Why Spiral Galaxies Differ

by Clark M. Thomas

Of the billions of observable galaxies in the known universe, there are a few basic categories, with many variations therein. At one extreme are the spherical elliptical galaxies, and at the other extreme are the irregular galaxies. A large percentage of nearby galaxies are classified as spiral, although in the "big picture" ellipticals with various degrees of size and elongation outnumber all others.

This essay is not concerned with establishing new taxonomic and morphological descriptions and categories. What we are accomplishing herein is explaining how and why spiral galaxies (which have NOT yet gravitationally interacted with other large galaxies) differ according to the openness of their spirals. Galaxies such as the Milky Way are constantly snacking on small galaxies and clusters nearby without changing their spiral arm types.

A too easy explanation is to attribute their differences to General Relativity effects. The problem is that GR fails to describe any form of gravity on this scale, and indeed fails or is the second choice on all scales. Einstein the man, whom I admire greatly, did such a good job one century ago with his GR fantasy scheme of branes, that he was embraced by many as a demigod of science. Even Einstein was forced to come up with the mystical *Lambda* in his General Relativity formula to keep his one-universe paradigm from imploding. Today's popular demigod of science, Stephen Hawking, is a minor theorist[1]. The world of

[1] http://astronomy-links.net/hawkingerrors.html

astronomy in 1915 was very different from that of 2015. We moderns have access to far superior theories and technologies.

If Einstein were a young astrophysicist alive today, he likely would dismiss the easy concept of General Relativity, even with the "old Einstein" math looking so good in limited cases. Today's "new Einstein" would never become a demigod of science. If complex reality is more difficult to put into a tiny mental pill, so be it.

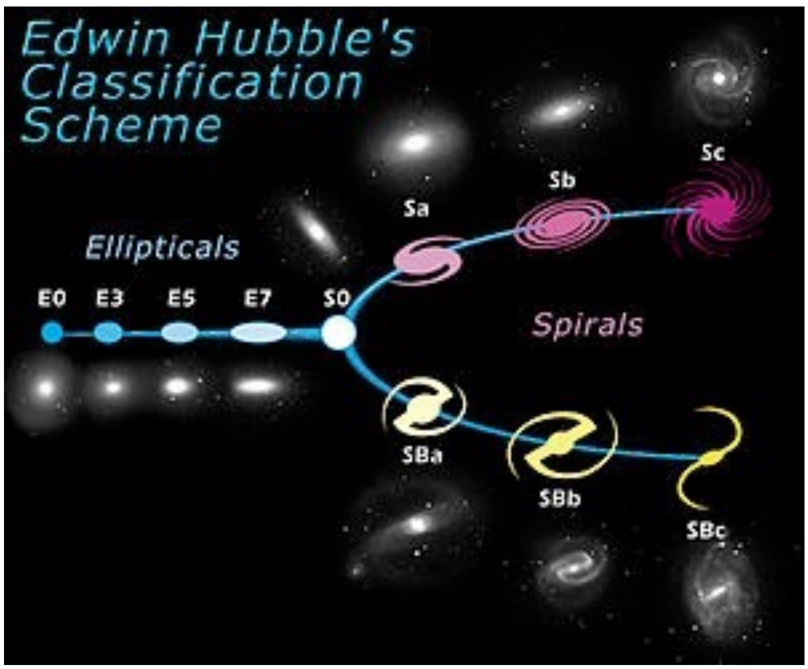
Einstein's "general" theory of relativity uses nearby examples for proof. The three tests he specified in 1916 all are measurable, but confined to his idea of there being only one universe. When the multiverse is entered into the paradigm, along with my updated understanding of LeSage's "hyperluminal corpuscles" and other new elements of push/pull gravity, then the quaint world of GR falls apart. In 1916 the idea of the multiverse had not yet been developed, as well as other critical ideas in cosmology. Within the broader perspective it is possible to elegantly design alternative explanations for everything that has been offered as proof of GR.

Most dissonant or alternative models of general relativity are like changing the hair style of a man. Some are mere toenail clipping, and of course achieve nothing to effectively refute GR. It is almost as if people are afraid of what Einstein concocted in 1915. This level of reverence is understandable: Ptolemy's geocentric model of the known universe stood the test of time for over a thousand years. Einstein is today's Claudius Ptolemy.

My approach to gravity, on the road to a theory of everything, utilizes all levels of reality, starting from tiny YY particles at the minus 39th meter dimension (far below the Planck level of 10^-35m). My coherent model extends outward into the total multiverse, and speculates about the total Yin/Yang borders, if any. It is only by developing a coherent science, that we can construct a new and successful paradigm of astrophysics.

