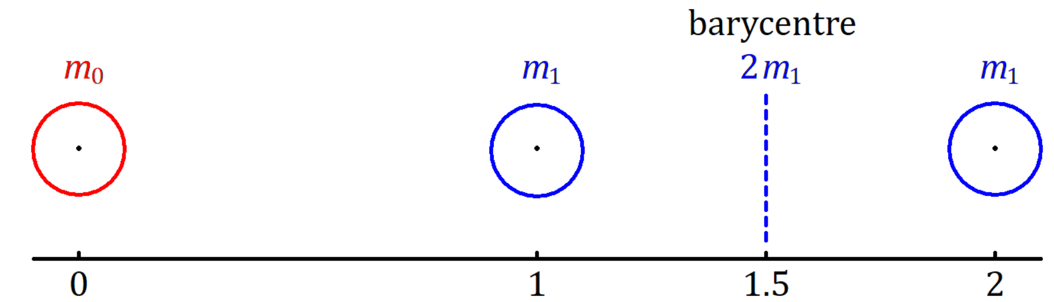
Suppose this force is instead exerted

by a barycentric mass $\boldsymbol{m_{bc}}$: $$F_{G,bc} = \frac{Gm_0m_{bc}}{r_{bc}^2} = \frac{Gm_0m_{bc}}{\left(\frac{r_1+r_2}{2}\right)^2} = \frac{4Gm_0m_{bc}}{(r_1+r_2)^2}$$

Both must be equal: $$F_{G,bc} = F_{G,tot}$$

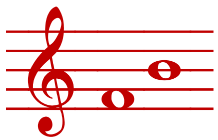
hence: $$\frac{4m_{bc}}{(r_1+r_2)^2} = m_1\left(\frac{1}{r_1^2} + \frac{1}{r_2^2}\right)$$

apparent vs. true mass: $$\frac{m_{bc}}{2m_1} = \frac{1}{2} \cdot \frac{(r_1+r_2)^2}{4}\left(\frac{1}{r_1^2} + \frac{1}{r_2^2}\right)$$



$$\frac{\text{apparent}}{\text{true}} = \frac{m_{bc}}{2m_1} = \frac{(r_1+r_2)^2}{8}\left(\frac{1}{r_1^2}+\frac{1}{r_2^2}\right)$$

Fill in the numbers:

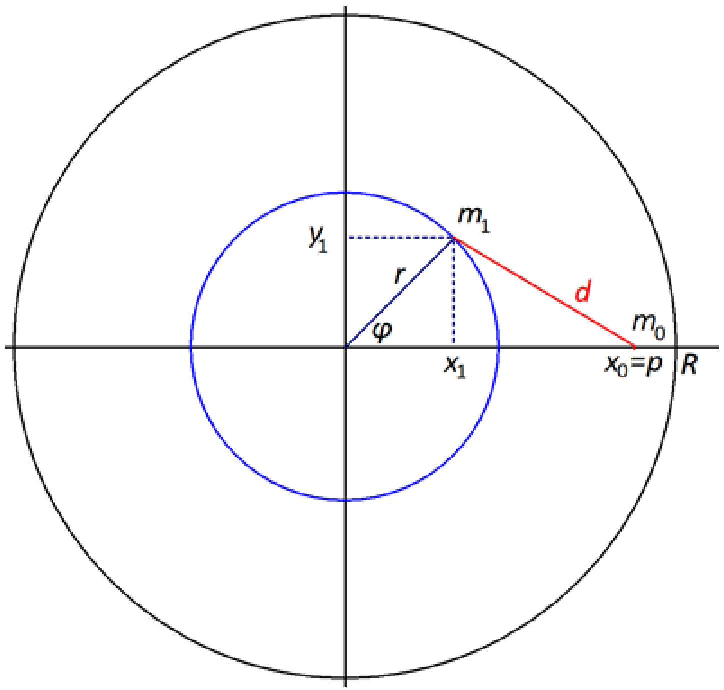
$$\frac{m_{bc}}{2m_1} = \frac{(1+2)^2}{8}\left(\frac{1}{1^2}+\frac{1}{2^2}\right) = \frac{3^2}{8}\left(1+\frac{1}{4}\right) = \frac{9}{8}\cdot\frac{5}{4} = \frac{45}{32} =$$  diatonic tritone.

So there it is. The ILLUSION of more mass than there actually is.

For m_0, it appears as a single mass at $r = 1.5$ being
$1.40625\times$ heavier than the two masses m_1 combined.

Or: $2m_1$ apparently resides at $r = \sqrt{8/5} \approx 1.265$ (derive this yourself)
which obviously is closer than the barycentre.

Gravitation by a homogeneous ring:



Consider the blue ring of radius $\boldsymbol{r}$
and a mass $\boldsymbol{m_0}$ at $\boldsymbol{p}$ from the centre.

Infinitesimal part of ring: $m_1 \equiv \partial^2 m = \rho(r) \cdot r\partial\varphi \cdot \partial r$

attracts it at: $d^2 = p^2 + r^2 - 2pr\cos\varphi$

hence: $\frac{F_G}{m_0} = \partial^2 a = G\frac{\rho(r)\cdot r\partial\varphi\cdot\partial r}{p^2+r^2-2pr\cos\varphi}$

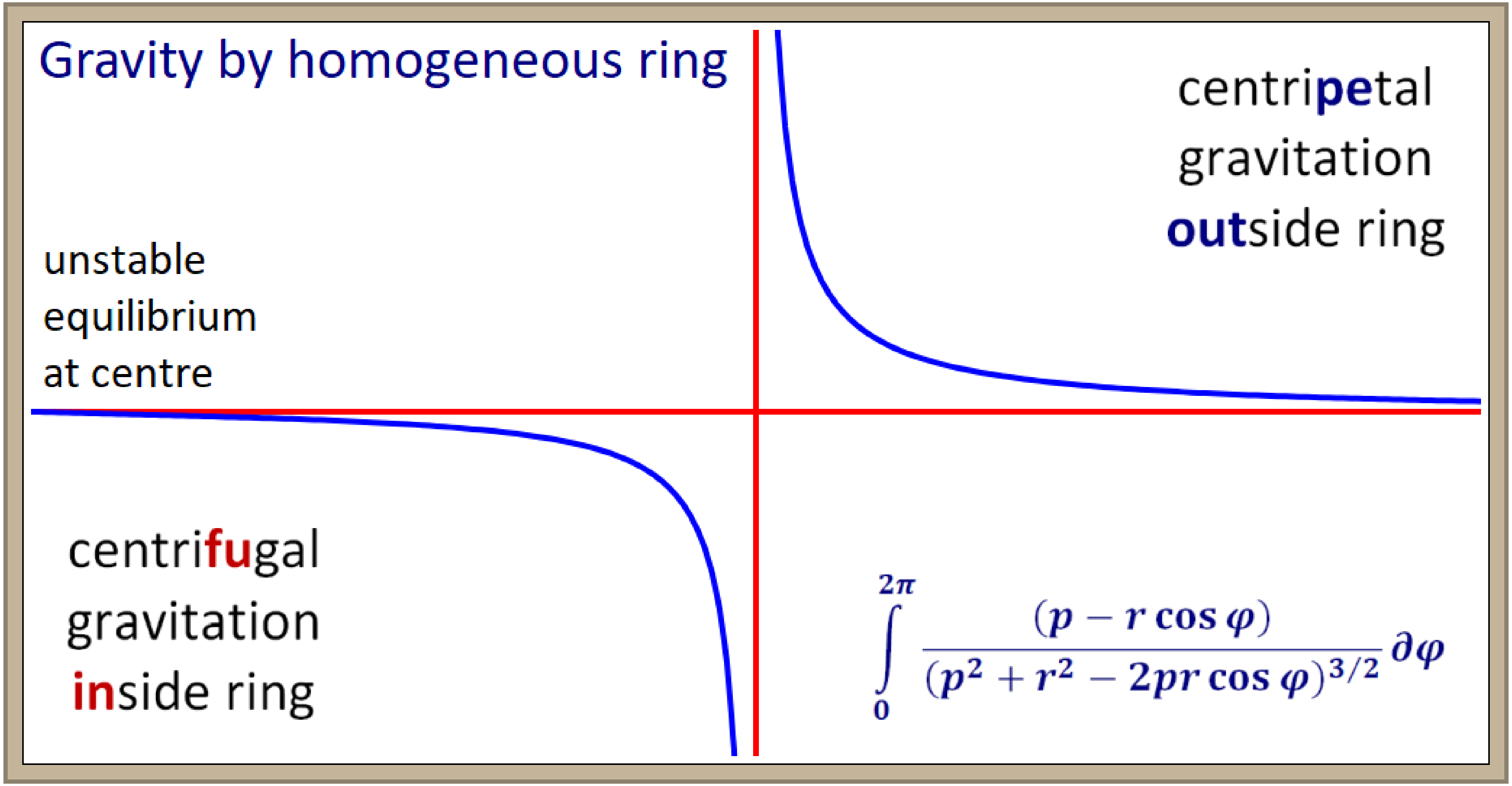
Symmetry wipes out the y-components, leaving:

