Does the Mandelbrot Set offer clues to the Cosmological Evolution of Form?

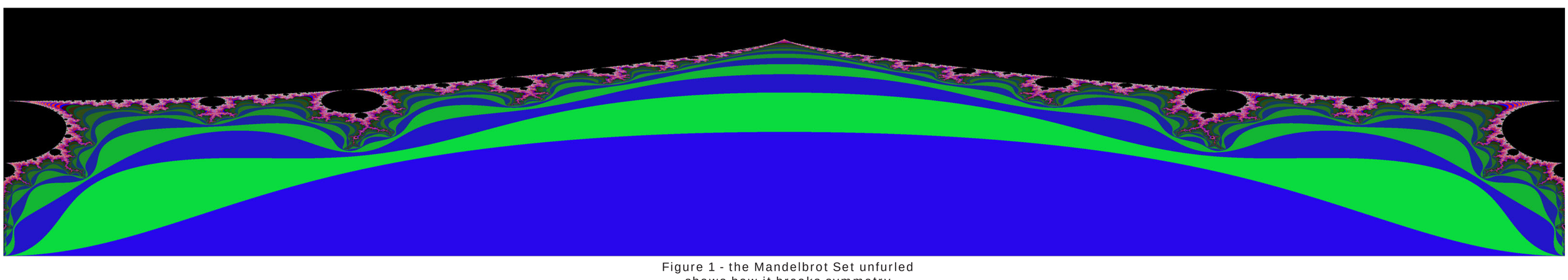

Figure 1 - the Mandelbrot Set unfurled shows how it breaks symmetry

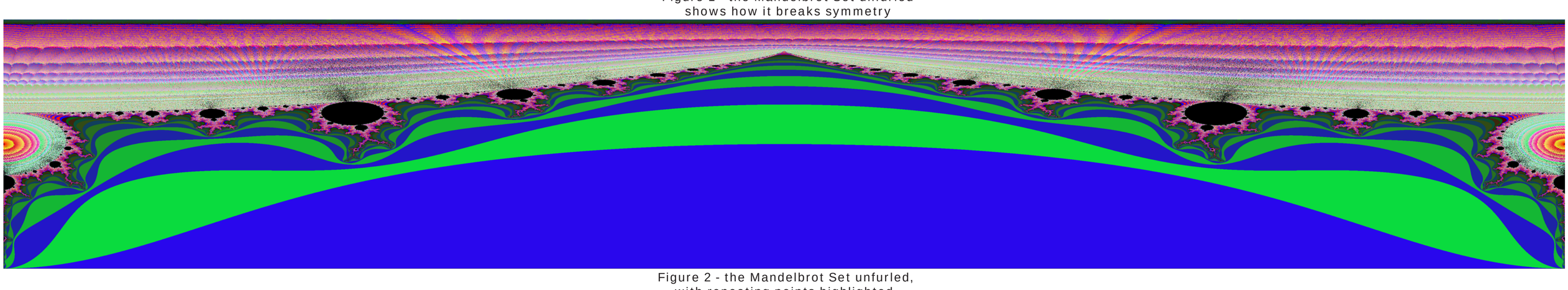

Figure 2 - the Mandelbrot Set unfurled, with repeating points highlighted.