I will make a few comments herein on the failure of GR, and provide appropriate footnotes to other essays for more discussion. Once we perceive how the magical world of GR self-destructs, we can then proceed to reasonably explain how and why spiral galaxies differ as they do.

Spiral galaxies were given morphological descriptions in the 1920s by Edwin Hubble. That was just after the confusion about these nebulae being either clouds with stars, or mostly clouds of stars. There are four major categories of spiral galaxies, first ranked by Hubble according to how open their spiral arms are[2]:



In this tuning-fork style presentation, those with loose spirals are Sc, or Sd for very loose. (There are some loose spiraled galaxies that are that way because of interactions with other passing galaxies, but we are excluding these random encounters from the basic theory.) Otherwise spiral arms could be Sb or Sa; or maybe So, the last likely being a transitional form toward elliptical:

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[2] https://en.wikipedia.org/wiki/Galaxy_morphological_classification#De_Vaucouleurs_system

The capital B following the S indicates a bar in the core. Our Milky Way is an SBb galaxy. Many spiral galaxies have bars.

An Sa galaxy has tight spirals, sometimes to the point where the spirals appear to disappear into the galactic plane. At that point an Sa could develop into an So galaxy, or into what is called a lenticular galaxy[3]. Lenticular galaxies are intermediate between spirals and ellipticals. Ellipticals do not have star-forming arms, so they are of interest in this essay only by comparison.

The spiral arms themselves do not develop from nothing. It is thought that density waves create gas collisions that yield dusty areas, and then new blue stars.[4]

Spiral arms don't fly off, and they don't quickly fall in toward the core and its bulge[5]. Apparent structural stability is because most galaxies are directed by (1) gravitational influences from external clouds of dark matter; also by (2) dark matter within the galactic plane itself … AND by (3) gravitational influences from a supermassive black hole, if present.

Here is the keyhole for this essay: There is an apparent direct relationship between the size of the bulge (and likely the mass of the supermassive black hole therein), and the type of spiral arms: **The largest bulges tend to produce Sa or So spirals; and less massive black holes produce Sb or Sc structures.**

The Milky Way has a supermassive central black hole with about three million solar masses. It produces an Sb (actually an SBb) galactic structure: Sb with a bar "B". In contrast, the

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[3] https://en.wikipedia.org/wiki/Lenticular_galaxy

[4] https://en.wikipedia.org/wiki/Density_wave_theory

[5] Carroll, Bradley W. and Dale A. Ostlie (2007). *An Introduction to Modern Astrophysics*. Addison Wesley. p. 967. ISBN 0-201-54730-9.

smaller Sombrero Galaxy (M104) has a truly awesome bulge with roughly a billion solar masses at its black core. It is either an Sa or So galaxy. Some believe the Sombrero is a transitional structure on the way to becoming another elliptical galaxy several billion years hence, passing first through the lenticular stage.

Large elliptical galaxies typically have very massive cores. In contrast, there are many small dwarf ellipticals[6] without large supermassive cores; they are typically just very old, possibly primordial, collections of yellow stars. They are like old globular clusters, but with more associated dark matter.

In addition, there are highly irregular galaxies that may have no significant black holes. The two Magellanic Clouds (Large and Small), as well as satellite galaxies of the MW such as Barnard's Galaxy, are excellent examples of irregular galaxies.

There are also some examples of spiral galaxies having a modest supermassive black hole without an apparent bulge[7].

I am not going to waste space in this essay describing in detail push/shadow gravity, and comparing it in great detail to the GR scheme. If you don't understand the differences, please read these references: [8], [9], [10], [11], [12], [13].

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6 https://en.wikipedia.org/wiki/Dwarf_elliptical_galaxy

7 https://en.wikipedia.org/wiki/Bulge_(astronomy)

8 http://astronomy-links.net/Gravities,BlackHoles,BigBangs.pdf

9 http://astronomy-links.net/GGvsGR.html

10 http://astronomy-links.net/TestingGravities.html

11 http://astronomy-links.net/supersymmetry.htm

12 http://astronomy-links.net/SeeingUnseeable.html

13 http://astronomy-links.net/RealTOE.pdf

The third gravitational force, mentioned in the previous fourth page, is *not* GR curves – supposedly culminating in a deeply curved brane wherein the supermassive black hole resides. Even if that model were in any way real, which it is not, the idea as developed within GR fails to explain distant attraction.

Importantly, the vortex down which lesser masses allegedly track does not extend very far from the "tornado" indentation structure itself. Even a black hole with a non-rotating billion solar masses would only have a Schwarzschild radius event horizon[14] roughy equal to the distance from the Sun as the orbit of Uranus[15]. Beyond the tornado-like gravity curvature surrounding each massive black hole there soon is a level area extending beyond. That proximal leveling means attracting slopes toward any mass in a one universe Universe can only be relatively local.

