HORIZON
Newsletter of the Wilderness Center Astronomy Club
Winter Solstice, 2002/2003

At Prime Focus
WCAC – Twenty Years and Counting

by Dave Gill

In the early days of the WCAC when I held both the positions of "President for Life" and "Editor for Even Longer", I would use the pages of HORIZON to prod and cajole the members into seeing things my way. I had a vision for the Club, and had a hard time accepting that others saw things other ways. I've mellowed — some. I've offered the "Bully Pulpit" of the front page of HORIZON to all successive Presidents. Most have elected not to take advantage of the offer. On this occasion of our twentieth "birthday", I've decided to take advantage of my position as "Senior Statesman" of the Club to seize the front page once again to plead my case. I will add that I did not seize this without the blessing of the current regime – thanks, Bill.

I was recently asked to give a program at Hidden Hollow, a noted regional star party held biennially near Mansfield. Whether they were hard up for cheap speakers or truly had an interest in our doings can be debated, but it gave me the opportunity to take a "50,000 foot" view at the WCAC. It was a perspective that has been hard for me to maintain. So this ended up being a unique opportunity to see us as an outsider might see us. And Robin and I walked away pretty proud of our accomplishments.

I plan on showing the Club my Hidden Hollow PowerPoint program at the January meeting, but at the risk of giving away the plot, we have:

- Established a successful club which appeals to a variety of interests
- Created an atmosphere where folks can express their interests safely whether it be in the pages of HORIZON, in the planetarium or at meeting programs
- Established a degree of public credibility in TWC's community and in the community at large through our consistent performance
- Established a successful educational presence through our star watches and offerings through TWC's outreach program
- Demonstrated that TWC's mission to Wilderness extended to the area beyond the Earth's bios-

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Inside Horizon

And More!

phere and that an astronomical observatory fit within that mission

- Demonstrated that we could justify that building investment

The Astronomy Education Building is truly the symbol that sums up our first twenty years. But it is also the large looming symbol that characterizes our future.

In a way, despite all the struggles we went through getting to this point, the AEB is just a beginning. Although the quote is attributed variously to Benjamin Franklin (regarding the hot air balloon) and others, the question, "What use is a new born baby?" springs to mind. Just like a baby, the AEB has been through a struggle to be born. But it is filled with a vast potential. The metaphor is incomplete. A baby has a life of its own – even without good parenting it has the potential for greatness. The AEB does not have a life of its own. It is totally dependent on us. It is a tool that we have at our disposal. Or maybe a workshop of tools. Whether we turn this workshop into Dave Gill's wood butcher nightmare or into Norm Abram's "New Yankee Workshop" is up to us. But it is largely up to us how we choose to equip the workshop and what kind of projects come out of it.

It is worth a brief digression here. We need to be clear here on the roles of TWC and the WCAC. These are often a source of confusion – even to those who have been around for a while. The WCAC is a special interest club for members of TWC. We do not exist outside of the universe of TWC. Many folks join us without a separate knowledge of or interest in TWC. But that is part of the beauty of our symbiotic relationship. The strange brew of special interest clubs brings a diverse cast of characters into the "melting pot" of TWC – and just like the famous American "melting pot", the organization is stronger for this diversity in members.

The WCAC has chosen an active role beyond being a social club for astronomy enthusiasts. The founders and leaders have shared a vision of astronomy education – that the idea of the night sky as wilderness fits within TWC's mission. We have piloted the Club in the direction of educational projects within TWC's community. We convinced TWC's staff and board that a "brick and mortar" investment in astronomy education was worthwhile and would be supported. We do not have literal ownership of the AEB, the planetarium or telescopes. We do have a moral ownership, however. Our role is one of stewardship (the Merriam-Webster online dictionary defines stewardship as "the conducting, supervising, or managing of something; especially: the careful and responsible management of something entrusted to one's care"), We have committed to the stewardship of both the hardware – the telescopes, planetarium instrument, and other instruments and accessories, and the software – the programming for the building. The two are intertwined – we need the hardware to do the programming, and we have to have programming to justify the investment in hardware.

This would all be much easier if we had a working Keller Telescope. But despite the effort and investment made so far, it is not working to our expectations. There are thermal problems with the optics, mechanical issues with the tube structure, and problems with the drive system. The drive has received most of the attention, and will be the most expensive to fix. Our original intent

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was to do this project ourselves, but now, two and a half years after "first light" we seem little closer to solving it. And there has been little done recently. So we solicited outside quotes. The quote of choice is quite high – around $45,000. Some have rightly questioned spending this kind of money on the telescope when a comparable sized LX-200 could be had off-the-shelf for much less. But there are a number of considerations including the quality of the finished product. But being part of TWC, we have to consider the "big picture" and, even if there were strong technical reasons, we would have to look at the public relations problems created by dumping a donated instrument like the Keller. It could make future community support more problematic.

Another problem is that the Keller telescope is just not an integral part of TWC's school programming as it stands today – and those are the key words – "as it stands today". School logistics make it very difficult to get school groups out to TWC at night – not to mention the poor odds of doing astronomy on a schedule in the unpredictable (but usually lousy) Ohio weather. The weather is also a key to dampening daytime astronomy on demand. And, regardless, we don't need the Keller for that. So, we are left in the position of trying to justify the position we consider best for TWC without a demonstrated need for it.

So our challenge is to create a need. Create a market. Create a demand. How are we going to do this? I don't know. I do know that our public star watch programs are increasingly popular. I do know that people want to use the telescope. I do know that there are untapped possibilities for using the Keller telescope – maybe not live in real time, but as a data gathering instrument for educational projects.

Well, what's all this got to do with you?

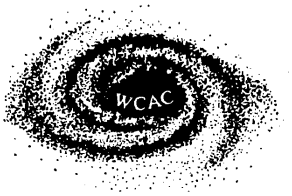
In order to create the need for this telescope and thus justify the investment, we need to do more. We need to do more programming. We need to be willing to take on new programs involving taking real time data. And for this we need more commitment from the members.

Now I don't like naming names, but you have to look at the people who have historically been doing the lion's share of the work for the Club. We all have full time jobs, families, businesses to run, part time jobs, etc. Some already have significant commitments to the WCAC. We need to broaden this base of volunteers. A good example has been the planetarium. Dave Ross has qualified over a dozen people to run the equipment. He has offered many times to work with anyone who wants to become comfortable on the console and in giving programs. We have tried to make the environment for those giving programs as non-threatening as possible. But Dave cannot get volunteers beyond a handful to give programs. Sure there is a learning curve – but it isn't hard. Similarly we have a need for more folks to come down to TWC for public nights and for special events.

In short, we need to get more people willing to commit to DO for the WCAC, not just show up at meetings. Without that commitment to broaden our base of volunteers, those in the leadership are reluctant to commit to the work needed to create the need to justify the Keller investment. That is work on top of what we do today.

