Chapter 15 - Astronomy
Afterword: "Why a book?"

I can't go out paradin', so I wrote a bloomin' bewk.

From the sidewalk to the stars

I just noticed something ; that my story begins and ends with the sidewalk! serving as the platform that leads to seeing the larger universe with eyes open — from the ground over and up. That's a ***physical*** aspect of discovery, with ***science knowledge*** providing a mental crossroads, if you will.

So far, I've written these chapters about my memories of discovering and experiencing astronomy in my own way as an amateur — that is, as someone genuinely interested, just er... not educated very formally. Fairly uninterested in going through the discipline to learn about mathematical equations enough to go into the profession. A shame on one hand because I'd rather understand it as an efficient language for understanding scientific knowledge. It is truly incredible how much cosmic understanding is formulated by specific arrangements of a relatively few mathematical symbols! One just needs to study diligently in order to understand how they work. Yet it's not entirely necessary for a basic, awestruck appreciation of the cosmos. On that level, there are many who claim incompetence with math — myself included, but use this as a fearful excuse to avoid studying the physics of astronomy. I was a math flunky throughout grade school, but I once learned trigonometry in order to create accurately functioning giant analematic sundials. I simply needed a productive application for the mathematics to be of any interest!. However as the saying goes, "use it or lose

it", and soon after those sundials were finished, my knowledge of trigonometry flew out of my comprehension like dust in the wind. Sine and cotangents? Poof. Gone. Yet I know that I could relearn it again if I applied myself.

My strength has been more about recalling events and in their details and chronological placement. Others have recognized this quality of mine, often being told, "you have the best memory!"
Is it selective? At any rate I love it, and memories and memory impressions are what fuels my writing.
I'm a fan of Marcel Proust, who wrote Remembrance of Things Past, (Ala Recherche du Temps Perdu). I am no way a refined artist with words that he was, but I appreciate his recall of memories and the importance of their associated impressions, and I recognize that I have my own and always have.

Information inspiration

I read more science literature than any other genre, deriving more satisfaction from the factual and theoretical — if critically written and by an informed and eloquent expert. My fav's have been books by Richard Feynman, Stephen Hawking, Janna Levin, Lawrence Krauss, Timothy Ferris, Neil de Grasse Tyson, and Richard Dawkins. Authors that connect me with questions about the cosmos that I've had the fortune to observe, raising curiosity about what is driving it.
Between reading science books and attending SFAA and CAS presentations, a greater understanding is formed. I can't do any summary justice here, and stress enough about how valuable it is to feed the mind with such relevant knowledge and questioning in regards to everything astronomical.
For example, take Janna Levin's books on gravitational waves

and black holes, SFAA lectures on spectrography measurements of gases within star systems, QED lectures by Feynman found online, Hawking's explanations about expansion of the universe, Dawkins explanations on the evolution of the eye - then look through a telescope at a nebula or galaxy...Then read Lawrence Krauss on the weirdness of quantum mechanics and how something comes from nothing, then read the news about the discovery of the latest exoplanets, and vivid images of Pluto and,... you get the picture. It's inexhaustible! I have less time and interest in fiction, because factual knowledge is so much more compelling! And that's just skimming the surface, not interested in being a knowitall. Simply curious.

Daily thought exercises

Bringing it down to astronomical basics helps me to grasp some perspective on the deeper physics. As a few favorite examples, I'll choose distance ; how much time does sunlight take to reach us? Current standards have established it to be around 8 minutes. How so? it's the distance light takes to travel that far through commensurate space and time — or space-time. The sunlight I'm feeling is from the past, in fact it turns out that everything we see is projected from the past ; the distant hill = nanoseconds away. The coffee mug in my hand = micro nanoseconds old as it's reflection reaches my retina. And the physics lessons grow from there when realizing how the Sun's light is made = gravity> electromagnetism> nuclear energy / But what is the light itself? Electrons emitting and absorbing photons in bizarre quantum entanglements — this takes [me] repeatedly re-reading about quantum electrodynamics to even begin to grok the phenomena.
Feynman famously said, "if you can't explain something in simple terms, then you don't understand it".

So I failed here. At best, all I can justifiably claim is that I have a ***developing*** understanding. I consider this small portion to be valuable — especially when more questions than answers arise! The curiosity fuels the hungry mind to journey further. I consider this to be a pleasure, almost hedonistically so. . And then when at the telescope, I can almost imagine the space-time ratio of moonlight, then Jupiter and Saturn , . . . but it becomes a real challenge to sense the space-time of something light years away!

I then rely on Dobson's words about how its distance and time both meet at Zero . . . we see it in the amount of space equal to the amount of time! Same with anything we see ; light nanoseconds, light seconds, light minutes, light Hours , to light years! (I'm not sure I've seen anything with a distance of light weeks or months, and I doubt it since the nearest star is around 4 light years away.)

Thanks to professional astrophysicists, and having access to their intel, much of current day physics can be deciphered more readily than ever. This was perhaps not always the case in the culture. Turning to this poem:

When I heard the learn'd astronomer,
When the proofs, the figures, were ranged in columns before me,
When I was shown the charts and diagrams, to add, divide, and measure them,
When I sitting heard the astronomer where he lectured with much applause in the lecture-room,
How soon unaccountable I became tired and sick,
Till rising and gliding out I wander'd off by myself,
In the mystical moist night-air, and from time to time,
Look'd up in perfect silence at the stars.

- Walt Whitman - 1819-1892

It's a dated commentary on pompous astronomers of yore, yet what I like about that poem is how it reminds us of the naturally refreshed feeling we get from the night sky, which gives the original motivation in the first place!
Meanwhile it's the learned astronomers who provide the valuable information that paves much of the way. How would eclipses be predicted? Or cosmic distances known? Theories and discoveries about the Hubble deep field? (the list intensifies)

Powers of Ten

The famous Eames short film helped establish a good sense of scale and distance for me at an early age. There is nothing like a good scale model to gather perspective on big distances!
Try finding graphs that depict galaxy groups with their relative proximities!

