

Across the Cosmos September 2025: The Interactive Nature of Star Birth

Several years ago, I wrote a chapter entitled *The Interactive Cosmos* for a book that enlisted scientists and theologians to explore the concept of creative interaction as the basis for our understanding of reality.¹ A short section of that chapter touched on interactions among nascent stars. We've known for decades that most stars – including stars like our Sun – form in clusters, with “sibling” stars, rather than in isolation. We've also known that stars form along with planets. However, linking “full-grown” stars and their planetary systems to their birth environments is an ongoing and very complex problem!

Most stars form in what we call *hub-filament systems*, web-like structures where filaments that can be many light-years long feed gas into nodes known as “hubs.” Stars and star clusters can form in both filaments and hubs, although the most massive star clusters are thought to form where multiple filaments join together in a hub. A primary goal of the research my colleagues and I are conducting is to identify the properties of birthing environments that do and do not produce stars more than about 8 times as massive as our Sun.

Why is this important? Stars more than about 8 times as massive as our Sun end their “lives” in explosions known as supernovae. These explosions seed interstellar space with heavy elements generated via nucleosynthesis during the “short” (cosmically speaking) million-year lifetimes of their progenitor stars. There is a lot of evidence suggesting that our Sun formed in an environment enriched by siblings that became supernovae. Planetary systems that form in such environments may be more likely to eventually produce habitable worlds.

How we're going about linking birth environments to the stars they produce is beyond the scope of this column; however, it may be of interest that the young star-forming regions identified as “yellowballs” by citizen scientists who participated in the *Milky Way Project* are providing the sources for our studies.² We are in the final stages of publishing a paper that presents our new Mid-InfraRed Interstellar Objects and Nebulae (MIRION) catalog, which discusses the properties of thousands of these “yellowballs,” and introduces a project that enables introductory astronomy classes to contribute to our ongoing research.³ Tolkien fans may recognize the word “Mirion” as Sindarin Elvish for the

¹ Wolf-Chase, G.: The interactive cosmos. In: Albright, C., Albright, J., Turk, M. (eds.) *Interactive World, Interactive God: The Basic Reality of Creative Interaction*. Wipf and Stock, Eugene (2017). Chap. 3

² This recent paper, which resulted from my election as a 2024 American Astronomical Society Fellow, discusses some of this: <https://arxiv.org/abs/2508.14188>

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Silmarils, or jewels, that were used in crafting the Elven rings of power.⁴ If you know of any astronomy instructors who might want to learn more about how they and their students might contribute to the study of these star-forming “jewels,” please don’t hesitate to contact me!

Until next month,

Grace

Grace Wolf-Chase (she/her/hers)
Senior Scientist; Senior Education & Communication Specialist
Planetary Science Institute
gwolfchase@gmail.com
<https://www.psi.edu/staff/profile/grace-wolf-chase/>
Vice President, Center for Advanced Study in Religion and Science
([CASIRAS](#))

⁴ See <https://www.elfdict.com/w/mirion>