Again, we look at our role as that of stewardship of a great community resource. The AEB is special – combining the telescopes and the planetarium in an educational facility in the naturalist tradition of education. We need to protect and grow that investment as we move forward. That requires a greater commitment from all of us. But the result will be a facility we can be proud of for generations. And you personally will benefit by stretching yourself. Ask those who have come forward and taken the risk of getting involved if they have regretted that action. I don't think you'll find many who do. Most have developed new confidence and a flock of new friends.

So, that is our challenge moving forward – to engage our membership more fully and create the need for the wonderful AEB that we have stewardship over. It is indeed a real challenge, but one I know we can meet. Can we count on your help?



WCAC News

Another year has slipped away. The sun has run another lap around the ecliptic (forgive the geocentric reference). The past year saw us beginning to offer our public events in the Observatory with a rain/shine planetarium program. Even on nights of inclement weather we usually had visitors. And on clear ones – at least when it was relatively warm – we had outstanding turnouts. We had several daytime open houses (and when we have an open house, it is REALLY open!) during TWC events. These brought many visitors as well. On the observing front, our special project was the successful observing and imaging of the minor planet 5391 Emmons, named after our own special friend, Dick Emmons.

Thanks to all of you who made these events successful. There are too many to name if I try to check off all those who participated. But a few deserve special mention for frequent and significant participation – John Waechter, Bill Castro, Dave Ross, Rick and Norma Breehl, Fred Grosse Gene Rickenbrode, and Ralph Geshwind were all fixtures at the public nights. We received significant material donations from Matt Oltersdorf, Rick & Norma Breehl, Christopher Beuhler, and Chris Emler. Dave Ross sweated quite a bit over the restoration of the Romick Fecker refractor which now rides shotgun on the Keller. Kent Rothermel and John kept the Keller in working order. Dave Ross rode herd on the planetarium, giving many shows, keeping the instrument working, pursuing his dream of an exit light solution and embracing the possibilities in the new PowerPoint capability. Many of you gave meeting programs – either long ones or short ones during our two "show and tell" events on books and equipment. Gene Rickenbrode did too many little things in the AEB to keep track of – he is our "go to" guy on maintenance issues. Chris Emler is working to get us Internet access in the AEB. Matt and Kent both did special programming. I'm sure I left some names out – I'm sorry if I missed you. It wasn't intentional.

Several of you have new telescopes – congratulations to the Breehls and to Ralph Geschwind on their new 10" LX-200's. If you hear that whirring noise over in the Massillon area, it is Ralph zipping through his variable star program faster than ever.

January marks our 20th anniversary, and we're observing it with a special birthday bash. We'll have some reflections, some food, and I'll be putting some photos from the archives showing many of us when we were younger. Please come and share the fun!

We start a relationship with the Hoover-Price Planetarium in January and February with a couple Saturn-centric starwatches at the Museum in Canton. I hope that we can continue this relationship – both organizations can benefit from the additional exposure. See pg. 12 and www.twcac.org for more details.

Short Stuff

Congratulations to Denny Hahn, (a.k.a. the bravest man in the world) on winning a telescope in a drawing at Hidden Hollow. We were saddened to hear of the death of long-time WCAC friend Ernst Mayer of Akron. He was an avid variable star observer for many years. He gave us several talks in our early years. More recently he donated a number of variable star books and charts to us. New member Jim Quinn's writing appears regularly in the pages of Invention and Technology magazine…welcome to new members, Jim Zorger, Bill & Carm Garrett, Kenneth Craddock, John Moore and Dr. Jim Cox. Get out and enjoy the great show being put on by Jupiter and Saturn… Gotta go – have a Happy New Year

– Da Editor

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The Fine Line

By Barb Vaughn

It was 2350 and I'd just arrived home from a social function.

The sky was reasonably clear with a thin cloud layer moving in quickly. The nearly full moon was glaring; Orion was teasing. I jumped out of the car, grabbed the binoculars, and off I went slipping and sliding down the driveway in my dress coat, a dress, and heels until I could turn and see Orion's belt. It was breath-taking...the sword in Orion was still crystal clear with NGC 1981, 1977, M42, and 1980 lined up (I think that those are the groupings).

As I stood there in the snow, in my "dress clothes" watching the clouds move in I thought that there truly is a fine line between sanity and insanity.

Thoughts on GO-TO Scopes

By Bill Castro

There seems to have been a lot of discussions in the magazines about GO-TO telescopes. This article addresses those discussions in magazines and is not intended towards anyone in the club. We do kid around amongst ourselves in the club about LX200 owners but we know that it is just kidding. Nobody in the club has any major issues about it. After all, we do have an LX200 in the observatory and we are implementing GO-TO with the Keller. What is interesting (and inspired this article) are the comments made a while ago in magazines. They seem really alarming. As if GO-TO will spell the doom for us all. As the owner of an LX200, German equatorial mounted refractor and a dob, here are some of my thoughts about GO-TO.

Maybe I just don't understand the question or their real concern. I pretty much started out with an 8 inch GO-TO scope. I did briefly have a 4.5 inch reflector I used to determine if I was interested in the hobby before I bought the GO-TO. Since buying the GO-TO I have added an 80mm refractor for quick observing sessions and a 13.1 inch dob (AKA Water Heater) for deep sky objects where more aperture helps.

Below is a brief list of statements I have read against GO-TO users. To each of these there seems to be a simple answer.

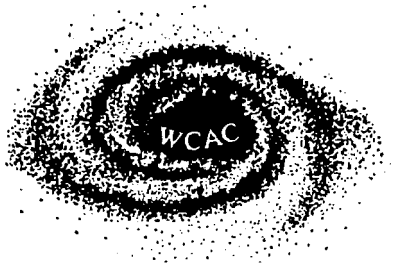
"The best part of amateur astronomy is finding the object". I doubt that most people who became interested in Astronomy did so just to star hop. If you like to star hop then by all means do so. There are many aspects to astronomy that interests many individuals. You should pursue what interests you. I do have to admit that the ability to find an object (star hop) comes in handy when you are at a public viewing night working the Keller and/or the Giust in the observatory. It is also very enjoyable the first time you hunt down and bag that elusive object. These skills can be learned and honed with a GO-TO scope as well.

"With GO-TO they don't know the night sky". I have GO-TO and I still learned the night sky. If anything, GO-TO has encouraged me to learn it more. That is why I bought the 13.1 inch "Water Heater". If you want to push your star hopping skills look for faint fuzzies in an 80mm refractor or binoculars. After that the 13.1 inch Dob is a breeze.

"Star hopping skills that you have worked so hard to develop will be lost." I have GO-TO and I still have the skills to star hop. (It isn't that hard to learn, you just have to be motivated.) Myself and other GO-TO owners have demonstrated our star hopping skills at public viewing nights using the Keller, Giust and even the 8 inch dob that are in the observatory.