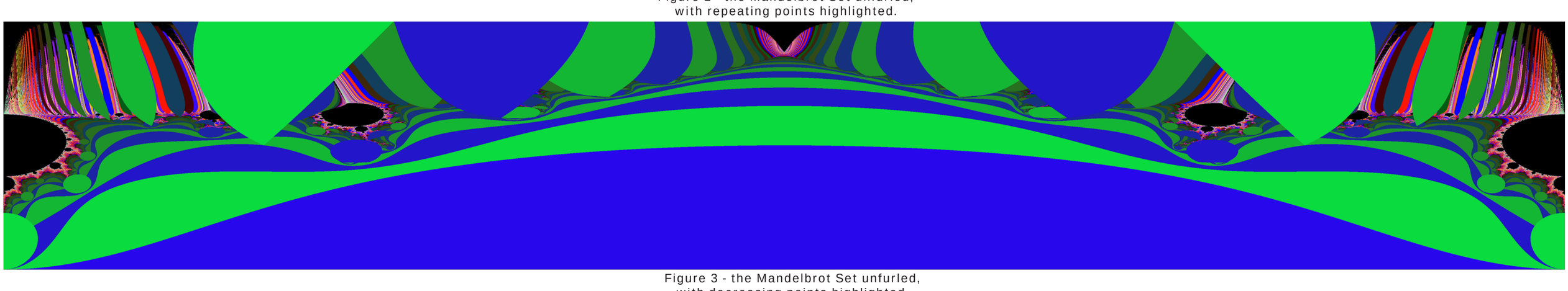

Figure 3 - the Mandelbrot Set unfurled, with decreasing points highlighted.