$$\partial^2 a_x = \frac{p - x_1}{d} \cdot \partial^2 a = \frac{p - r\cos\varphi}{\sqrt{p^2 + r^2 - 2pr\cos\varphi}} \cdot \partial^2 a$$

$$= G\frac{(p - r\cos\varphi)\cdot\rho(r)\cdot r}{(p^2 + r^2 - 2pr\cos\varphi)^{3/2}}\partial\varphi\partial r$$

$$\boldsymbol{\partial a_x = G\rho(r)r\left(\int_0^{2\pi}\frac{(p - r\cos\varphi)}{(p^2 + r^2 - 2pr\cos\varphi)^{3/2}}\partial\varphi\right)\partial r}$$

Gravitational force by a single ring (towards centre = positive):



$p = 0$ $p = r$ $p = 2r$

Avoid unstable equilibrium: central mass m_{bh} .

Do spiral galaxies REQUIRE a heavy central mass?

Avoid division by zero:

void of radius r_{bh} around m_{bh} ,

as well as void of radius r_v around star of m_0 ,

so must integrate from φ_v to $2\pi - \varphi_v$

where: $\varphi_v(p, r, r_v) = \begin{cases} \arccos \frac{p^2 + r^2 - r_v^2}{2pr}, & |p - r| < r_v \\ 0, & |p - r| \geq r_v \end{cases}$

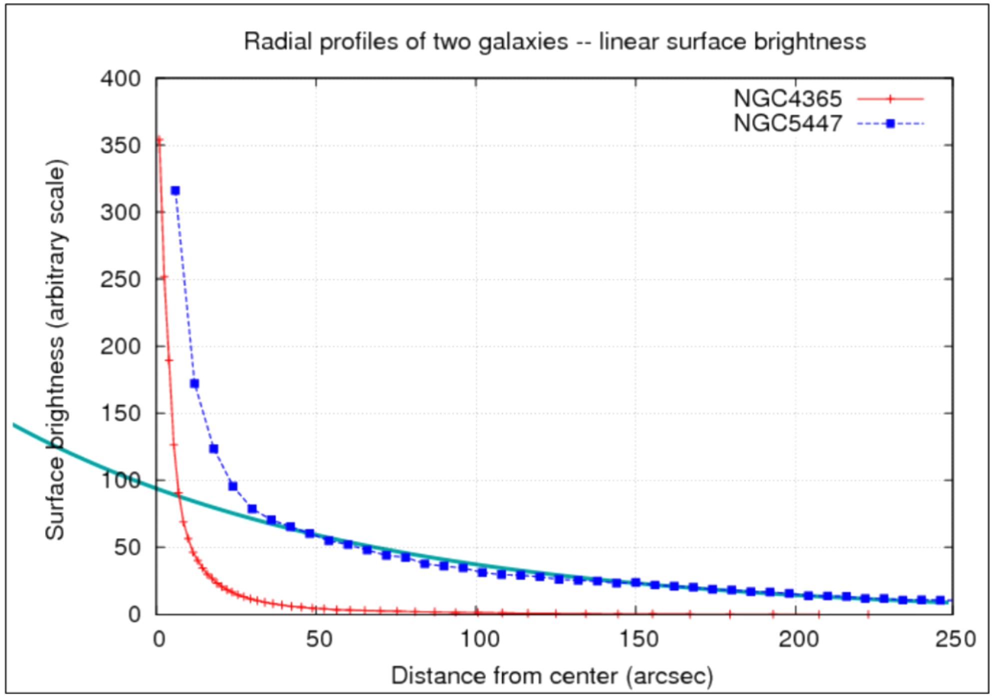
Then: centripetal acceleration at position p :

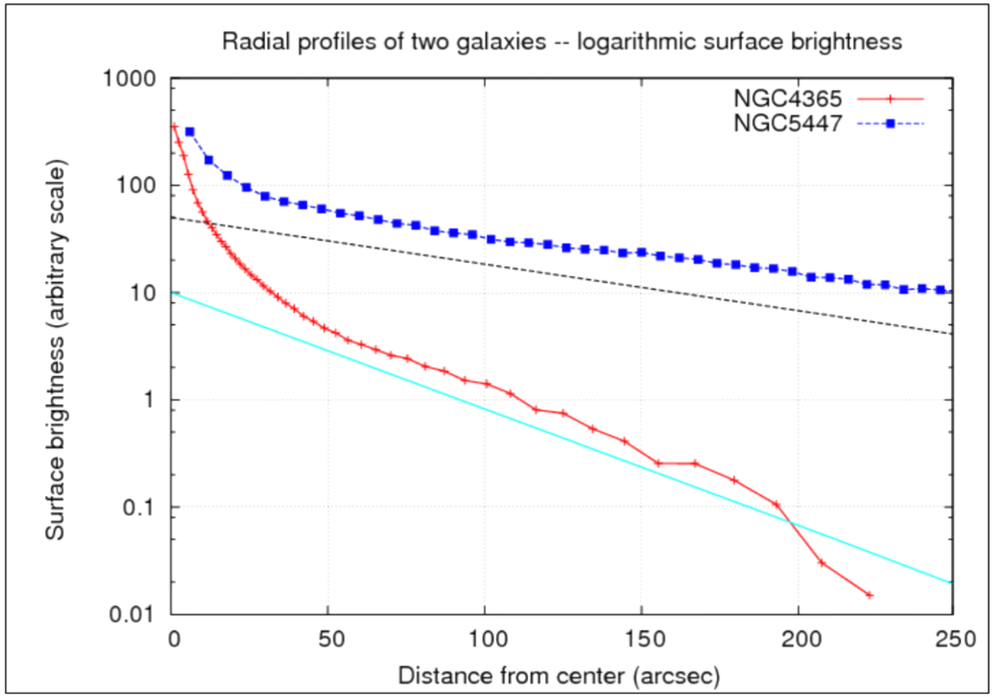
$$a_{cp}(p) = \frac{v_{rot}^2}{p} = G\left(\frac{m_{bh}}{p^2} + \int_{r_{bh}}^{R} \rho(r) r \left(\int_{\varphi_v(p,r,r_v)}^{2\pi - \varphi_v(p,r,r_v)} \frac{(p - r\cos\varphi)}{(p^2 + r^2 - 2pr\cos\varphi)^{3/2}} \partial\varphi\right) \partial r\right)$$

where R is radius of galaxy and p ("position") is distance to centre.

Density profile usually assumed

∝ surface brightness (but isn't $L \propto M^{\sim 3.5}$?)