"Where is the sense that you are participating in science rather than observing it". Professional astronomers have GO-TO and are doing real science. I believe it is what you do with an object after you find it that the real science comes in. There are no extra points given on your data or paper for star hoping. AAVSO does not have a box to check for GO-TO owners. I have caught myself zipping too fast from one object to the next to make my list that night. This has been with the GO-TO AND the Dob AND the refractor. Either way, I still remind myself to stop and enjoy the view. If you are doing any work with imaging or sensors then GO-TO with a solid mount is the way to go. It will speed up your work quite a bit.

"They are different" The last statement that they are different sums it up. GO-TO owners aren't really that different. The underlying theme of all those that are truly interested in astronomy is the interest in the night sky. It is this common interest that sparks the desire to learn more and gives the motivation to master the skills and technology needed to achieve these common goals of learning the night sky. Weather it is with a GO-TO, dob or equatorial mount; the end result will be the same. Those that are truly interested in the night sky will learn it, those that are not will disappear from the hobby.



Under Distant Skies Lucky Stars

by Dave Ross

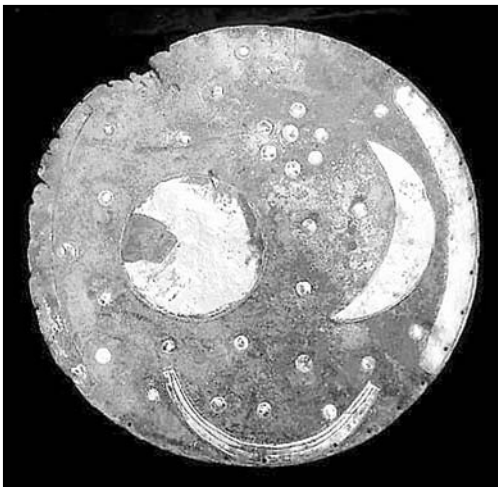
"It belongs in a museum!"
-Indiana Jones

It almost sounds like an episode from the German television version of Dragnet, but that's how one of Europe's most exciting recent archeological discoveries starts out. Rumors began circulating in Berlin and Munich back in 1999 about some mysterious "Treasure of Sangerhausen". At the right price it was available either to a museum or perhaps a private collector. Under German law, however, the whole business of trafficking in cultural antiquities is illegal and the academic community let it be known that they were simply not interested.

Privately, many worried that some important discovery might be lost forever if an unknown archaeological treasure really was about to fall into private hands. The authorities were consulted and an intricate sting operation was hatched with the help of Swiss police. The would be dealers and the alleged treasure were all taken into custody. Their visions of life in a lovely little villa on the Riviera having evaporated, these vandals have since cooperated with both criminal and archaeological investigators. What might have ended up being a tremendous loss has now been studied by some of Germany's leading scholars.

Preliminary results were exhibited at the State Museum for Prehistory in Halle last Spring under the title "Das Universum ist eine Scheibe" (The Universe- a Disc). The principle artifact that had been unearthed was indeed a treasure: a bronze disc dating from 1600 B.C. and decorated with apparently cosmological symbols. This Treasure of Sangerhausen turned out to actually be a bit of misdirection, however. The recovered artifacts were traced back to a hillside called the Mittelberg outside the town of Nebra in the region of Saxony-Anhalt. Professional excavations began there this past Summer. It has since been hailed as Germany's Stonehenge and some tout the Nebra Star Disc as the oldest known star map of its kind.

The region where the disc, along with several swords and other artifacts, had originally been looted was well known as a Bronze Age burial



ground but nothing like this unique artifact had ever been found. It's a bronze disc about 32cm in diameter and decorated with inlaid gold. There is a large gold disc, perhaps representing the Sun or a Full Moon, a crescent shaped object that seems paired with it, and some twenty nine gold dots which suggest stars. Among these there is a little cluster of six dots in a circle encompassing another, suggesting the seven sisters of the Pleiades but possibly the Praesepe cluster or even Delphinus in other interpretations. The other dots seem to have been deliberately placed so as to form no discernible pattern besides this one. Others find the number of dots significant- the twenty nine days in the lunar month.

Based on the orientation in which the disc originally rested, which was preserved well enough to recover, there are two golden arcs at either side and a shorter one at the bottom of the disc. The two arcs at the sides are believed by some to represent the 82.7 deg. of arc between the northernmost and southernmost sunrise and sunset points at Nebra in the Bronze Age. The shorter arc at the bottom may represent the Sun-boat that crossed the sky from sunrise to sunset. Others suggest that it represents a region of the Milky Way.

Not much is known about the people who appear to have occupied the site for perhaps a thousand years until around 700 B.C. Last Summer's dig at the site where the disc was found revealed a circular wall about 200 meters in diameter surrounded by a system of trenches. The swords, mentioned earlier, and other artifacts

appear similar to ones found from Greece and across the Balkans to Romania.

That some sort of astronomical interpretation should be applied to the disc found on Mittelberg hill is suggested by the observation that from that site the Sun can be seen to set at the Summer Solstice behind the tallest mountain in Germany, the fabled Brocken, some 80 km away. Other landmarks in the surrounding region are said to still have vaguely astronomical connotations to their names.

The "Treasures of Nebra" are obviously so fresh that a great deal of work remains to be done to sort out something resembling a more authoritative interpretation. But calling its most exciting find "a Bronze Age Star Disc" is a name no one seems to dispute. Exactly what it symbolized and how it may have been used as a map, or for measuring purposes, or as a calendar or in religious ceremonies... These things may never be known. (I can imagine what it might have looked like as a shaman danced before a roaring fire and flashed those golden cosmic symbols into the eyes of those celebrating in the night.) In any case, scholars are eagerly awaiting next Spring's publication of a monograph covering everything revealed to date, and an international conference has already been set for 2004 sponsored by the State Museum for Prehistory in nearby Halle.

With a smile and a wink the Star Disc almost seems glad for all the attention it's gotten after some 3600 years underground. As with the plundered tombs of ancient Egypt, or the plowed under mounds of Ohio for that matter, one wonders what may yet lie buried waiting to be discovered, and what things have been lost forever. Thank those lucky stars, all twenty nine, that in this case all's well that ends well.

(The oldest this, the earliest that... The Nebra Star Disc may indeed be an important find; but it can't hurt tourism to tell everyone that it is. The measurement of the 82.7 deg horizon arc seems a bit over precise with respect to such an ancient artifact. Would it be less impressive to state the measurement as +/- .5 deg.? In any case, the internet seems to be the best place to keep up with developments. Naturally some of the best material is in German, but you might still enjoy the pretty pictures...