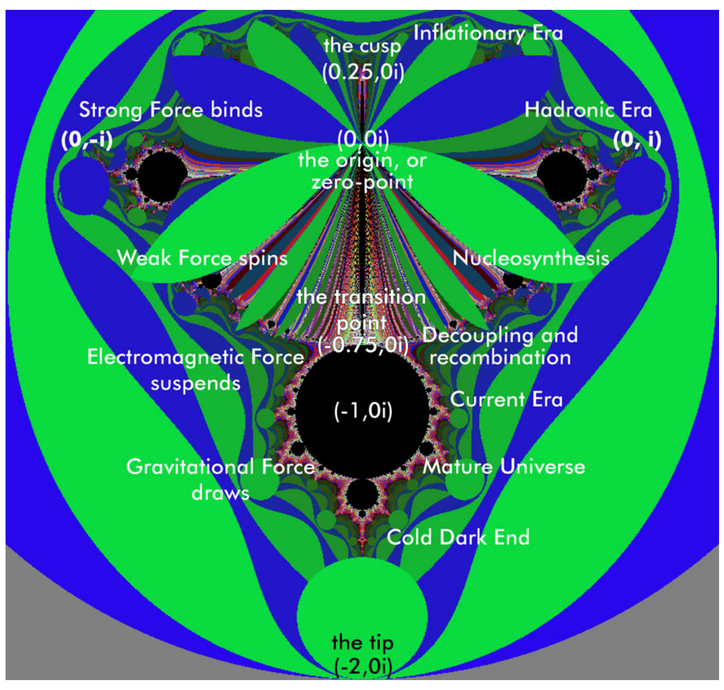

Figure 4 - Annotated Mandelbrot Butterfly summarizes aspects of the theory

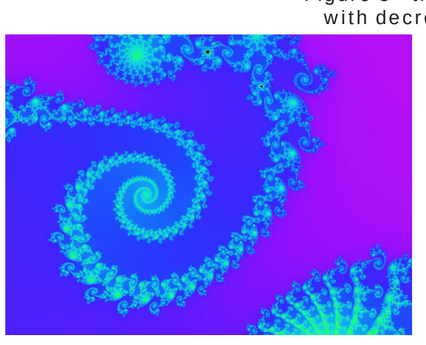

Figure 5 - Open Spiral

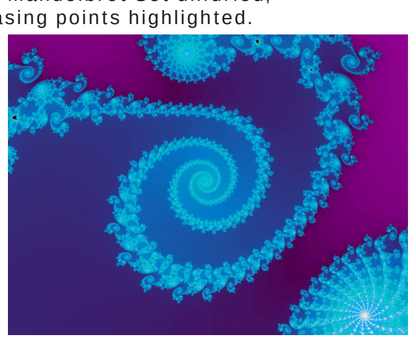

Figure 6 - Tight Spiral

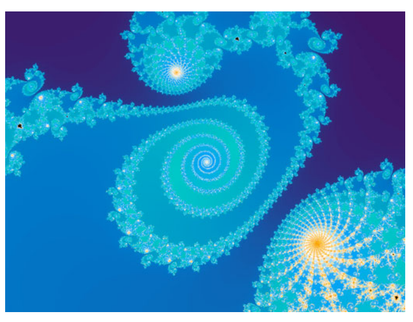

Figure 7 - Tighter Spiral

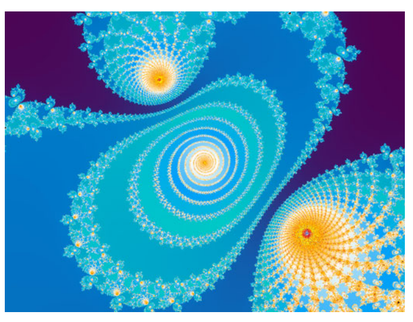

Figure 7 - Squashed Spiral

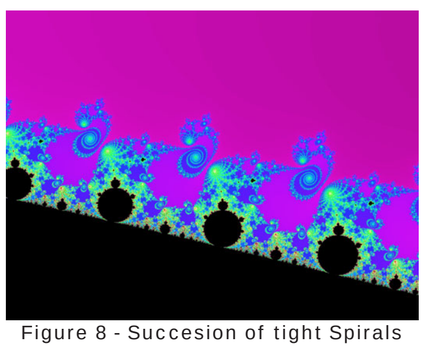

Figure 8 - Succesion of tight Spirals

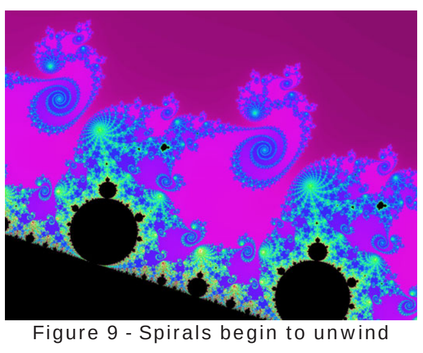

Figure 9 - Spirals begin to unwind

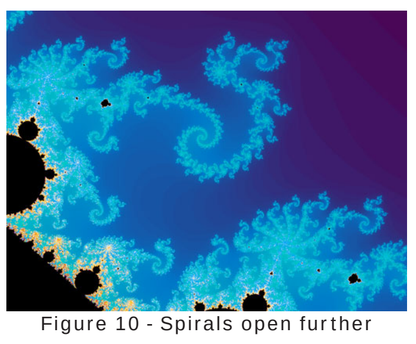

Figure 10 - Spirals open further