Sunset or Earthturn?

Like contemplation of distances, there's becoming extra aware of the revolving planet that we're on. It is one thing to have the common knowledge of the revolving Earth every 24 hours, but I discovered that I really need to use the imagination during sundown to realize this. Imagine as you face the sinking sun to the west that the Earth is actually slowly moving in the opposite direction behind you. Then, add in your latitude ; if near the equator, the Earth turns at an angle relative to the sun, which is 23.5 degrees at the polar axis. So I imagine a rotation line stretched from slightly northwest in front of me to slightly southwest behind me. This serves as an approximation of the Earth's rotating direction when facing west.
While I thought I had a decent astronomical grasp of this

motion, what really helped me grok this was seeing a video clip online of an equatorial mounted camera that was tracking a point central in the Milky Way. Wow! The world turns!
(the sky darkens fast... At my bay area latitude, much slower.)

"where does outer space end? It's sorta hard to imagine " - Flaming Lips

Those every day observations are a form of entertaining mind games, that help me gain better ideas about how light, time and motion work.
I risk repeating myself when writing, and I mentioned already that during a total solar eclipse that it seemed as if I was in a room the size of the universe and the light switch was turned off. This is how it felt in general when out in the dark with the telescope — just the light was faded instead of abruptly shut off! (still faded for an eclipse, just more abrupt at totality)
My point is about the intimate sense of being in a room — a very very spacious room. With stuff that I can see within this universe sized room, of greatly variable distances, but I can't see walls; the expansion prevents it. Is there a wall or end? The observational border 4 billion or so light years out? Expansion happening from everywhere? Fascinating questions! How much more do I know since becoming a hardcore observer of deep sky phenomena?
It depends on how much science I study. Looking at stars is a starting point.
You don't have to be an arborist or biologist to appreciate a tree. But galaxies are not so immediate, even our own, at such a mind bogglingly vast scale and distance across, that it requires some absorption of knowledge and deep pause...
I highly recommend it.

Valuable visions

It's a wonderful quality to remember what a specific globular cluster like M13 looks like. And all of those distinctive nebulas such as M17 and more! If not for all of those spectacular nights seeing in the dark with high quality telescopes, I'd be so less rich in this regard.

“At the mercy of a busy road, We can watch the universe explode” - McCartney

Regrets?
Not many, but I wish to have somehow done Sidewalk Astronomy in Cambridge England, where Isaac Newton, inventor of the reflector telescope once held the Lucasian chair of mathematics, along with Stephen Hawking later on, at Cambridge university. I imagine some of the foot traffic there to have interesting students with a thing or two to say. (plus I'd love to punt the river Cam to Grantchester Meadows and back.)

Origins

When asked of John Dobson "how did you become interested in Astronomy?", his characteristic response was "I was born. What the hell is your problem?"
(wisecracking with a sly half smile)

What would I add if asking myself the same question?
Maybe something kind of like:
"I got on the sidewalk... "

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A few acknowledgements

Losses over the past few years

Tragically, brother Brian died in July of 2017. Believed to be from complications from transplant drugs ; something backfired. A huge loss, and as mentioned, much of my life path has been affected by him getting me to the bay area when I was at the impressionable age of 20.
So many countless times shared. The lungs transplanted in 2014 gave him three decent years.
So missed, beyond words.

Carrie Galbraith [aka Ethyl Ketone]
A great connecting influence, gone too young in January 2018. Widely missed. We shared several kinds of good times, from art college to Cacophony, to telescope nights at Lake Sonoma. A brilliant artist, teacher and cultured mind.

Louis Brill
Writer, artist of light, collaborator, and encouraging to stay with your projects. He went in September 2018. Writing inspired until the end. We went back to Cacophony / early Burning Man, then he got me involved with his light projection based artwork. We miss Louie Lights.

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I can't separate the role that Alisa Lowden played in the construction of both of my handmade telescopes. She was with me for many steps during their making, cheering me on along the way. She treated me to Dobson's class for a birthday

present, and she represents those peak years of my life. She really enjoyed the benefits of the telescope views — in our backyard and under darker skies — emphasis on our Yosemite trips!

The San Francisco Amateur Astronomers [SFAA], and all involved and most are mentioned throughout a few chapters. Apologies for any names forgotten. My horizons were advantageously expanded by this resourceful group! Thanks to the star parties and lectures — well organized by impressive individuals! We had wonderful times!

And again, honorable mention for John Dobson!

Books

I've listed some of my favorite science writers, now here is a short list of influential books.

QED : The Strange Theory of Light and Matter
by Richard Feynman
[read more than once. Visualize the construction of light via Feynman diagrams!]

Seeing in the Dark
by Timothy Ferris
[good perspectives on amateur observational Astronomy]

The Moon is New
by John Dobson
[JD expresses his cosmological ideas through a fictional narrative]

Black Hole Survival Guide
by Janna Levin
[get this! It's a small volume, digestible, and irresistible]

The Greatest Story Ever Told – So Far
by Lawrence Krauss
[brilliant survey on the development of modern physics. I also recommend his new book "The Physics of Climate Change"]

Unweaving The Rainbow
by Richard Dawkins
[scientific wonder personified! Actually I love all of his books!]

There's more for certain, and thanks to that — and for everyone mentioned and unmentioned in this book who was there. From good friends, acquaintances, to the general public. Thanks for being there.

Typed with my eyes, using a Tobii Dynavox, thanks to Emily at Kaiser in Marin county.

Dean Gustafson, June 2021