Linear (exp. curve [used in KEPLERIAN DECL.] by HR)

Logarithmic

Seems ~reciprocal for smaller r

Seems exponential for larger r

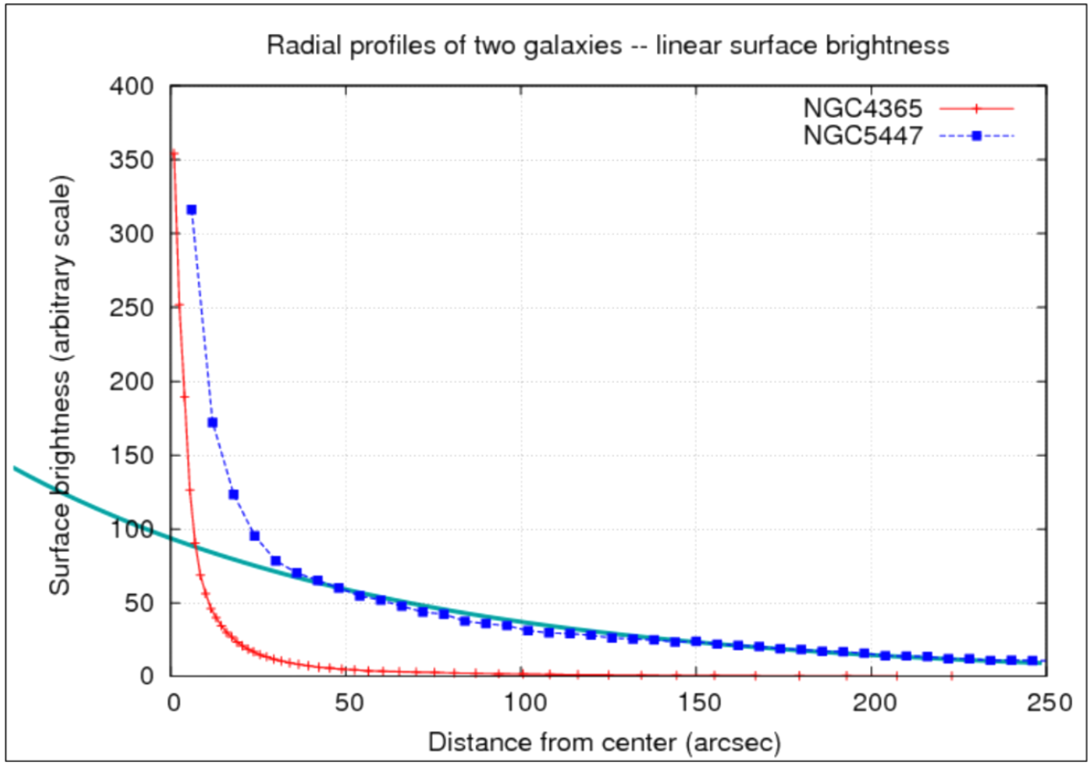
(50,59), (25,95), (12.5,175) / (50,5), (25,16), (12.5,40)

Images from: http://spiff.rit.edu/classes/phys443/lectures/gal_2/gal_2.html

Keplerian decline:

Based on purely exponential density profile.

A toddler sees it is absolutely definitely completely **WRONG** near galaxy's centre!



Reciprocal density profile:

$$\rho(r) = \frac{\rho_1}{r}$$

with: $dm = 2\pi r \rho(r) dr$

we get: $M = \int_0^R 2\pi r \frac{\rho_1}{r} dr$

so: $M = 2\pi \rho_1 R$

and: $\rho(r) = \left(\rho_1 = \frac{M}{2\pi R}\right) \cdot \frac{1}{r}$

Exponential density profile:

$$\rho(r) = \rho_2 e^{-f\frac{r}{R}}$$

where f is a dilution coefficient.

with: $dm = 2\pi r \rho(r) dr$

we get: $M = \int_0^R 2\pi \rho_2 r e^{-f\frac{r}{R}} dr$

so: $M = 2\pi \rho_2 R^2 \frac{1-(f+1)e^{-f}}{f^2}$

and: $\rho(r) = \left(\rho_2 = \frac{M}{2\pi R^2} \cdot \frac{f^2 e^f}{e^f - f - 1}\right) \cdot e^{-f\frac{r}{R}}$

"Vertical" gravity cancels out, yielding a mass correction factor of: $\frac{\pi r^2}{4\pi r^2} = \frac{1}{4}$

Hence: $\boldsymbol{\rho_{rcp}(r) = \frac{M}{8\pi R \cdot r}}$

Henks: $\boldsymbol{\rho_{exp}(r, f) = \frac{M}{8\pi R^2} \cdot \frac{f^2}{e^f - f - 1} \cdot e^{f\left(1-\frac{r}{R}\right)}}$

Milky Way

$$M_{mw} \approx 10^{12}\odot = 2 \times 10^{42}\ \text{kg}$$

$$R_{mw} \approx 75\ \text{kly} = 7 \times 10^{21}\ \text{m}$$

$$m_{bh} \approx 4 \times 10^{6}\odot = 8 \times 10^{36}\ \text{kg}$$

Radius intentionally overestimated in order to obtain more gradual effect at great distance and to emphasise effect of mass outside orbit.

$$f = 2.5 \rightarrow v_{\odot} = 215\ \text{km/s}$$

$$\boldsymbol{\rho_{exp,MW}(r) = \frac{M}{8\pi R^2} \cdot \frac{f^2}{e^f - f - 1} \cdot e^{f\left(1-\frac{r}{R}\right)} = (1.136\ \text{g/m}^2) \cdot e^{2.5\left(1-\frac{r}{R}\right)}}$$

$$\boldsymbol{\rho_{rcp,MW}(r) = \frac{M}{8\pi R \cdot r} = (1.121 \times 10^{19}\ \text{kg/m}) \cdot \frac{1}{r}}$$

Combined into a weighted average:

$$\boldsymbol{\rho_{cmb}(r) = \frac{r}{R}\rho_{exp}(r) + \left(1 - \frac{r}{R}\right)\rho_{rcp}(r)}$$

Numerically solving:

$$v_{rot}(p) = \sqrt{G\left(\frac{m_{bh}}{p} + p\int_{r_{bh}}^{R} \boldsymbol{\rho(r)}\, r\left(\int_{\varphi_v(p,r,r_v)}^{2\pi-\varphi_v(p,r,r_v)} \frac{(p - r\cos\varphi)}{(p^2 + r^2 - 2pr\cos\varphi)^{3/2}}\partial\varphi\right)\partial r\right)}$$

using:

$$\boldsymbol{\rho_{exp,MW}(r) = (1.136\ \mathrm{g/m2}) \cdot e^{2.5\left(1-\frac{r}{R}\right)}}$$

$$\boldsymbol{\rho_{rcp,MW}(r) = (1.121 \times 10^{19}\ \mathrm{kg/m}) \cdot \frac{1}{r}}$$