The disc's home page is at:
http://www.archlsa.de/sterne/

The magazine Der Spiegel has some interesting illustrations:
http://www.spiegel.de/spiegel/0,1518,216379,00.html

A good summary in English, and apparently the source of the information in the article above, can be found at:
http://www.astro.uni-bonn.de/~dfischer/mirror/243.html

Dancing shamans, indeed! Why not flash the Sun's rays to frighten subjects into submission? Not knowing what the disc's use was may be an invitation to the imagination but this does not alter the fact of not knowing. -The Demiurge)

BIRTHDAY PARTY!!

We will celebrate the 20th anniversary of the WCAC at our January meeting.

Plan to attend this fun event!! Bring along pictures or a story to share with the group.

Friday, January 31, 2003

Mutual Events for Jupiter's Moons

Every six years, as the Earth passes through Jupiter's equatorial plane, we get to see the moons of Jupiter interacting with each other (at least in a visual sense). We see occultations and eclipses. Occultations are when a satellite moves in front of another from our vantage point. Eclipses occur when a satellite slips into the shadow of another moon. (The two are not the same – think of the sun angle!)

Below is a table of events that can be observed from our area in 2003.

Date of maximum(TT)						Event	Magn. Drop	Durat. s	Distance to planet (RP)	Right As. of planet (P)	Declination of planet (P)	Distance to Earth	Planet Az	Planet H	Sun Az	Sun H
Year	m	D	h	m	s					h m s	d ′ ″	AU	d	d	d	d
2003	1	1	6	4	24	4 OCC 1 P	0.234	305	1.0	9 18 15	+16 30 59	4.48	-55	55	-155	-71
2003	1	2	1	59	17	3 OCC 1 P	0.058	869	0.0	9 17 58	+16 32 28	4.47	-103	11	96	-43
2003	1	2	2	10	8	1 OCC 2 T	0.425	216	0.0	9 17 58	+16 32 29	4.47	-101	13	98	-45
2003	1	2	2	12	57	3 OCC 2 P	0.053	212	0.0	9 17 58	+16 32 29	4.47	-100	13	98	-45
2003	1	3	10	7	32	2 ECL 1 P	0.513	643	5.9	9 17 29	+16 34 56	4.46	60	52	-85	-30
2003	1	3	11	55	10	2 OCC 1	0.000	0	6.0	9 17 28	+16 35 4	4.46	84	33	-69	-10
2003	1	4	5	49	43	2 OCC 1 P	0.068	598	5.8	9 17 11	+16 36 29	4.45	-55	54	-166	-71
2003	1	6	6	46	10	2 ECL 3 P	0.155	1144	7.7	9 16 25	+16 40 26	4.44	-30	63	-134	-66
2003	1	6	10	15	32	2 OCC 3 P	0.212	1228	9.3	9 16 21	+16 40 43	4.43	66	49	-84	-29
2003	1	7	7	42	56	2 OCC 1 P	0.203	1755	1.3	9 15 60	+16 42 31	4.43	4	66	-114	-57
2003	1	7	9	30	8	2 ECL 1 A	0.713	1688	0.0	9 15 58	+16 42 40	4.43	54	55	-92	-37
2003	1	9	4	8	35	1 OCC 2 P	0.419	215	0.2	9 15 15	+16 46 19	4.41	-76	41	130	-64
2003	1	9	4	57	47	3 OCC 2 P	0.041	196	0.4	9 15 14	+16 46 23	4.41	-64	50	156	-70
2003	1	9	7	25	56	1 OCC 4 P	0.182	313	2.9	9 15 11	+16 46 36	4.41	-1	66	-120	-60
2003	1	9	9	28	31	3 OCC 4 P	0.315	508	2.1	9 15 9	+16 46 47	4.41	56	54	-92	-37
2003	1	10	6	25	0	2 ECL 4	0.005	0	6.4	9 14 47	+16 48 37	4.41	-32	63	-146	-68
2003	1	11	8	17	46	2 OCC 1 P	0.060	466	5.9	9 14 19	+16 50 55	4.40	32	63	-106	-51
2003	1	13	11	39	45	2 ECL 3 P	0.208	849	8.4	9 13 22	+16 55 36	4.39	89	28	-73	-13
2003	1	14	2	47	1	2 ECL 1 P	0.329	1105	5.6	9 13 5	+16 56 60	4.38	-87	30	106	-50
2003	1	14	6	5	24	2 OCC 1 P	0.027	4855	3.7	9 13 1	+16 57 18	4.38	-33	63	-160	-69
2003	1	14	8	43	57	2 ECL 1 P	0.601	1874	2.1	9 12 58	+16 57 33	4.38	49	58	-102	-46
2003	1	16	5	30	8	1 ECL 2	0.000	0	0.7	9 12 6	+17 1 46	4.37	-44	60	176	-70
2003	1	16	6	6	3	1 OCC 2 P	0.416	215	0.4	9 12 5	+17 1 49	4.37	-28	64	-160	-69
2003	1	16	7	40	36	3 OCC 2 P	0.020	156	0.7	9 12 3	+17 1 58	4.37	25	64	-118	-57
2003	1	17	10	21	40	4 OCC 1 P	0.149	436	5.3	9 11 31	+17 4 31	4.36	78	39	-85	-27
2003	1	18	0	59	19	4 OCC 1 P	0.204	836	0.9	9 11 14	+17 5 55	4.36	-101	13	87	-29
2003	1	18	3	57	46	4 ECL 1	0.006	0	3.2	9 11 10	+17 6 13	4.36	-70	46	127	-61
2003	1	18	5	1	15	4 OCC 2 P	0.161	1380	2.6	9 11 9	+17 6 19	4.36	-52	57	157	-68
2003	1	18	9	58	23	4 ECL 2 P	0.457	1269	5.5	9 11 3	+17 6 48	4.36	74	43	-89	-32
2003	1	18	10	37	3	2 OCC 1 P	0.051	383	5.9	9 11 2	+17 6 51	4.36	82	36	-83	-24
2003	1	19	1	6	55	4 OCC 3 P	0.160	546	10.5	9 10 44	+17 8 16	4.36	-100	15	88	-30
2003	1	23	7	41	31	1 ECL 2	0.010	0	0.9	9 8 36	+17 18 23	4.34	40	61	-120	-56
2003	1	23	8	2	53	1 OCC 2 P	0.423	216	0.6	9 8 35	+17 18 25	4.34	49	58	-114	-52
2003	1	23	10	22	1	3 OCC 2 P	0.000	37	1.0	9 8 32	+17 18 39	4.34	83	34	-87	-27
2003	1	29	1	57	1	2 OCC 1 P	0.034	286	5.8	9 5 36	+17 32 15	4.33	-85	33	99	-38
2003	1	30	9	53	3	1 ECL 2	0.061	0	0.9	9 4 53	+17 35 27	4.33	84	34	-93	-31
2003	1	30	9	59	21	1 OCC 2 T	0.425	217	0.8	9 4 53	+17 35 28	4.33	85	33	-92	-30
2003	1	31	0	5	55	3 OCC 1	0.000	0	5.2	9 4 34	+17 36 53	4.33	-101	14	81	-16
2003	2	3	5	10	2	4 OCC 2 T	0.294	375	3.3	9 2 51	+17 44 36	4.33	-16	66	163	-65
2003	2	3	8	39	30	4 OCC 3 P	0.092	376	1.9	9 2 46	+17 44 56	4.33	73	45	-109	-44
2003	2	3	23	40	40	2 ECL 3 A	0.320	576	9.3	9 2 27	+17 46 25	4.33	-102	13	78	-11
2003	2	5	4	6	22	2 OCC 1 P	0.020	222	5.8	9 1 49	+17 49 14	4.33	-43	61	134	-58
2003	2	10	0	54	12	1 OCC 2 T	0.425	218	1.1	8 59 14	+18 0 32	4.34	-87	32	91	-23
2003	2	10	1	10	43	1 ECL 2 P	0.278	62	0.9	8 59 13	+18 0 33	4.34	-84	35	94	-26
2003	2	11	2	34	43	2 OCC 3 A	0.479	730	9.2	8 58 40	+18 2 57	4.34	-65	51	110	-42