In no way do tractor-beam and membrane-slope gravities effect mass hundreds of millions of light years away, as when we are describing the relationship of our local group of galaxies to the *Laniakea* supercluster[16]. In contrast, a modern understanding of push/pull gravity easily and elegantly explains this distant net-force dimension and more, with help from Newton's First Law.

Remember, Einstein warned that if any part of his GR fails, it all fails. Remember too that the *Laniakea* supercluster, as great as it is, is only one of many such structures in our local visible universe. Einstein's simple fantasy had nothing to say about the emerging understanding of the multiverse as the real Universe.

Spiral galaxies are not static objects. The MW looks static, but it rotates fully every quarter-billion years. The arms of the MW and similar galaxies maintain their positional integrity while the galaxy bulge, and the entire galaxy itself, rotate. Basic

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[14] http://astronomy.swin.edu.au/cosmos/S/Schwarzschild+Radius

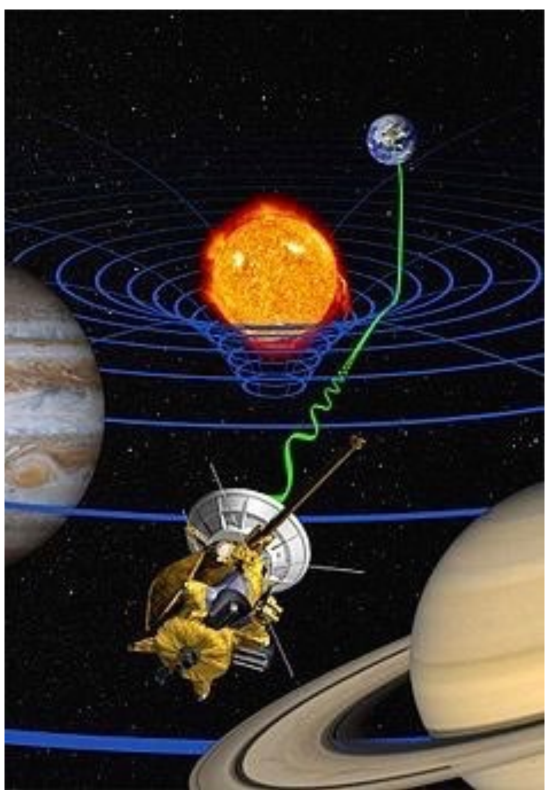
[15] https://en.wikipedia.org/wiki/Schwarzschild_radius

[16] http://astronomy-links.net/RealTOE.pdf

Newtonian math would suggest that the inner areas rotate faster than the outer ones, as do planets revolving around our Sun. But the outer arms move as if the galactic plane were a solid structure. This incredible observation was the first strong indirect indication of massive dark matter clouds surrounding the galaxy and accelerating the outer areas that are closer to their great shadowing mass.

My upgrade of the LeSage push/shadow gravity paradigm clearly explains what is going on. General Relativity cannot describe this scale, and thus Dark Matter is a dark conventional mystery today. The same goes with alleged Dark Energy, the *Lamda* fudge factor in Einstein's GR equation notwithstanding.

Here[17] is just one illustrated example of how "hard verification" of GR is not proof at all:



[17] https://en.wikipedia.org/wiki/Introduction_to_general_relativity

In this illustration the electromagnetic message beam pointed toward Earth from the Cassini Saturn probe is thought to be slightly delayed as it dips into and out of the Sun's weak-gravity indentation in its voodoo GR membrane, rolling along like a billiard ball on an uneven surface. Somehow, here the brane curve seemingly only works on the down-and-up vector, not also on the downwardly sloping vector from right to left.

What is going on is more rationally explained by push/shadow gravity as the sequential effects of (a) equal net push/shadowing before the electromagnetic beam gets to the Sun – then (b) partial shadowing from the left in this illustration – and finally (c) equal net push/shadowing again as the message beam leaves the Sun's vicinity. Entering the partial shadowing phase, the multiverse's net particulate pressure increases on the right, pushing slightly the radio wave photons from Cassini *toward* the Sun (unlike in the above artist's rendering). As the photon stream is leaving, the process works exactly in reverse. Both models show similar bending, but in a different shape.

In other words, the illustration above gets right the idea of bent radio waves and delayed transmission – but the real process is quite different, even as the net effects are measured identically. Thus, "GR math" here can be just another expression of measurement for push/pull gravity.

There is another region of associated dark matter, and it is found inside the galactic plane. The best explanation to date for the formation of visible arms in the disk involves quantum foam gravity waves in the disk emanating from the bulge area. The areas between and among arms are indeed not empty of Yin/Yang matter, even if not currently visible.

