

Photonic Cleaning Technologies presents; Astrophotography and a Career in Astrophysics – William J. Gottemoller



The Milky Way from a friend's cottage

I am on a shoreline, a dark expanse of tall grass against a horizon of unmoving navy blue, surrounded by the eerie, black silhouettes of the forest behind me. The sky above is awash with stars, covering the sky from horizon to horizon in a blanket of bright glitter. The Milky Way, broken only at the southern horizon by the light of a nearby town, fills the sky with its characteristic structure—the stem of a rose bush, a plane of milky haze with numerous faint prickles protruding outwards in all directions. Alone at Newport State Park in Door County, Wisconsin, I sit upon a bench and meditate in near-perfect silence, my journey through the universe interrupted only by the regular crashes of the waves on the shore.

Many of us have experienced *that* moment, that profound event which either has compelled us to fall in love with something or to understand why we love it. But to astronomers, this “moment is not singular, for our many routines on even a typical

night—connecting our equipment, slewing to our object, or capturing the first sub of our sequence—are themselves *those* moments.

For me, as with most of you, every moment in astronomy—from stargazing under Wisconsin’s only Dark Sky Park to opening a dome for another night of imaging—is that profound moment. There is no “diminishing marginal utility,” no event that becomes gradually less exciting the more I do it; I find every experience—and, therefore, astronomy as a whole—as I did when, at four years old, I first engaged with it: exciting yet curiously mysterious, perplexing yet remarkably enlightening, humbling yet simultaneously inspiring.

Astrophotography, therefore, is a natural consequence of my inexorable passion for astronomy—it is, for the moment, *the* outlet for my inspiration. But even that fails to recognize how truly impactful astrophotography has become to me, for it is now a vehicle for science



The first picture I ever took of the night sky—June 22nd, 2019



The Cygnus Region in Bortle 5 skies with an Astronomik CLS filter



The Dumbbell Nebula (M27) with the Milwaukee Astronomical Society's "B-Scope"

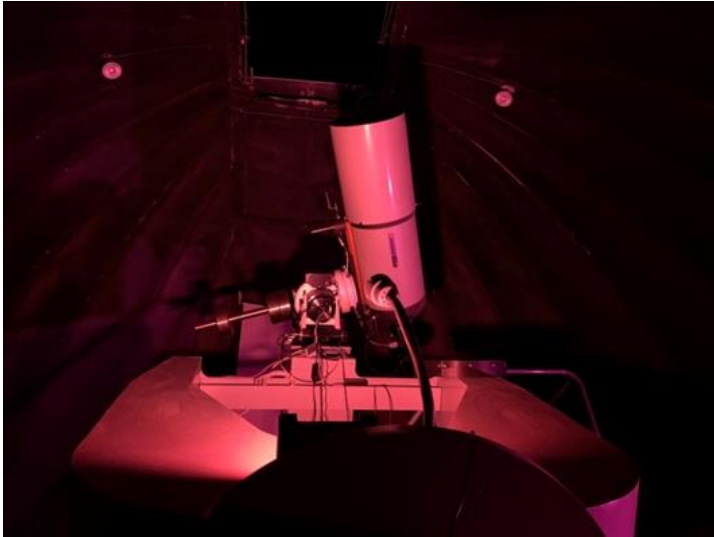
communication, a gateway to my future career, and a means for me to understand a universe that I will eventually study.

I was first introduced to astrophotography by chance, when at fourteen years old I found myself outside on a partly cloudy, summer night, drawn to my light-polluted, backyard sky, reveling in pure curiosity. Elated, I took a single thirty-second exposure, which revealed several dozen stars invisible to my naked eye (the light pollution is visible as a brilliant orange color). Despite my complete ignorance of the night sky, I found myself in a state of palpable excitement: I had rediscovered the stars.

