Stellar Metamorphosis: Flipping the pH Scale to Apply to the Wolynski-Taylor Diagram

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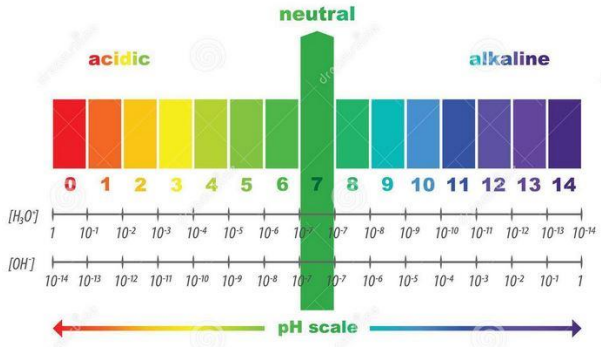
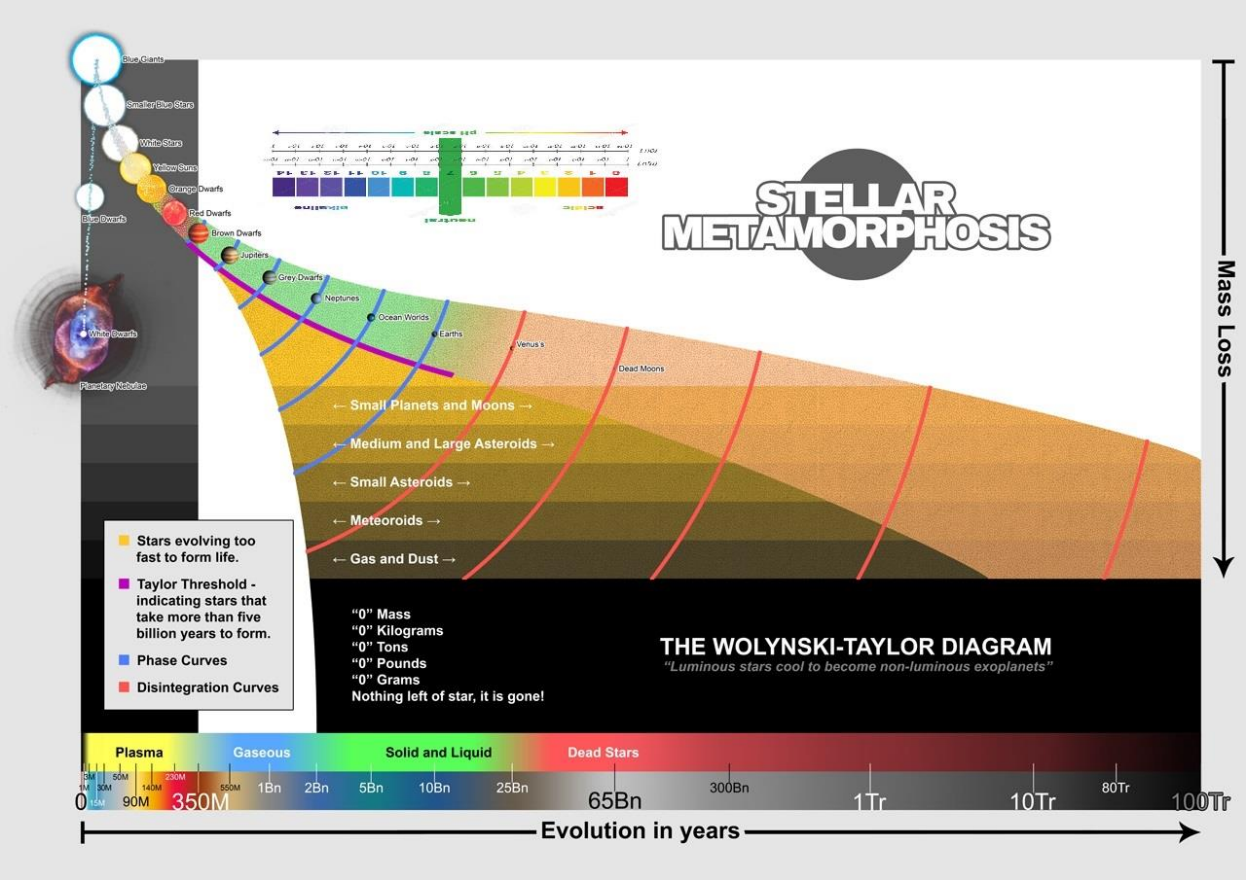
Abstract: The pH scale just needs to be spun 180 degrees to apply to the Wolynski-Taylor Diagram. The star when it is in younger gas giant stages will have a much more basic atmosphere. As the gas giant evolves and loses its atmosphere, it will become more acidic. So what this means is that to start life, you start with a more basic atmosphere, to sustain life it needs to be more towards a pH of 7. The oceans on Earth have a pH of about 8.2, so we're still good. They were much more basic though earlier in Earth's evolution.

The pH scale never starts at 14 on the left, and 0 on the right, but this is more accurate to understand how a star's atmosphere becomes more acidic as it evolves from younger stages. Below is the scale as normally read.



On the next page is the chart flipped 180, juxtaposed to the Wolynski-Taylor Diagram.



The pH of the star lowers more towards the acidic regions as it evolves. This is a main tenant of planetary evolution (stellar evolution, same thing). The flipping of the pH scale is not exact to the diagram, it is simply to show the direction the atmosphere evolves in. The acidification of the ocean will continue to occur with or without us. As well, the basic nature of the star will continue to lessen as it evolves from more gaseous states simply because the OH- radicals are forming rocks/minerals, and become trapped. This also means that ocean worlds as we find them can have their stages of evolution determined by what pH their oceans are. A younger ocean would have a higher pH (more basic), an old/dead ocean would have a lower pH (more acidic).

Another idea for how the star could have its basic nature become more acidic as it evolves is the introduction of a larger proportion of H+ ions from hotter stars. So not only are the OH- ions formed into rocks and minerals and trapped internally, but H+ ions from hotter stars' solar wind contribute to the changes. So of course it takes a village of stars to form life, but the majority of the important processes happen inside the star itself. Think of hotter hosts as guiding stars, not directly responsible for life, but definitely helping in their own way.