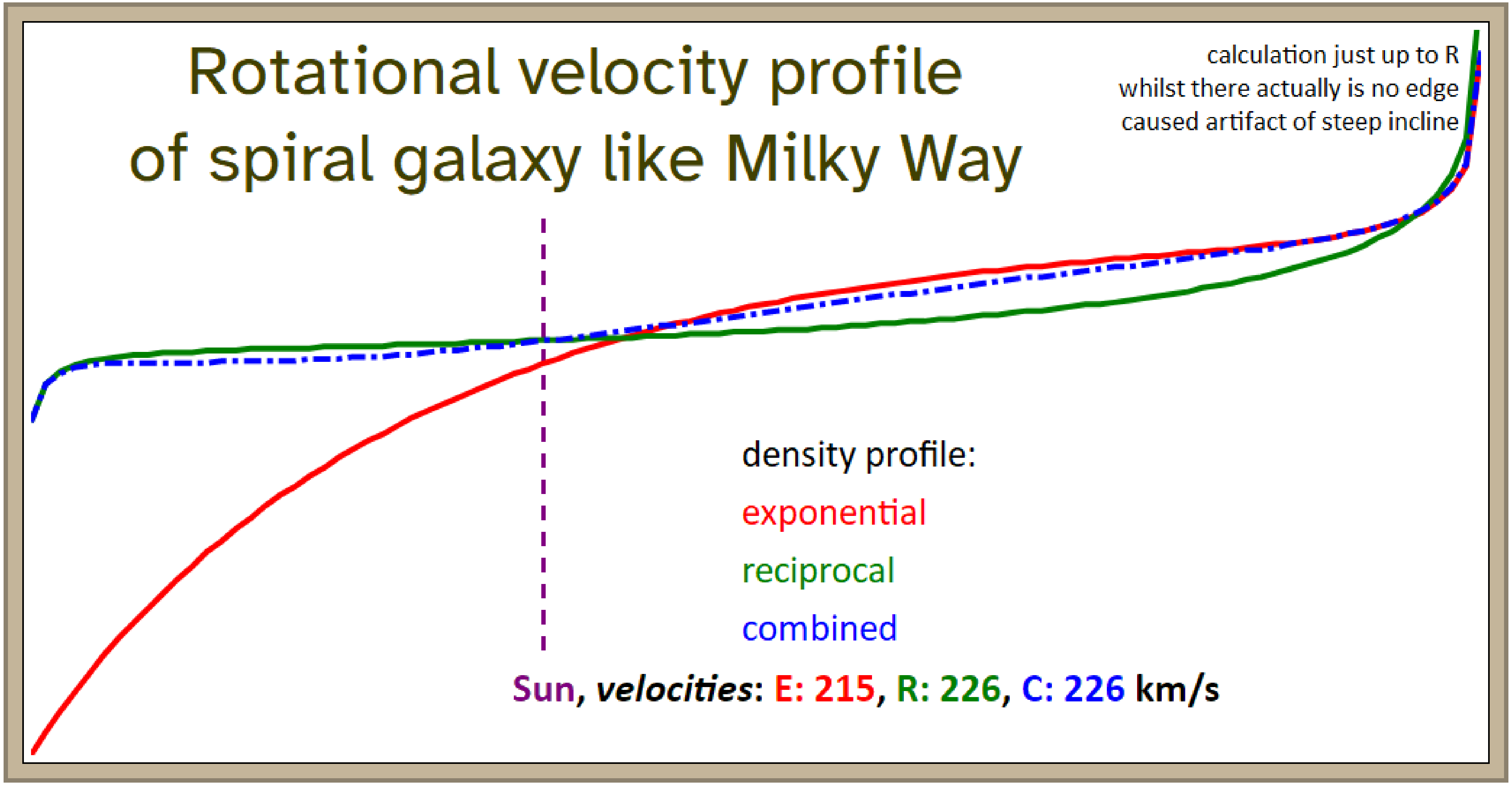
$$\boldsymbol{\rho_{cmb}(r) = \frac{r}{R}\rho_{exp}(r) + \left(1 - \frac{r}{R}\right)\rho_{rcp}(r)}$$

and:

$$r_v = 5\ \mathrm{ly},\ \ r_{bh} = r_S$$

yields…

Theoretical rotational velocity profile of a disk, based on surface brightness only:



Does it match observed profiles? Hypothefes non finxi.

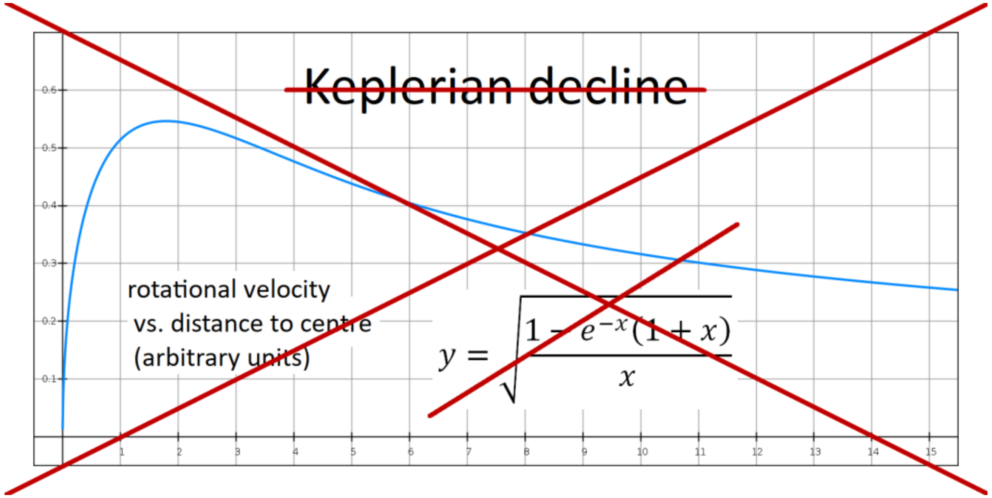
Mother Nature correctly does what she should do according to Newton's law of gravitation.

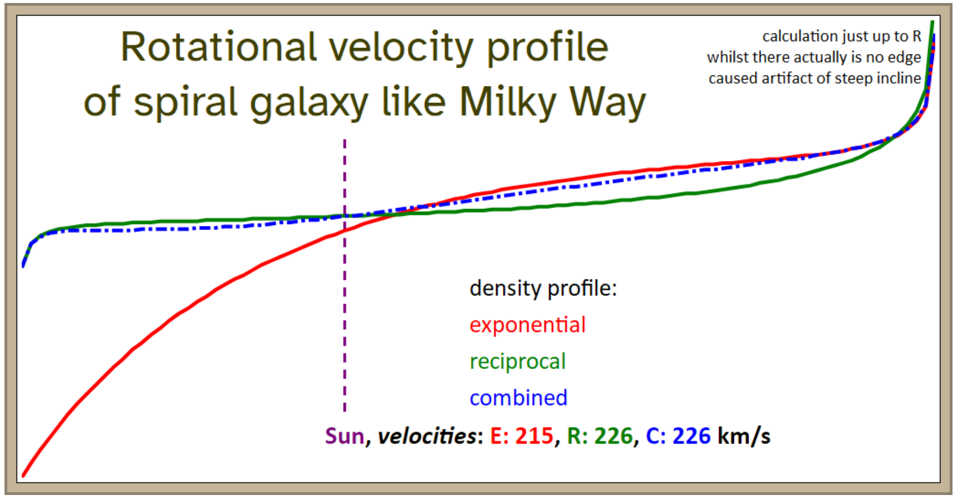
DARK MATTER is a COCK AND BULL STORY that hides the RED HERRING of Keplerian decline.

Not to mention MODIFIED GRAVITY[2]. 

*It is incomprehensible and **blameworthy** that professional cosmologists throughout the world have haphazardly parroted this ill-founded excogitation for many decades as were it a truth.*

[2] HOW DARE YOU? Newton & Einstein ***concluded*** from *phenomena* & *experience*!
Update 2023-11-15: "MOND" seems debunked with $\mathbf{16\sigma}$: https://www.youtube.com/watch?v=i4lu9AxRtqA&t=57s





Ex falso sequitur quod libet.

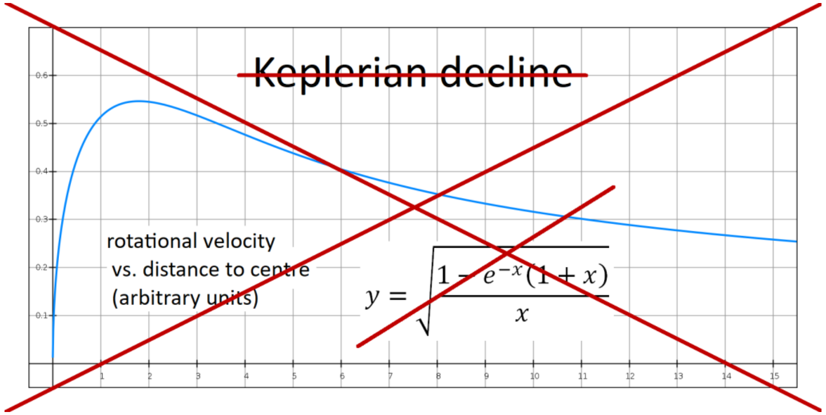
Ex veris proveniunt veritates.

How the human brain works:

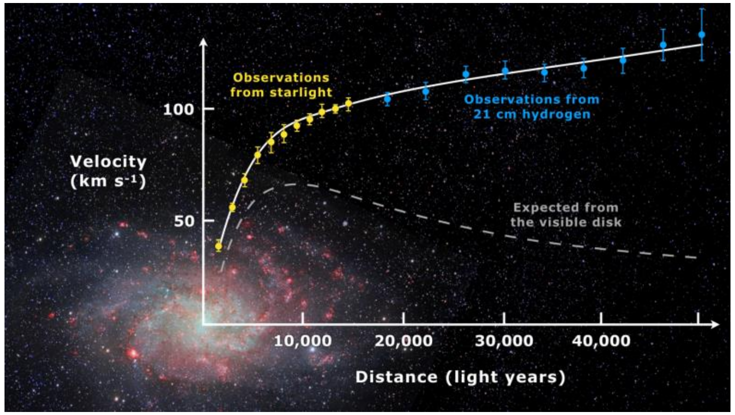
Eye no maykah no missed aches.