Throughout the next year, I used the little money I had to accumulate some equipment—an iOptron SkyTracker Pro, a 10-18 millimeter lens, a light-pollution filter—and to travel to see the Milky Way, a remarkable feat considering I was, at the time, a jobless teenager. Even with that setup, however, I managed several images I found inspiring (but, by advanced measures, quite rudimentary). At a friend's cottage, for example, I captured the Milky Way—which had a brilliant, veiny structure resembling small cracks in an asphalt road—and, using free software like DeepSkyStacker, I for the first time amplified some of the Milky Way's fainter features. And at my signature spot for stargazing—a small, grassy parking lot along the Ice Age National Scenic Trail—I first captured Cygnus' many HII regions with my Astronomik CLS clip-in filter.

Yet despite the many exciting places and parts of the sky my equipment has brought me, my experiences in astrophotography are less related to the equipment *I have* (for I have very little), and more the equipment *I have access to*.

In September 2020, I joined the Milwaukee Astronomical Society (MAS), an organization my grandfather, William Collins, presided over almost half a century ago. At the time, I joined out of pure curiosity, but little did I know then that the club would not only inspire all my astrophotography pursuits thereafter, but become directly responsible for everything I've ever achieved (and, indeed, everything I may ever achieve) in astronomy.



Milwaukee Astronomical Society's "G-Scope"



The Crescent Nebula in HOO, with "G-scope"



The Cone and Christmas Tree nebulae in HOO

A couple weeks after I joined, Jeff Kraehnke, an MAS key holder, taught me how to operate two of the observatory's telescopes—"B-scope" and "F-scope." B-scope was a centenarian, a 12.5" reflector built before the MAS even existed, yet it managed to capture remarkably detailed images of the Dumbbell Nebula. F-scope, the smaller of our two computerized telescopes—a Stellarvue SVQ100 f/5.8 on an Astro-Physics 900GTO mount—also captured several spectacular subs of the Sadr Region.

Those two nights were the click. They were that "moment," that first moment which single-handedly led me to the stars and engulfed me in an ocean of the Sadr Region's hydrogen gas. Those nights burn in the center of my heart: *Everything* I achieved from then on came from those two nights. The first exposures of the Dumbbell Nebula—taken just hours after I presented a biography of Carl Sagan, my idol and spiritual guide, to my science class—are a tattoo in my mind: They are permanently engraved, as vivid and dichotomous as the Milky Way in a Bortle 1 sky.

Unsurprisingly, that feeling never left even as I continued to spend my nights at the observatory. Night after night (around eighty nights a year), I could be found in the Observatory's "Control Room," capturing objects whose light was emitted even before the neolithic revolution—or, in the deepest fields, before the dinosaurs existed—through both F-scope and "G-scope" (a Celestron EdgeHD 14" on an Astro-Physics GTO1600 mount) while sleeping under the stars or, just as often, writing under the stars. The Observatory has become my second home—and even my first during the summer. And yet, even on the hundredth time I journeyed thirty minutes from home to the field of domes in New Berlin, that first feeling has never faded: Every night feels like that first night with B-scope. I am constantly—nightly, even—caught in a euphoric trance by the night sky.

Over time, those many nights I spent imaging at the Milwaukee Astronomical Society Observatory helped burgeon my

involvement there. I joined the Observatory Committee and eventually the Open House and Publicity committees, and I helped lead a special committee on internet access at the Observatory. I also assisted in forming, passing, and implementing major proposals on new imaging trains for our two astrophotography rigs, installing internet throughout the Observatory, and replacing the mount on F-scope with an Astro-Physics Mach 1 GTO. I even became the youngest board member in club history, serving a three-year term that will end in 2025.

As I became more involved with the MAS, so did I with astronomy as a whole. With suggestions from over a dozen MAS members, I founded an astronomy club at my high school (MFHS), which after a rocky start became one of the largest clubs in my school. A couple months later, with the encouragement of the current MAS President, I requested to and, at age sixteen, received keys to the observatory, becoming the youngest “key holder” in club history. I was also introduced to Slooh—a remote astronomy and astrophotography platform with telescopes in the Canary Islands and southern Chile—by an MAS member and Slooh ambassador, whose student memberships, per a grant we won, are now free to all MFHS Astronomy Club members. Eventually, with the help of that same MAS member, I even became a Slooh ambassador myself.

