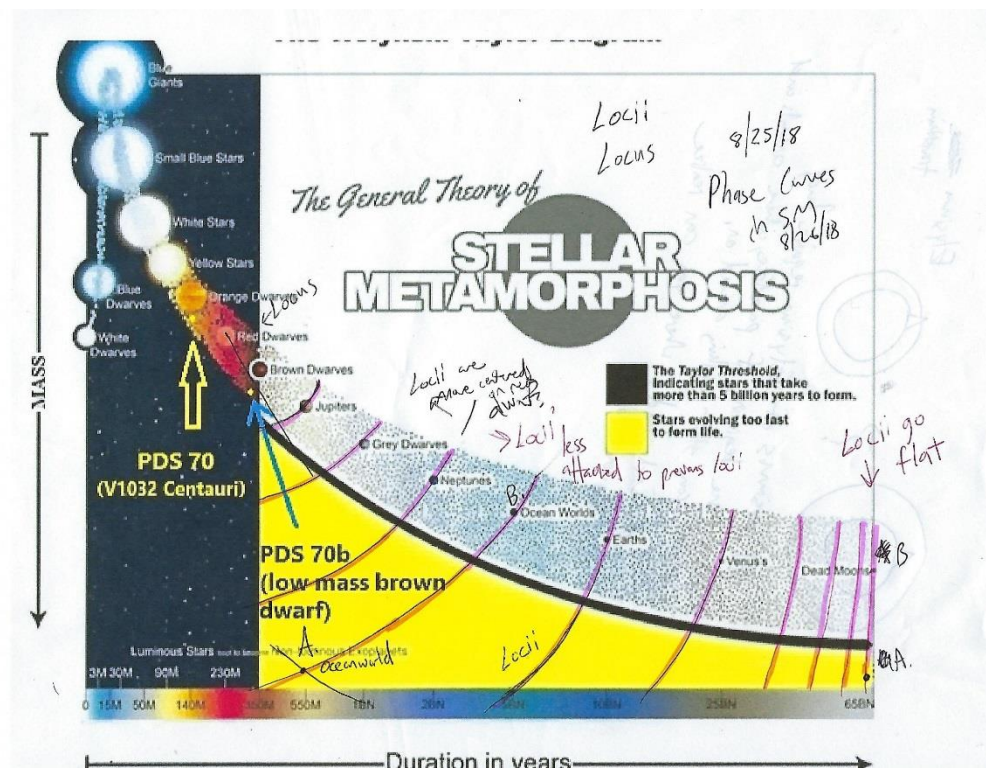


Phase Curves in Stellar Metamorphosis

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Abstract: Phase curves are presented to make more sense of the Wolynski-Taylor Diagram. They are curves on the graph which show the stage of evolution an object is in, as compared to a younger/older star. Explanation and clarification is presented so that stellar evolution (planet formation) is more easily understood. This graph is also subject to change as more data comes in, regardless this sets the precedent for thinking about astronomical matters in the 21st century.

Phase curves on the WT diagram show that stars in similar stages of evolution can be younger, older or even similar in age, it just depends on how fast they evolved.



In this diagram are some raw notes. I have highlighted the locations of the phase curves with a pink highlighter. You will notice the phase curves are quite pronounced towards the middle regions of a star's evolution and grow significantly larger towards Neptune stages of evolution, and then begin flattening out when the stars completely

die and become solid worlds that have no atmospheres, internally produced magnetic fields or life. There are many reasons why phase curves need to be introduced. Some of these reasons are outlined below.

1. The ocean world labeled A., and the ocean world labeled B. have a ~4.5 billion age difference, regardless if they can be both considered as stars in similar stages of evolution. This is because they both fit on the same phase curve.
2. Ocean world A. is very small as compared to B., regardless if they are in similar stages of evolution.
3. Ocean world A. will never form advanced life as will B., as it sits far below the Taylor Threshold for advanced life formation.
4. Ocean world A. will have a much shorter ocean world stage, as it will last maybe ~100 million years, given the conditions do not change significantly. This is opposed to B., which will remain in ocean stages for ~4 billion years, given conditions also do not change significantly.
5. The intersecting line at A. shows a continued trend downward, as this signals a much more rapid rate of mass loss due to atmospheric escape. B.'s will evolve a bit slower as they have stronger gravitation to hold onto the atmosphere. The only real way A. could hold onto its oceans is if it froze over and the water could not evaporate back into interstellar space. This being said, the Goldilocks Zone hypothesis fails to address this issue. Sure, the object could orbit were liquid water would pool on the surface, but it would also escape much more rapidly if the object's gravitational field is too weak. The Goldilocks Zone hypothesis does not account for the gravitational field of the evolving star itself.
6. The phase curve for Dead Moon A. is also the same for Dead Moon B. This tells us a lot as well. They are both about the same age, and in the same stage of evolution. This is different than the ocean worlds, as those were different ages.
7. Dead Moon A. is a lot smaller than B.
8. Since the phase curve flattens out, this means the stage is indefinite, (the star is dead and will break up in intergalactic space to be recycled back into the universe).
9. Phase curves have the most impact on the prediction of the star's physical and chemical properties after red dwarf stages of evolution, where their rate of evolution can be slowed down/sped up by orbiting a hotter host or becoming solitary.

10. Most interesting though, is that water worlds could be out there without life on them. Though their window for hosting life, given it is pooled on the surface is much smaller than water worlds that sit above the Taylor Threshold, as outlined in #4.

11. The rate at which the smallest water worlds evolve given they orbit in the Goldilocks Zone is up for revision, as it might be much, much faster than 100 million years. This means that even if we do find water in the atmospheres of these objects and they are in the Gold zone, the water is probably evaporating away quickly and it does not host life.

12. Again, the stars move to the right and down on the diagram after blue giant stages, due to conservation of mass, which is the law that states that when mass is removed, the object becomes less massive. The stars do not move down or up a phase curve.

13. Lastly the older a star gets, the more it can be pushed around by hotter, younger stars, but the phase curves themselves don't change, the stars that evolve on the diagram do.

14. I kept PDS 70 and PDS 70b for this diagram to show that establishment dogma has found two younger stars, not a birthing "solar system". Solar systems are not something to be born, they are groups of independent objects that orbit each other, and are not related to each other by formation. Star systems are polymorphic, meaning many forms of stars in the same system, but all stars. Like carbon can be both diamond and graphite, but those forms are very different regardless if they are both carbon.

15. Always watch out for claims of disks making objects. The nebular hypothesis is 20th century stuff that can be ignored. ☺