UTTERLY INSANE application of shell theorem to flat disk, i.e. malarkey

yields ***completely wrong*** expectation:



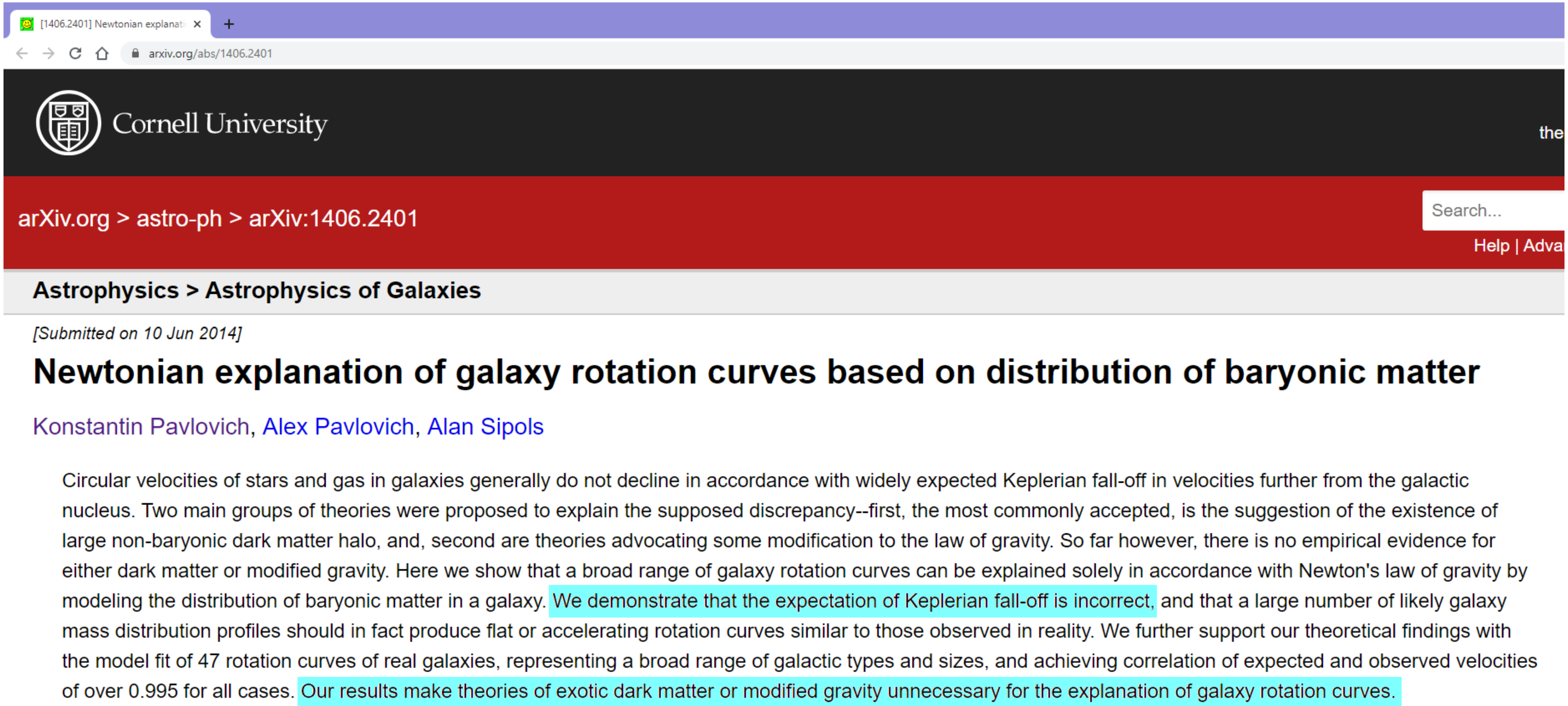
of course not matching reality:



so they contrive the concoction of dark matter.

Wrongly Invented Matter Prediction, Stupid!

Konstantin Pavlovich et al. https://arxiv.org/abs/1406.2401, June 2014:


[1406.2401] Newtonian explanati

arxiv.org/abs/1406.2401

Cornell University

the

arXiv.org > astro-ph > arXiv:1406.2401

Search...

Help | Adva

Astrophysics > Astrophysics of Galaxies

[Submitted on 10 Jun 2014]

Newtonian explanation of galaxy rotation curves based on distribution of baryonic matter

Konstantin Pavlovich, Alex Pavlovich, Alan Sipols

Circular velocities of stars and gas in galaxies generally do not decline in accordance with widely expected Keplerian fall-off in velocities further from the galactic nucleus. Two main groups of theories were proposed to explain the supposed discrepancy--first, the most commonly accepted, is the suggestion of the existence of large non-baryonic dark matter halo, and, second are theories advocating some modification to the law of gravity. So far however, there is no empirical evidence for either dark matter or modified gravity. Here we show that a broad range of galaxy rotation curves can be explained solely in accordance with Newton's law of gravity by modeling the distribution of baryonic matter in a galaxy. We demonstrate that the expectation of Keplerian fall-off is incorrect, and that a large number of likely galaxy mass distribution profiles should in fact produce flat or accelerating rotation curves similar to those observed in reality. We further support our theoretical findings with the model fit of 47 rotation curves of real galaxies, representing a broad range of galactic types and sizes, and achieving correlation of expected and observed velocities of over 0.995 for all cases. Our results make theories of exotic dark matter or modified gravity unnecessary for the explanation of galaxy rotation curves.

1. We demonstrate that the expectation of Keplerian fall-off is incorrect,
2. Our results make theories of exotic dark matter or modified gravity unnecessary for the explanation of galaxy rotation curves.

Gravitational lenses:

List found at: https://lweb.cfa.harvard.edu/castles/
(manually added a few, e.g. the "Horseshoe")
62 have z_{src}, z_{lens} & α_{Einst}, 58 also have mag_{lens}

Using 3-spherical geometry of universe

(see http://henk-reints.nl/astro/HR-Geometry-of-universe-slideshow.pdf)

which has its own lensing effect
(affecting calculated mass and luminosity)
(e.g. meridians converge beyond equator).