2003	2	11	3	21	1	2	ECL	3	A	0.346	535	9.5	8	58	39	+18	3	1	4.34	-51	58	121	-50
2003	2	12	6	14	9	2	OCC	1	P	0.007	144	5.7	8	58	4	+18	5	32	4.34	42	62	-162	-62
2003	2	17	2	51	24	1	OCC	2	P	0.403	218	1.3	8	55	36	+18	15	60	4.36	-52	58	116	-43
2003	2	17	3	22	45	1	ECL	2	P	0.493	119	0.9	8	55	36	+18	16	2	4.36	-39	62	124	-48
2003	2	18	5	35	43	2	OCC	3	A	0.479	688	9.1	8	55	4	+18	18	18	4.37	37	63	178	-61
2003	2	18	6	56	26	2	ECL	3	A	0.365	500	9.6	8	55	2	+18	18	24	4.37	65	51	-145	-56
2003	2	19	8	21	10	2	OCC	1		0.000	0	6.9	8	54	31	+18	20	33	4.38	84	35	-118	-44
2003	2	24	4	49	31	1	OCC	2	P	0.358	216	1.4	8	52	15	+18	29	53	4.41	27	65	157	-57
2003	2	24	5	35	1	1	ECL	2	P	0.706	149	0.9	8	52	14	+18	29	56	4.41	48	60	178	-59
2003	2	25	8	36	44	2	OCC	3	A	0.479	643	9.0	8	51	44	+18	31	58	4.41	91	27	-116	-40
2003	2	28	1	17	12	1	ECL	4	A	0.483	390	3.3	8	50	35	+18	36	38	4.43	-66	51	100	-24
2003	3	1	3	3	8	2	OCC	4	A	0.405	469	7.2	8	50	9	+18	38	24	4.44	-23	66	123	-42
2003	3	1	3	57	4	1	ECL	4	A	0.280	123	7.5	8	50	8	+18	38	28	4.44	9	67	139	-50
2003	3	1	6	30	2	2	ECL	4		0.335	0	8.5	8	50	5	+18	38	38	4.44	71	48	-158	-55
2003	3	2	0	36	4	2	ECL	1		0.004	0	5.1	8	49	47	+18	39	51	4.45	-74	45	94	-16
2003	3	3	6	48	47	1	OCC	2	P	0.311	213	1.6	8	49	17	+18	41	49	4.46	77	43	-150	-52
2003	3	3	7	47	31	1	ECL	2	A	0.853	163	1.0	8	49	16	+18	41	52	4.46	88	32	-131	-45
2003	3	9	2	56	2	2	ECL	1		0.020	0	4.8	8	47	13	+18	49	57	4.52	-7	68	124	-39
2003	3	9	4	10	9	4	OCC	1	P	0.004	110	4.2	8	47	12	+18	50	1	4.52	36	64	146	-49
2003	3	9	7	24	36	4	ECL	1	A	0.704	175	1.8	8	47	9	+18	50	11	4.52	88	31	-139	-46
2003	3	10	3	43	6	4	ECL	3		0.086	0	9.2	8	46	53	+18	51	14	4.53	24	66	138	-45
2003	3	10	8	49	30	1	OCC	2	P	0.270	210	1.8	8	46	49	+18	51	29	4.53	102	15	-117	-33
2003	3	16	5	14	59	2	ECL	1		0.059	0	4.6	8	45	12	+18	57	37	4.59	69	50	172	-51
2003	3	21	1	19	54	1	ECL	2	P	0.613	148	1.2	8	44	10	+19	1	24	4.65	-34	65	108	-20
2003	3	23	7	33	8	2	ECL	1	P	0.132	77	4.3	8	43	47	+19	2	45	4.68	99	19	-139	-40
2003	3	25	4	14	19	4	ECL	2	A	0.822	213	7.3	8	43	31	+19	3	41	4.70	62	54	152	-44
2003	3	25	7	39	44	1	ECL	3	P	0.122	683	1.5	8	43	30	+19	3	44	4.71	101	16	-138	-38
2003	3	28	1	58	36	1	OCC	2	P	0.208	204	2.4	8	43	12	+19	4	46	4.74	6	68	118	-25
2003	3	28	3	33	19	1	ECL	2	P	0.404	116	1.3	8	43	11	+19	4	48	4.75	53	59	141	-39
2003	4	2	3	31	52	2	ECL	3	A	0.258	262	9.5	8	42	54	+19	5	38	4.82	59	56	142	-37
2003	4	3	6	29	8	1	ECL	4		0.111	0	5.7	8	42	52	+19	5	39	4.83	96	23	-160	-42
2003	4	4	4	5	23	1	OCC	2	P	0.203	205	2.6	8	42	52	+19	5	37	4.84	70	49	152	-40
2003	4	4	5	47	1	1	ECL	2	P	0.218	49	1.5	8	42	52	+19	5	37	4.85	90	30	-174	-43
2003	4	4	5	50	47	3	ECL	4	A	0.700	378	14.4	8	42	52	+19	5	37	4.85	91	29	-173	-43
2003	4	5	0	53	7	3	ECL	1	P	0.465	134	2.2	8	42	52	+19	5	33	4.86	-15	67	109	-12
2003	4	9	2	38	20	1	ECL	3	P	0.278	276	7.4	8	43	1	+19	4	43	4.92	51	60	131	-28
2003	4	9	3	8	1	2	OCC	3	P	0.026	243	7.7	8	43	1	+19	4	42	4.92	60	55	138	-32
2003	4	9	6	52	6	2	ECL	3	P	0.190	187	9.3	8	43	2	+19	4	39	4.92	103	14	-153	-38
2003	4	10	1	15	36	2	ECL	1	P	0.429	188	3.6	8	43	5	+19	4	24	4.93	11	68	114	-15
2003	4	10	2	6	39	4	ECL	3		0.029	0	14.6	8	43	5	+19	4	23	4.93	39	64	124	-23
2003	4	11	3	31	29	4	OCC	1	P	0.150	768	0.7	8	43	11	+19	3	59	4.95	69	50	145	-34
2003	4	11	6	14	2	1	OCC	2	P	0.211	210	2.8	8	43	11	+19	3	56	4.95	99	20	-165	-40
2003	4	12	3	37	6	3	ECL	1	P	0.688	194	2.8	8	43	16	+19	3	33	4.96	71	48	146	-34
2003	4	16	5	36	52	1	ECL	3	A	0.378	279	7.0	8	43	47	+19	1	16	5.03	96	23	-177	-39
2003	4	16	6	21	31	2	OCC	3	P	0.007	155	7.4	8	43	48	+19	1	15	5.03	103	15	-163	-37
2003	4	17	3	31	35	2	ECL	1	A	0.565	201	3.3	8	43	56	+19	0	39	5.04	74	46	146	-32
2003	4	19	6	22	3	3	ECL	1	P	0.860	231	3.5	8	44	19	+18	59	4	5.08	104	12	-163	-36
2003	4	24	5	47	9	2	ECL	1	A	0.654	204	3.1	8	45	24	+18	54	31	5.15	102	15	-173	-36
2003	4	26	3	35	19	3	ECL	2	P	0.362	38	7.3	8	45	53	+18	52	29	5.18	81	39	149	-30
2003	4	29	1	37	41	1	ECL	2		0.000	0	2.5	8	46	44	+18	49	2	5.23	55	57	124	-14
2003	5	6	1	58	33	1	OCC	2	P	0.345	249	3.6	8	49	7	+18	39	12	5.34	68	50	129	-16
2003	5	7	2	41	2	2	OCC	4	A	0.406	1479	9.4	8	49	30	+18	37	35	5.36	78	41	138	-21
2003	5	13	4	15	9	1	OCC	2	P	0.409	262	3.8	8	52	2	+18	27	7	5.46	98	20	162	-29
2003	5	14	2	47	39	4	OCC	1	P	0.058	279	4.6	8	52	27	+18	25	21	5.47	84	35	141	-20
2003	5	15	4	16	59	4	OCC	1	P	0.017	505	5.9	8	52	57	+18	23	19	5.49	99	18	162	-28
2003	5	19	1	38	32	2	ECL	1	P	0.305	124	2.2	8	54	49	+18	15	30	5.55	74	45	128	-10
2003	5	26	3	52	30	2	ECL	1	P	0.157	42	2.0	8	58	34	+17	59	43	5.65	101	15	157	-24
2003	5	29	2	22	33	2	OCC	3	P	0.031	206	5.3	9	0	14	+17	52	37	5.70	88	30	137	-15
2003	6	14	2	49	46	1	OCC	2	P	0.146	252	4.8	9	10	21	+17	8	27	5.91	100	15	143	-16
2003	6	15	2	58	8	3	ECL	2	P	0.995	400	8.8	9	11	3	+17	5	23	5.93	102	12	145	-17
2003	6	24	2	11	24	3	OCC	4	P	0.146	704	13.5	9	17	24	+16	36	40	6.03	99	15	135	-11