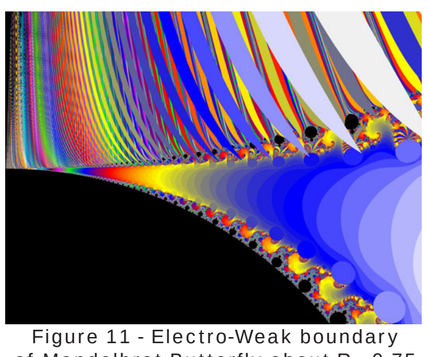

Figure 11 - Electro-Weak boundary of Mandelbrot Butterfly about R=-0.75

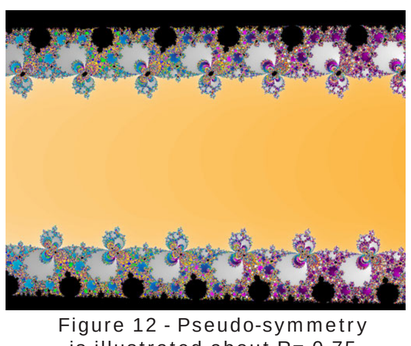

Figure 12 - Pseudo-symmetry is illustrated about R=-0.75

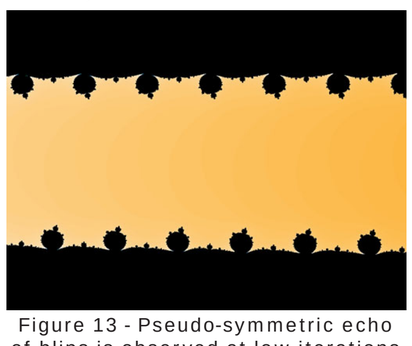

Figure 13 - Pseudo-symmetric echo of blips is observed at low iterations

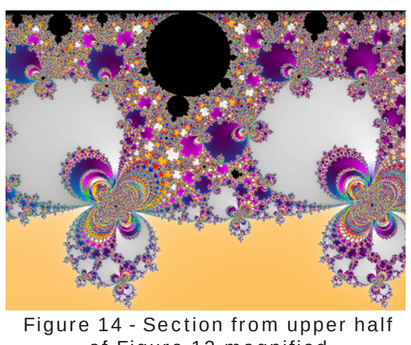

Figure 14 - Section from upper half of Figure 12 magnified

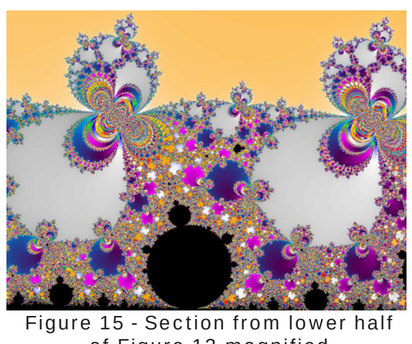

Figure 15 - Section from lower half of Figure 12 magnified

Figure 16 - M81 in GALEX image seen in ultraviolet shows new stars in spiral arms