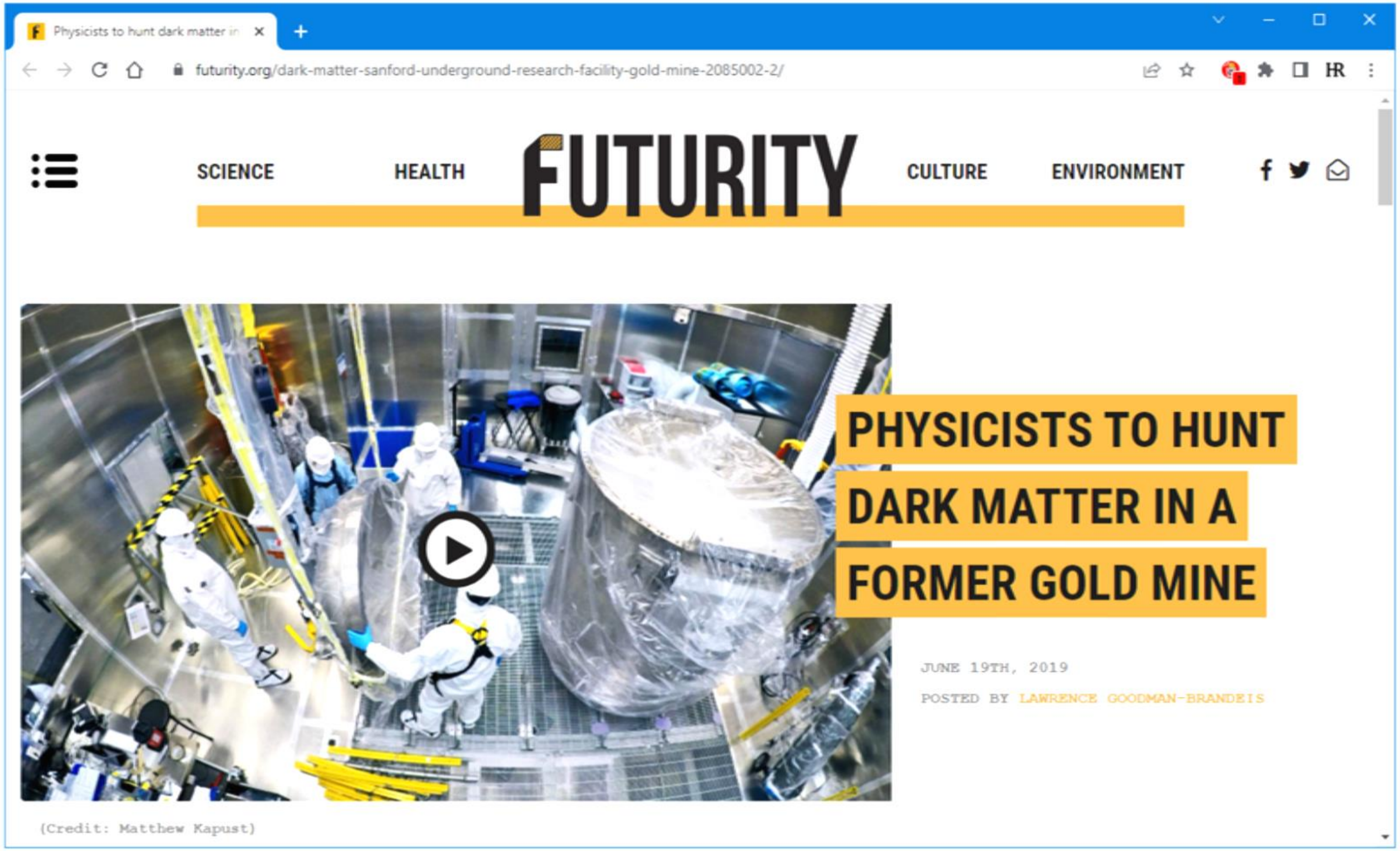
Comparison with Andromeda galaxy:

(see http://henk-reints.nl/astro/gravLensing.html)

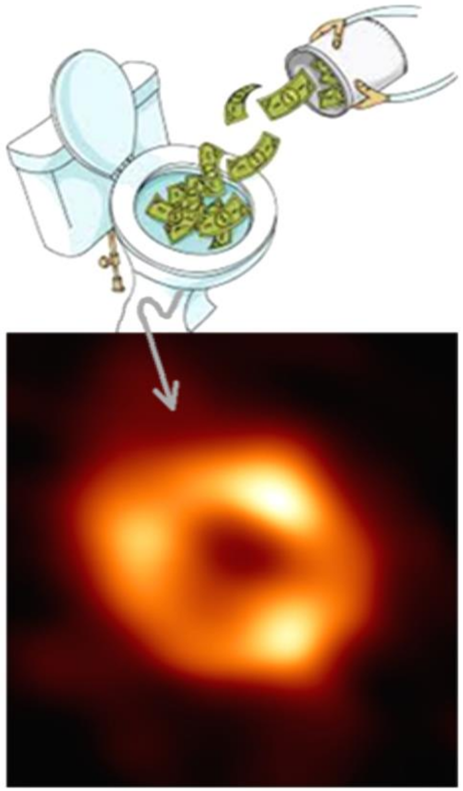
- only 6/62 lensing objects are heavier;
- only 3/58 are less luminous;
- only 4/58 have less specific luminosity (L/M).

Would this give rise to the concept of dark matter if the idea not yet existed?

Gold mine looted for pointless quest:



Hardworking taxpayers' earnings:



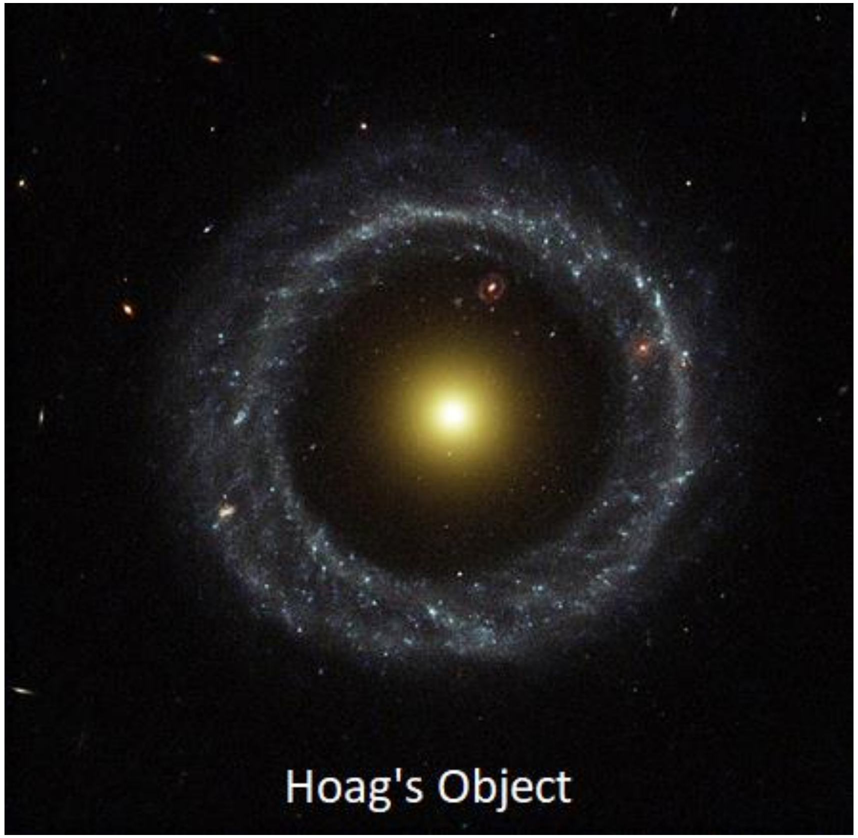
ALL research for this naively made-up non-stuff should **STOP immediately!** Today! ***NOW*!**

As already pondered on page 22:

Do spiral galaxies REQUIRE a heavy central mass?

If not enough central mass:

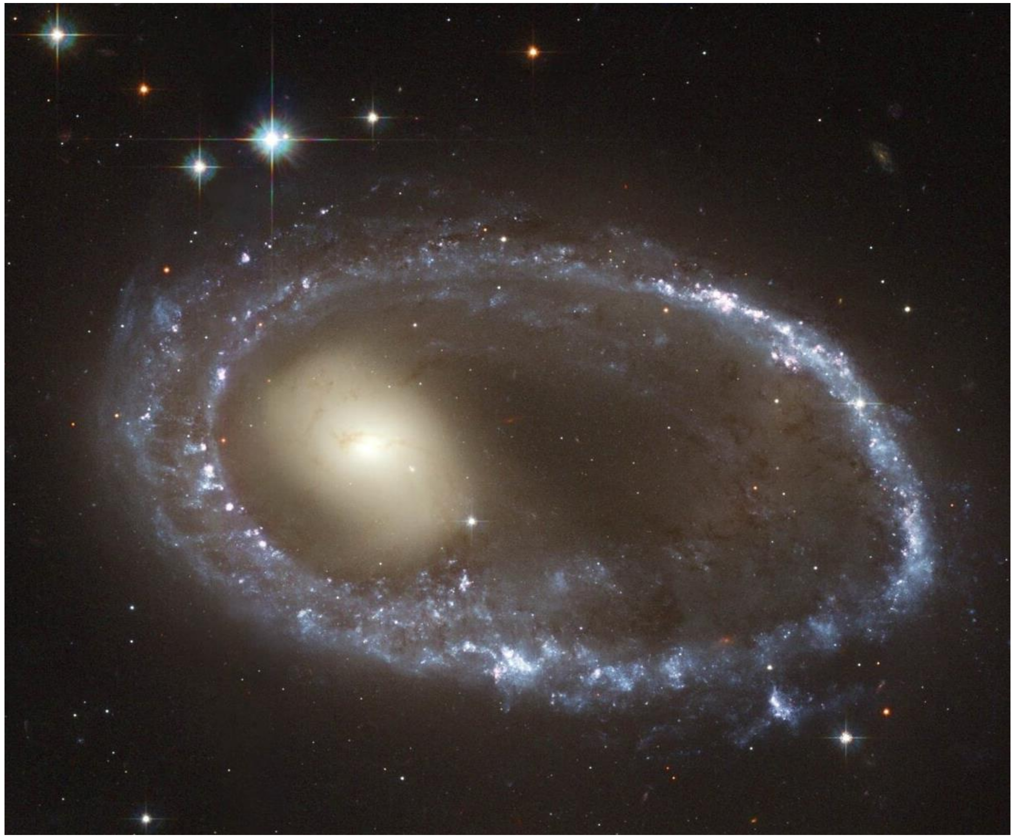
1. inner mass pulled outward;
2. comes closer to outer mass;
3. outer mass pulled inward;
4. comes closer to inner mass;
5. back to 1, ultimately yielding...