My Fecker Follies

by Dave Ross

Years ago Barb Vaughn wrote with excitement, as she still does, about her experiences using the little reflector she proudly made in one of our Astronomy Day workshops back whenever that was. After many satisfying sessions at the eyepiece of her trusty 4" Newtonian she was so disappointed one night when nothing seemed to want to come to focus and she couldn't figure out what was wrong. I don't remember exactly who pointed it out to her, but she's remembered ever since to make sure to not put the eyepiece in upside down. Our little home brewed project allowed this possibility as an unanticipated snag for the unwary. Whatever ribbing I may have lavished on Barb at the time I hereby take it all back. It's my turn to admit to a bit of telescopic dyslexia, of a sort.

A year ago last Summer the club came into possession of yet another telescope when we purchased a 4" brass refractor from Mr. Darrell Romick. Actually, to say we purchased it is a little gratuitous. Let's say Darrell donated it and we thanked him with a gift subscription to Sky and Telescope, which was more than he asked. The scope had been in Darrell's garage for years; Dick Emmons says decades and I believe him. Darrell bought it used sometime in the 60's and had always wanted to put it on a proper mount and use it more but realized that was probably never going to happen and thought the club might get some use out of it.

Dave Gill immediately recognized it's potential as a guide scope for the Keller. But it would take some work. The heavy brass tube was badly tarnished with spots of outright corrosion showing. There was some funny handle thing sticking in the way of bringing your eye to the eyepiece. The focuser was all but frozen in place and would need to be disassembled and lubed, and it appeared to be an odd size that would need to be adapted for standard eyepieces. Ah, but at the business end... The objective was intact, albeit buried under what at some point apparently became a protective layer of undisturbed dirt and grime. And on the outside of the lens cell was stamped, "J. W. Fecker, Pittsburgh, 1944". A vintage, war-era Fecker! The Fecker company was known in its day as a maker of very fine amateur and professional instruments.

I think it was Fred Jarka who helped me prop the heavy beast up against a post outside the entrance way at the AEB and point it at the moon one night in the Fall of 2001. The only eyepiece we could use was the ancient Ramsden of unknown focal length that came with it. Even through heavy dirt the lens produced a lovely image! A diamond in the rough! All it needed was someone willing to take on another project...

As it turned out it was a much welcomed diversion last Winter after my father's death. Back in 1944 my dad had been a Tec Sargent in the 81st Tank Battalions service company. As a welder he fixed some seriously broken stuff in those days, and what ever knack I have in the workshop I no doubt owe to him. He carried back from Germany two souvenirs that not only survived the war but also my growing up: a pair of Zeiss 7x50 binoculars that he bought for $25 from a guy desperate to stay in a card game, and a small industrial microscope boosted along with assorted pieces and parts from a bombed out factory. Probably my earliest astronomical memory is trying to see something, either Sputnik, in which case I was only three or four, or some later satellite, while my parents held the binoculars. The swirly stars were pretty but I don't know if one of them really was the satellite. And I don't know how many hours I passed as a kid tinkering with that microscope and the odd assortment of parts that I now know could not have all been intended to go together. The microscope now sits in a glass case in our front room and the binoculars still make an appearance from time to time when I'm out with my scope. And, with thanks to the Planning Committee for the chance to work on another project involving lenses and brass parts, the Fecker now reports for duty mounted along side the Keller.