Figure 17 - Another GALEX image of this classic spiral galaxy

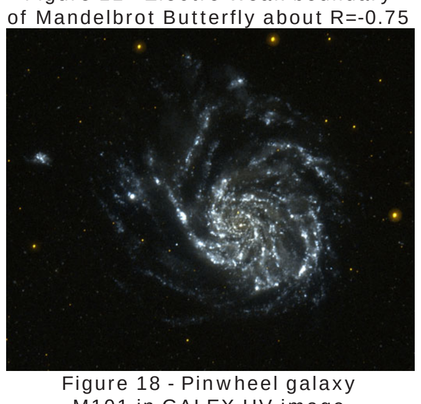

Figure 18 - Pinwheel galaxy M101 in GALEX UV image

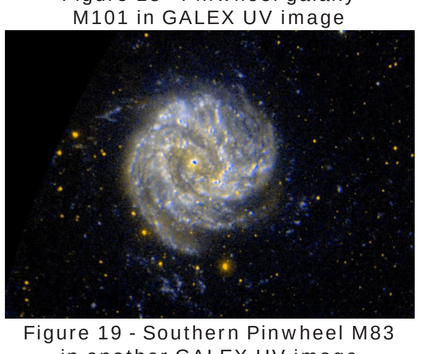

Figure 19 - Southern Pinwheel M83 in another GALEX UV image

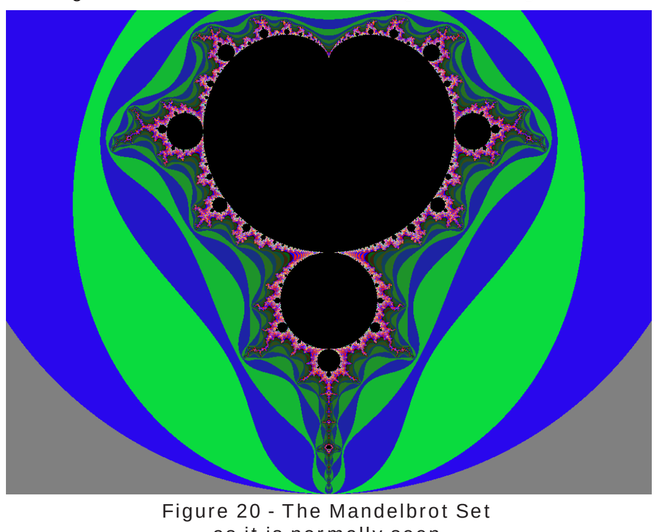

Figure 20 - The Mandelbrot Set as it is normally seen

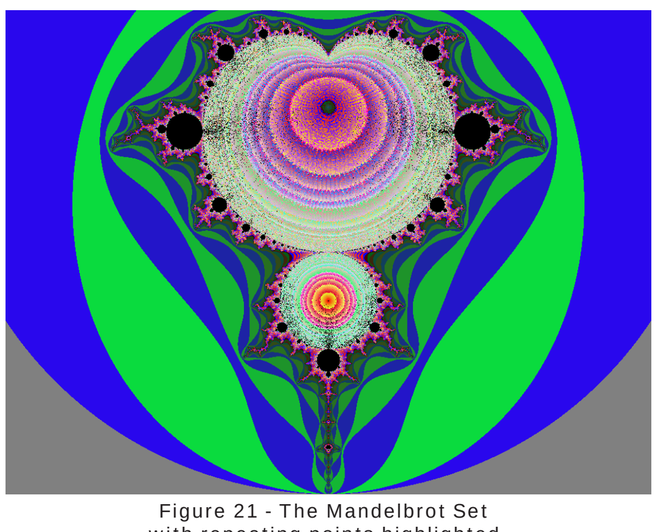

Figure 21 - The Mandelbrot Set with repeating points highlighted

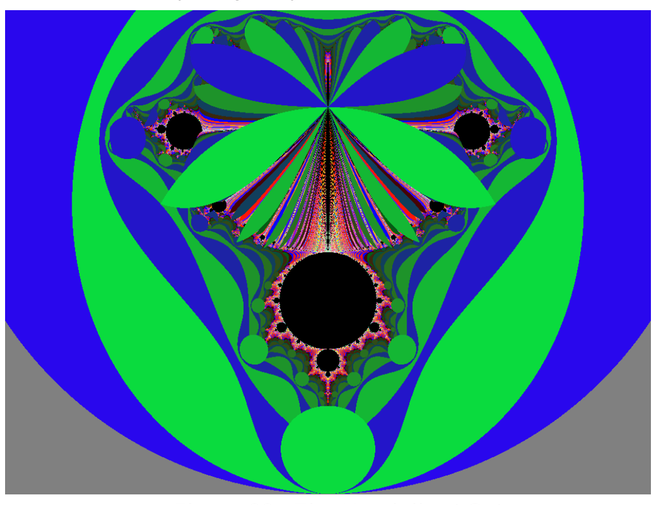

Figure 22 - The Mandelbrot Set with decreasing points highlighted

Abstract:

Like a shining orb hanging in space, the Mandelbrot Set (or M) is both an absolute entity and an unattainable ideal. M is arguably something which has always existed in theoretical space, or resides beyond time and space. Does this unique mathematical object offer us clues to the history and fate of the universe? My research indicates that it may in fact offer us a roadmap of sorts. While searching for computational shortcuts (20 years ago), I found instead a whole family of figures spawned by the process that generates M. When the first one appeared on the screen, I immediately noted a resemblance between the progression of forms on its periphery, and the cosmological epochs I had just learned about in Astrophysics. Seeing on closer inspection that what M displayed was not quite true to Big Bang theory, I put this idea on the shelf, but the revolution in observational cosmology has made my theory far more plausible.

Research by Pietronero and others put the idea of the large-scale fractal distribution of matter on a solid footing and the work of Baryshev, Teerikorpi, and others made Fractal Cosmology a respectable topic, if not yet mainstream. But in theoretical cosmology we see many appearances, and they begin early on. Fractals arise at the ultra-large scale, in Andrei Linde's self-reproducing inflationary universe theory, and in other flavors of 'new' inflation. They appear in the ultra-small realm, near the Planck scale, in Causal Dynamical Triangulation theory, in Quantum Einstein Gravity, and elsewhere. This all shows that fractals are relevant in cosmology, and helps to establish the plausibility of my theory. However, my work is substantially different.

My theory considers the Mandelbrot Set to be a primal object which can be coaxed to tell us something about the progression of forms in the universe, because as a powerful attractor, it aided in shaping the universe's unfoldment. Thus, my ideas have something in common with the recent work of Garrett Lisi with E8, and Edward Witten's work with the Monster group and Black Holes, in that they show how mathematical objects may be far more than a curiosity or diversion. It appears, instead, that fundamental properties of the real world may be quite well represented by objects (thought to be) existing only in theoretical space.

After a brief description of my theory, I will devote the remainder of my presentation to a discussion of Spiral Galaxy shapes, and the manner in which they arise and evolve in specific regions of M (between -0.75, 0i, and -1, 0.25i or -1, -0.25i). I will compare this with what we know about the shapes of the earliest galaxies, the observed varieties of spiral galaxy shapes, and the evolution of galaxy shapes over time. Finally, I will attempt to contrast what the main differences are between my Cosmology derived from the Mandelbrot Set, and the adjusted Big Bang or Lambda CDM's views and predictions.

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