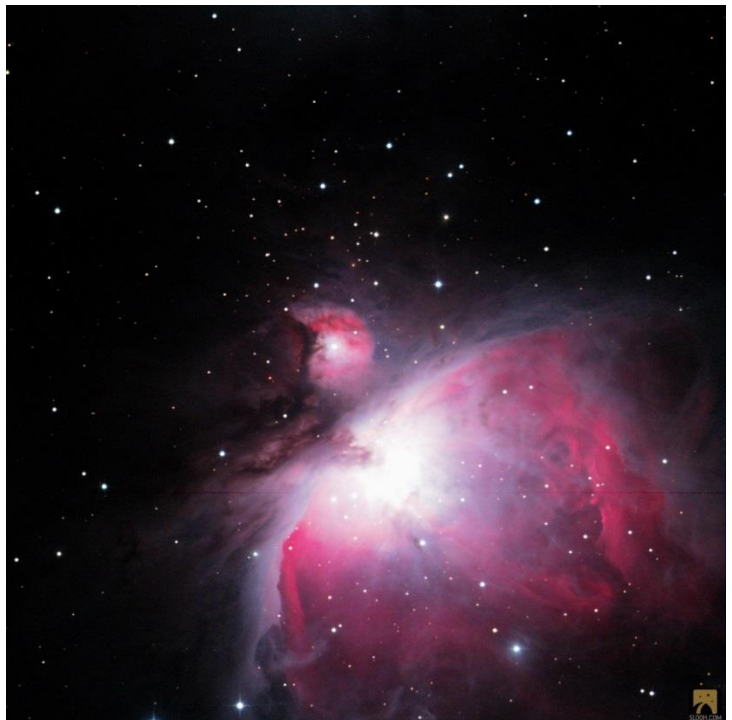
My astronomy activities culminated when the MAS nominated me for the Astronomical League’s Horkheimer/Smith Service and Horkheimer/Parker Imaging awards—the League’s highest award for service and its highest astrophotography award for a male astrophotographer, respectively. To my surprise, I won both awards, becoming the first person in Astronomical League history to sweep the major Horkheimer awards in one year. My dad and I were flown to New Mexico on an expenses-paid trip—where through the clouds the Milky Way reflected off our rental car—to spend seven days in astronomical heaven, meeting some of the most inspiring people in the world



12 hours of the Eagle Nebula in SHO, from “G-scope”



Double Cluster in Perseus, taken from a dark site



Messier 42 shot was taken by Astroclub Vice President Caitlyn Grant



Menomonee Falls High School (MFHS)
Astronomy Club members at Yerkes Observatory



Me (pictured left) alongside the Astronomical League's Vice President, Chuck Allen, during the ALCON awards dinner

Seth Shostak, Harrison Schmitt, Scott Roberts, and *many* others—and traveling to the institution I hope to, one day, work for (the NRAO's Array Operations Center in Socorro).

The MAS and astrophotography are wholly responsible for who I am today; they have opened the door to my present life, a life dominated by astronomy, leading me through a constant loop of inspiring events and exciting achievements. I am compelled to wonder what may have happened if I never joined MAS, or if I never went outside with my camera on that first partly cloudy, summer night: Would I be where I am—or even *who* I am—today?

Early in the morning, I am exhausted, my tiring yet inspiring journey through the universe compelling me to lie on the bench, eyes half-closed, alone, a small soul occupying a lonely island under a starlit night sky. I watch, with little thought, the barely perceptible waves, the break of the horizon with the sky, the stars Betelgeuse and Bellatrix rising through the fog. As the sky grows gradually brighter with the approaching sunrise, I gather the energy to pack up my telescopes and walk to my car. My night is over.

But the end of the night means the beginning of the day: The beautiful night of my upbringing in astronomy may be coming to a close, but an equally inspiring transition from night to day—from amateur astronomy to professional astrophysics—is approaching. In the words of Carl Sagan, “Somewhere something incredible is waiting to be known.” In the end, amateur astrophotography has compelled me to join the search for that “something.”

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