Actually, the scope is only part Fecker. The most important part, the objective, was indeed made by the Fecker company. But everything else gives the appearance of having been an ATM's project back in the days when making a telescope still meant machinist's skills. There are splined joints

in the tube, soldered shoulders, and other clues that the telescope was not the product of mid-20th century manufacturing processes. To this unknown ATM's credit, the tube assembly, perhaps going on 60 years old, is as solidly serviceable as ever. It turned out that nothing on it was actually broken. I cleaned and polished the brass as best I could by hand, removed the odd handle and plugged the holes, cleaned up the focuser, had a machinist ream the draw tube for 1.25" eyepieces and add a couple set screws to keep them in place, and carefully cleaned the objective. Ah, yes, the objective...

From my reading I knew at least a couple important points to keep in mind when disassembling an achromatic objective. Well, three... 1.) For God's sake don't break anything! 2.) Take note of any pencil marks on the side of the elements which indicate the correct rotational alignment. 3.) Preserve the shims used to create the required air space between the crown and flint. I made sure to cover points 1-3 to a Tee! But now I know that there's a fourth... 4.) Note the assembly order; that is, which element faces the sky and which faces inward.

The brass tube of the "Fecker" telescope about to undergo surgery before being given a thorough cleaning. The odd handle must have once served some useful purpose, perhaps if the scope was used with a diagonal. Since it would interfere with straight through viewing and also with using tube rings to mount it to the Keller it had to go. Happily, it was removed pretty easily. No pictures were taken as the lens was disassembled, WHICH MIGHT HAVE HELPED!

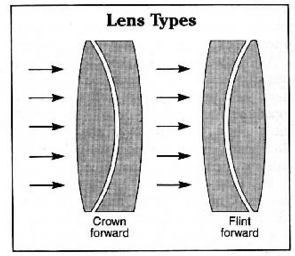
When I finally had the glass out and in my hand, all clean and shiny again after tending to the little pencil marks, tucking the paper shims away safe, and giving it a long and well deserved bubble bath, I looked at them and said to myself, "Look at that, classic Fraunhofer doublet. Double convex crown element, and a meniscus lens of flint. The inside curves match pretty closely, though they are not exactly the same, and can only go together one way. And the double convex crown faces the sky. Classic Fraunhofer.

Imagine my disappointment when I finally had the chance to look through the entirely reassembled and newly collimated telescope and found myself wondering where that lovely image of the moon through the dirt haze went! I tried to convince myself that it was really a pretty good image after all, that the tube needed time to cool, that maybe I didn't get the lens as clean as I thought. Maybe I got the pencil marks wrong! I'll do everything over, borrow Dave Gill's laser collimator and it'll be fine. By this time the scope was ready to be mounted to the Keller. There were a number of us down in the AEB for a planning meeting that night, a waxing moon in the sky. After extolling what a fine image this telescope would offer I had to admit that this just couldn't be right. When you'd focus in to get the crater details sharp as possible there would be this halo of light around the bright parts of the image. When you'd focus the halo away, the details were all soft. Kent Rothermel observed, "Try turning the lens around." Nah, what are you talking about, Kent! This is a Fraunhofer! It only goes one way! I couldn't have got that wrong. Could I?

Two aphorisms come to mind. A little knowledge is a dangerous thing. And, the observation of one of my esteemed professors that one of the chief roles students perform is to rediscover things their teachers forgot long ago. The Fecker objective certainly looks like a Fraunhofer design. But, as Tom Dobbins reminded me later, Fecker took over the optical company of John Brashear in Pittsburgh, and Brashear refractors were more often than not designed to be "flint forward" doublets. There is a flint forward design known as the Steinheil which employs two meniscus shaped elements. But in the late 19th century Charles Hastings of Yale University developed a flint forward design, tuned for certain optical and mechanical characteristics,

that looks for all the world like a Fraunhofer but isn't. Brashear- the manufacturer, and Hastings- the theoretical optical engineer, collaborated extensively on all sorts of projects around the turn of the century. Writing about Brashear in a "Gleaning for ATM's" article in Sky and Telescope (April, 1991), Bart Fried says it well, "Today this fact is forgotten, so Brashear lenses are often mis-assembled during cleaning." Fecker lenses too, since he inherited the Brashear optical shop with all its tooling and designs.

I feel a little better knowing I'm at least in good company. Sure enough, Kent was right. What had been observed earlier was a classic case of spherical aberration which is an optical defect that is controlled extremely well in achromatic doublets; ones that are assembled properly, that is. I reassembled the lens, turned it to the moon again and voila! - an outstanding view that demonstrates why fine refractors have such enduring appeal. I hope you'll get to look through it sometime soon and see if you don't agree.



Differences between crown-forward and flint-forward achromats are shown with the curves exaggerated. Each flint element is a concave meniscus; starlight enters from the left, and focus is toward the right. After Brashear began collaborating with Charles S. Hastings, their objectives were commonly flint-forward. Today this fact is forgotten, so Brashear lenses are often mis-assembled during cleaning.

This simple diagram, from Bart Fried's Sky &Telescope article on John Brashear, illustrates what the achromatic doublet in the 4 inch "Fecker" refractor looks like. In the flint forward design, on the right, the inside curves are actually steeper than in a traditional Fraunhofer doublet. Hastings experimented with a variety of ways to control the various aberrations encountered in refractors and was a pioneer at fine tuning lenses for the blue sensitive emulsions available to early astrophotographers. But the main advantage of the flint forward design was mechanical in nature. When mounted as a Fraunhofer, in diameters over about 6", the flint element began to behave something like a sagging sling. Flipped forward, however, it became a Roman arch with its characteristic strength. It became an important design consideration in the days when increasingly larger refractors reigned supreme as research instruments. Brashear himself helped bring an end to that era by developing more practical techniques for both figuring and silvering large mirrors.

★★★

Saturn Observation Campaign

by John Waechter

Several months ago NASA sent out a call for amateur and professional astronomers to participate in the Saturn Observation Campaign.

The goal of the campaign is to to promote public awareness of the Cassini-Huygens mission to Saturn and to create opportunities to engage the public in the excitement of astronomy by observing this spectacular planet.

The Cassini-Huygens mission, launched in 1997 and due to reach Saturn in July, 2004, is composed of two elements: The Cassini orbiter that will orbit Saturn and its moons for four years, and the Huygens probe that will dive into the murky atmosphere of Titan and land on its surface.

The WCAC has agreed to participate in this nationwide program. We are committed to hold three Saturn Observing outreach events during each annual observing season. The next few months provide prime opportunity to enjoy the magnificent view of this most beautiful planet at it's best.