Core heavy enough to stay put, but too light for keeping other mass near it, so this mass went over edge of potential well.

But Dr. Becky has no idea:

https://www.youtube.com/watch?v=uE46_wuj7P0&t=311s

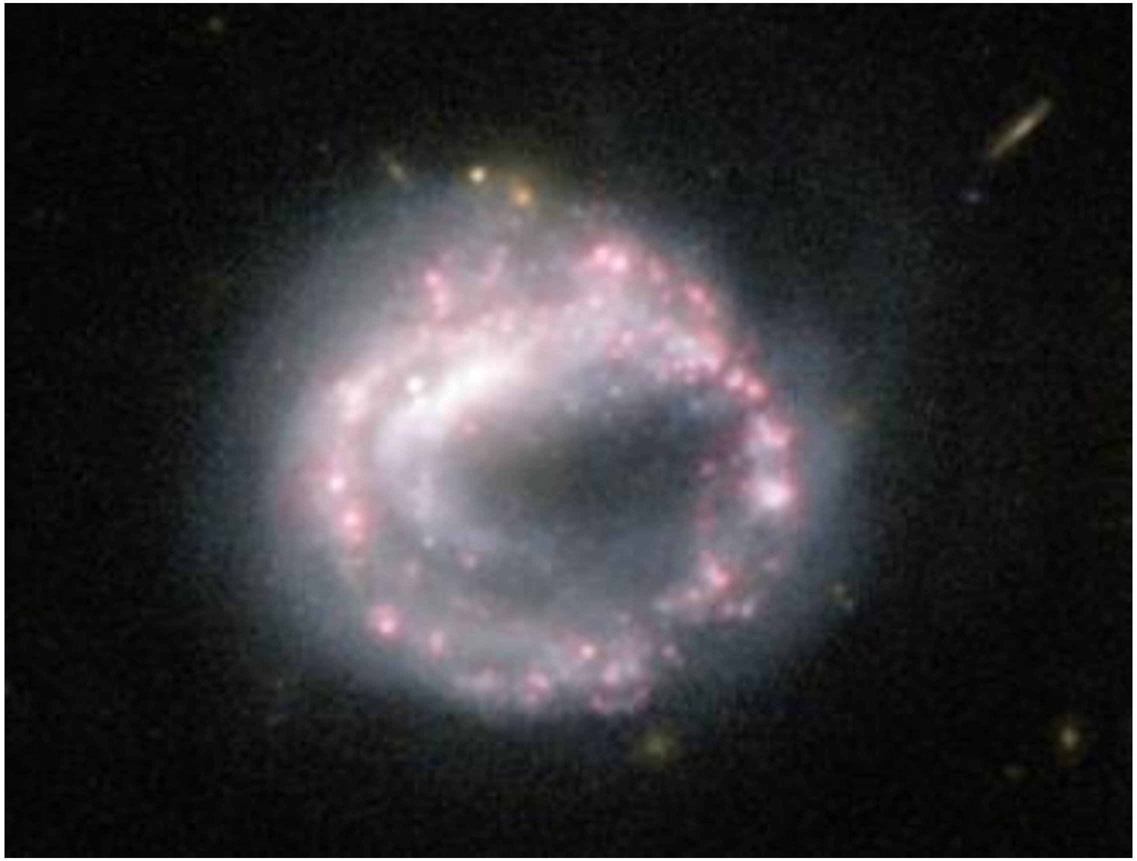


Imagine this as a forward playing video & you "see" the centrifugal gravitation on the apparently insufficiently heavy core in action. It will ultimately result in...

https://en.wikipedia.org/wiki/Ring_galaxy

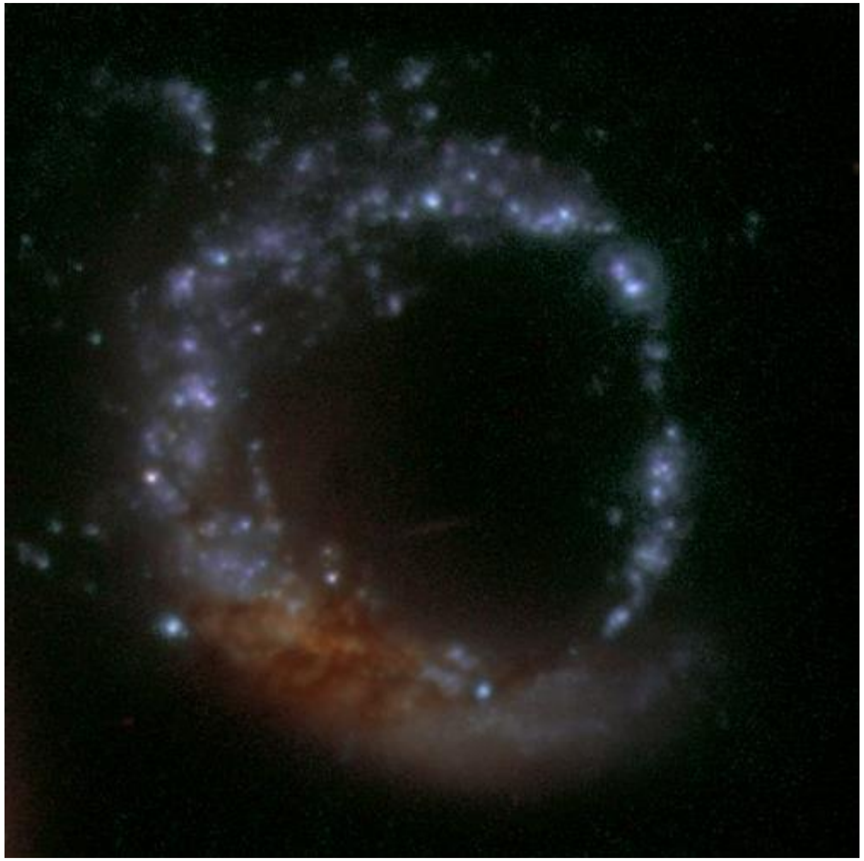
https://www.esa.int/ESA_Multimedia/Images/2004/04/Ring_galaxy_AM_0644-741

Insufficient central mass fully absorbed by ring:



https://esahubble.org/images/potw1310a/
Credit: ESA/Hubble & NASA, Acknowledgement: Judy Schmidt