Wave oscillations in the quantum sea within the bulge around the central supermassive black hole are directly related to oscillations in the disk beyond. These waves cannot travel faster than the speed of light, so they seem to be very slow actors on the scale of a galaxy with a 50,000 light years radius. From our human perspective, this is a *quasistatic* phenomenon.

Think of water waves in Earth's oceans. Water molecules stay where they are, but oceanic waves move about in different directions everywhere. Earth's water waves, driven by wind, are much more chaotic than the one-source waves emanating from rapidly rotating galactic back hole environments.

Quantum field theory began within the era of Planck, but it has been developed along with totally weird schemes of branes and string theory. Einstein was left befuddled on the sidelines before he died.

These so-called gravity waves generate apparent dust regions and star forming areas within, simply from their agitating areas of the continuous quantum foam within the galactic plane. So, we have (1) a primary external dark matter phenomenon with massive external clouds that shepherd the arms, and helped create the galaxy in the first place. We also have (2) a dark matter disk phenomenon in the form of waves emanating from the rotating supermassive black hole's central mass that create the "arms" in the first place.

Neither of these two force vectors sufficiently explain the spiral arms spatial distribution: To find that answer (3), we go back to the original elegant observation that large spiral galaxy bulges contain large supermassive black holes, and their host galaxies display variants of the Sa form. Spiral galaxies with smaller bulges produce Sb or Sc arms that are more open. Finally, irregular galaxies without bulges don't have arms at all. In contrast, large elliptical galaxies typically have very large supermassive black holes with everything else rolled into a giant round or elongated ball. This central push/shadow force distribution constitutes the third phenomenon at work in different spiral galaxies.

The question arises as to why spiral galaxies look like disks; and elliptical galaxies look more like fuzzy footballs, or fuzzy basketballs. It is important to realize that push/shadow gravity works all around the central black hole, not just along the galactic disk. Electromagnetic gravity waves in the disk (coming from the spinning core mass) tend to perpetuate a rotating spiral disk structure, and are primarily responsible for the appearance of central bars.

However, the central mass and its event horizon are not disk shaped. Over billions of years a spiral structure can disappear as it approaches the bulge. Eventually a remnant spiral disk can rearrange itself uniformly around the bulge's push/shadow force fields – if the central mass is sufficiently large.

In cases where very old spiral galaxies resist turning into elliptical galaxies, look to their external dark matter. Also look to the size of a galaxy's central dark mass. An Sc spiral galaxy structure, as long as it stays intact as such, is less likely to move toward an elliptical form, than is an Sa or So. How a galaxy evolves over time is not magic. The basic physics of multiverse push/shadow gravity work on all gravitational scales within all galaxies in all local universes.

Here is another way to explain the difference in gravitational effects among central black holes and their bulges:

The as-if arms are engaged in a dance between push/shadow forces "pulling" outward, and push/shadow forces "pulling" inward. I have placed quotes around the word "pulling," because there are no pulling tractor beams or inward-sloping membrane indentations, just net differences in experienced multiverse pressure flows.

From the perspective of an Sb or Sc arm, looking inward toward the central bulge, you would "see" a moderately large bulge, and "see" a fairly small central event horizon. This is the MW perspective, where our central black hole hosts a "small" supermassive core of some three million solar masses. In our case we would be looking in from some 30 thousand light years out.

From the perspective of something like the Sombrero galaxy, with about a billion solar masses at the core, given a residence proportionately distant from the central black mass, as in the first example above, you would “see” something quite different: a vastly larger bulge. In fact, you would be inside the bulge even far away from the true center.

The black hole mass would still be tiny, although not a singularity. As far as totally blocking incoming multiverse particles, the event horizon functions as a “virtual black mass.” In other words, not just the actual mass, but also the event horizon itself fully blocks incoming corpuscles. There are, of course, many corpuscles that just avoid the event horizon and the black hole’s “photosphere” just beyond. Non-captive energy packets sail in a more distal path around the virtual mass, resuming their original path. This is what happens in black-hole gravity lenses, and in the Allais effect[18].

Finally, there is extra stellar mass in a much larger central bulge, which amplifies the net blocking associated with the central mass. Whereas the central virtual mass event horizon totally blocks directly incoming particles, it’s only about the diameter of Uranus’ orbit in the Sombrero’s case. The much larger bulge with many billions of partially-blocking stars collectively blocks more incoming particles.

Here we have the functional difference between local strong gravity “wells” and larger weak gravity wells. From a perspective tens of thousands of light years away from the core, the net experience is the sum of strong and weak gravity shadowing - all of which helps to keep the galactic arms intact, as long as this net

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[18] http://astronomy-links.net/Allais.html

force balances the net shadowing force from dark matter outside the galaxy.

You can't put all of this truth into a cute little GR formula, but real astrophysics is what it is.