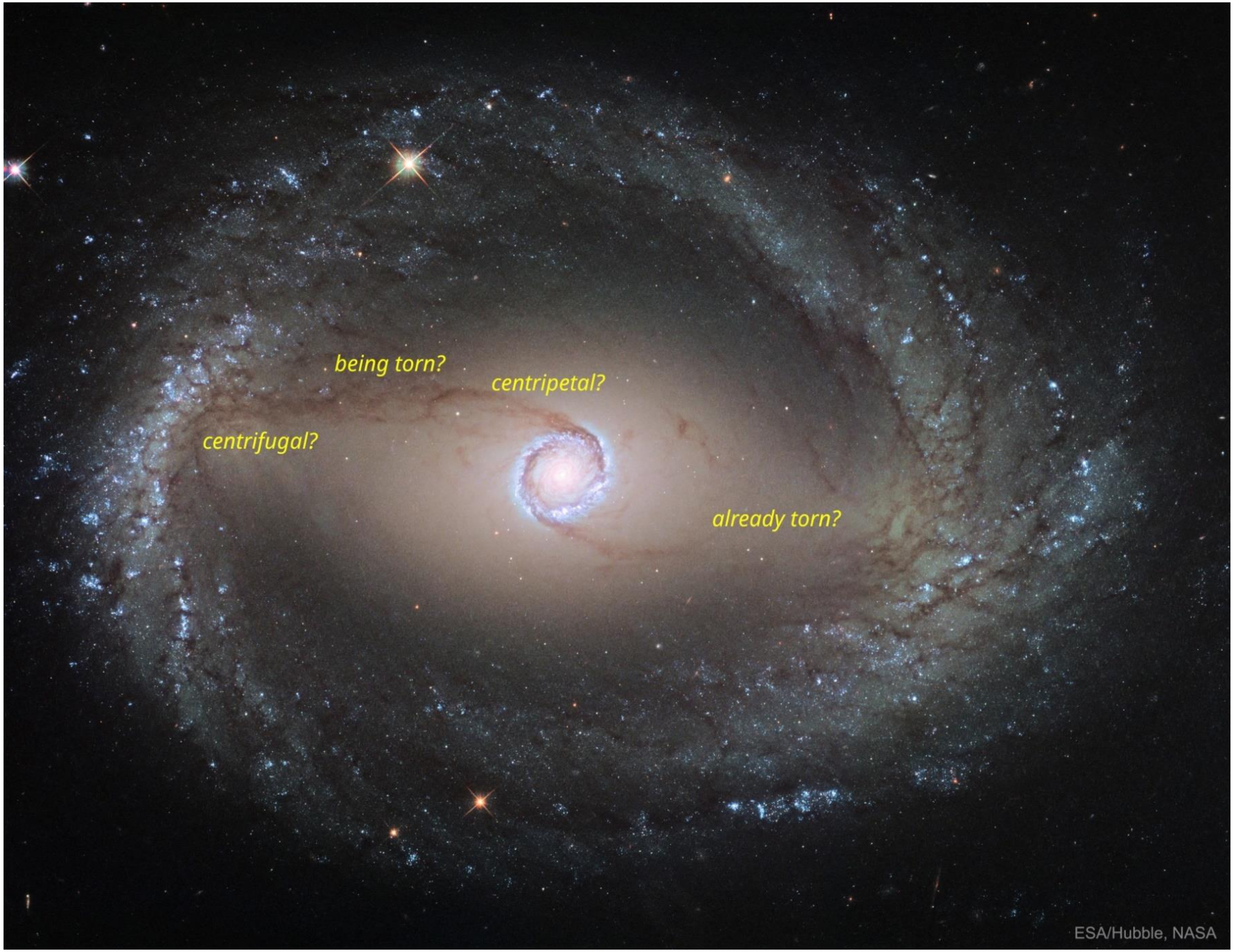
Zw II 28



https://esahubble.org/news/heic0820/
Image credit: NASA, ESA, and M. Livio (STScI).

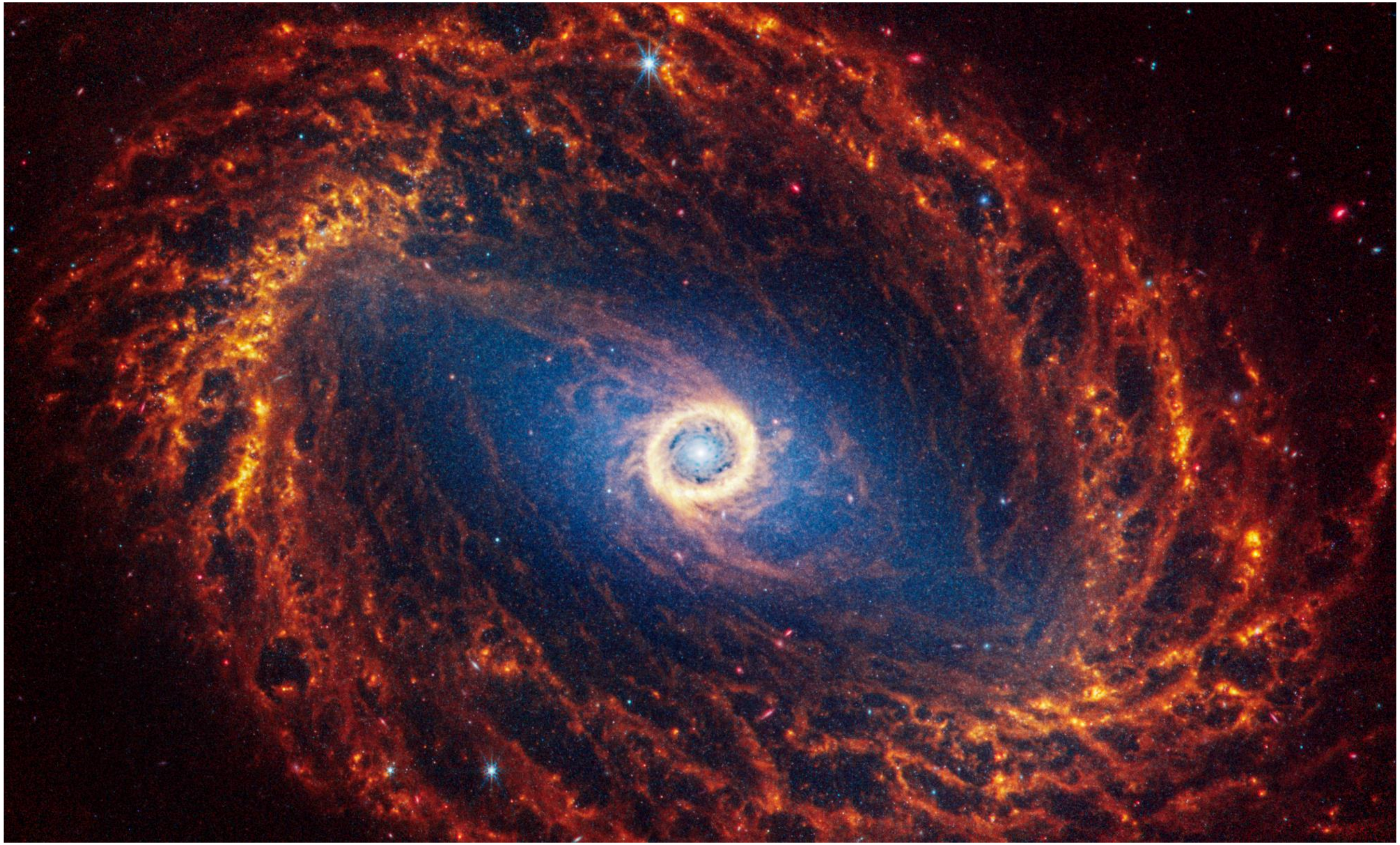
(half of) Arp 147

APOD 2022-05-08: NGC 1512 has a more complicated density profile:



Annotated by Henk Reints; https://apod.nasa.gov/apod/ap220508.html, image credit: NASA, ESA, Hubble Space Telescope

JWST 2024-01-29:



https://stsci-opo.org/STScI-01HM9Z66EBRH66REYVABS9CPFP.png
https://webbtelescope.org/contents/news-releases/2024/news-2024-105?news=true

Might it be that
all barred galaxies are
undergoing centrifugal gravitation
due to a small SMBH at their centre?

Cf. the Milky Way, which has a bar,
whilst Sgr A* is a small SMBH.

See also my analysis of the Coma cluster:

http://henk-reints.nl/astro/coma

and: http://henk-reints.nl/astro/HR-rotating-bar.pdf

as well as: http://henk-reints.nl/astro/gravLensing.html

(loads of numbers about gravitational lenses)

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