We have designated the WCAC Public Observing nights on February 7th and March 7th as Saturn nights. Also, in a joint program with Hoover-Price Planetarium in Canton, we will set up our telescopes for the public at the Museum on 4 Friday nights (weather permitting), January 10 & 17 and February 14 & 21. These events will start at 6:30 pm with a presentation in the Hoover-Price Planetarium. Please contact me if you can help with any of these events.

Visit the NASA Cassini-Huygens Mission web site at: http://saturn.jpl.nasa.gov/index.cfm or follow the links on the WCAC web page.

Changes – The Evolution of our Hobby

by Dave Gill

Many folks coming into astronomy today can be overwhelmed by the choices that confront them in telescopes, accessories, publications, software and the ubiquitous Internet. But this is a relatively new explosion. The occasion of the WCAC's 20th anniversary is a good excuse to look back at how far the hobby has come in the past 20-25 years. The evolution of amateur astronomy in this time period is nothing short of spectacular.

My personal history in astronomy started in the late 1960's or early 1970's. At this time, the "typical" amateur telescope was a 6" or 8" Newtonian on a German equatorial mount, or a small refractor – usually also on a GEM. Telescope making was promoted at museums and science centers where mirror grinding was still being taught. A couple revolutions were in progress at this time. In the late 1960's the Schmidt-Cassegrain telescope became first commercially available. It took a while for them to really take off – probably in the early 1980's. The competition between Celestron and Meade brought streams of innovation, lower pricing and their share of horrific optics.

In the late 1970's an unlikely character was fomenting a revolution of his own. John Dobson was figuring out how to make big telescopes on the cheap – not for commercial reasons but rather to bring the glory of the universe to more people. His scopes were a giant step backwards in terms of technology. They boasted no finely machined shafts and precision clock drives. They had cardboard tubes, plywood mirror cells and mounts, and mirrors ground from porthole glass. But they were big. Real big. Those of us who grew up with the 6" f/8 scopes found the lure of an affordable 10" or 13" or 17" telescope irresistible. Articles in *Sky & Telescope* and Astronomy profiled Dobson and his "Sidewalk Astronomy", and Coulter Optical started selling these "Dobsonian" giants. Amateurs never looked back. A series of articles in Astronomy showed how to make the classic "Dob". A few years later, Telescope Making profiled the next generation of Dobs – the truss tube design taking advantage of the same truss structure used on the 200" Hale telescope. Companies such as Obsession, Tectron, StarSplitter and others sold them, and many amateurs, myself included, made them.

At the same time as the venerable Newtonian was being reinvented, so was the refractor. The long focal length flint and crown achromat was being replaced by Roland Christen's three-element apochromats which were virtually color free. Other manufacturers used other designs and types of glass to achieve wonderful achromat designs. The refractor found new life and popularity.

Eyepieces shared in the revolution as well. My early 70's eyepiece box had Ramsdens, Kellners, Orthoscopics and maybe an Erfle – all in 1.25" sizes. The Dobsonian telescope with its short f/ratio and wide light cone needed better eyepieces. Wider field designs like the Plossl reached a much larger market. TeleVue's Al Nagler developed a really wide field eyepiece – the 82 degree Nagler. What an eyepiece! Similar designs sprang up. Wide field versions for longer focal lengths also became popular. The much maligned Barlow lens, when properly designed, became an indispensable accessory.

Finding objects in the "old days" relied either on star hopping (some of us still rely on it) or on setting circles. The mass availability of microprocessors and consumer electronics made electronic telescope pointing available. Modern "Go To" telescopes can be easily aligned and accurately find objects. The GPS versions make this process even easier. Electronic setting circles for Dobs became possible as well. And the ATM community, led by Mel Bartels, came up with a public domain design for electronics and software for PC control of Dobs and other scopes.

Star charts themselves have been revolutionized. My early '70's collection included a copy of the "field edition" of Becvar's "Skalnate Pleso" and later, a copy of Norton's Star Atlas. Advanced observers might have Becvar's "Atlas Borealis" and "Atlas Eclipticalis" or Hans Vehrenberg's photographic atlases. The approach of the millennium signaled the need for a new generation of celestial cartography to update the charts to the 2000.0 Epoch caused by earth's precession. The young Dutch cartographer Wil Tirion drew a strikingly beautiful set of charts published as "Atlas 2000.0". Tirion's work ended up appearing in many publications. The spread of larger telescopes called for better charts – ones with fainter stars and more deep sky objects which were now within the amateur's grasp. Later the "Uranometria" atlases were published, followed by the "Millennium Star Atlas".

But the real revolution in celestial cartography came from the PC. From simple planetarium programs plotting the constellations, these have become extremely sophisticated packages combining customizable object catalogs, select plotting, plotting of asteroids and comets, and many other features. Programs such as The Sky, Starry Night, Guide, Megastar and Voyager have allowed amateurs to make custom charts – such as the ones we did to help

us find Dick Emmons' "pet rock" this past fall. These wonderful capabilities are truly amazing. I am a book lover, and I cherish my print atlases – but I would not be without my copies of Guide, Megastar and Starry Night.

That brings the second major area of revolution – the personal computer. In the late 70's, only nerdy hobbyists had home-brewed computers. The Apples were just coming on the scene. My first computer was a Texas Instruments something or other that I attached to my TV and saved data on a tape recorder. I had Basic on that machine and I remember programming some of the equations of Jean Meeus into it to predict planetary positions. It was a lot of work, but the prospect of being able to look back and forward in time was great. Eventually real computers came out with commercial software to allow astronomical applications as discussed above. But probably an even bigger revolution came from the Internet. It created a worldwide community of amateur astronomers connected by email groups and news groups. And the World Wide Web made data instantly available.

The well-connected amateur in the early '70's might get a variable star newsletter or "Tonight's Asteroids" – mimeographed newsletters lovingly typed, cut and pasted together. Really serious amateurs might get post cards from the Central Bureau for Astronomical Telegrams announcing important news such as comets, novae, and other discoveries. Large institutions might even get them as telegrams. The rest of us had to rely on the news media – and for astronomical news, they could be rather unreliable. Right after we started the club in 1983 there was a very fast moving comet that zipped quite close to earth. Comet Iras-Iraki-Alcock was a real delight – but I had to learn about it from the newspaper, and the first night I saw it was more a result of good luck than of good information. Later I subscribed to the "Comet Rapid Announcement Service" run by Ohio amateur Steve Smith. Today, announcements are instantaneous. Comet elements are available from a number of places. You can see charts at various websites – or download the elements and customize a chart yourself. Organizations like the AAVSO, IOTA, ALPO and others keep in touch with their members – the observing arm of the organizations – through email and websites. We can get instant news of supernovae, novae, fast moving asteroids, comets, and even geomagnetic storms likely to cause auroral displays.

The Web has provided an inexhaustible repository of information to the curious amateur. Many organizations and individuals have well-stocked web sites. The web-consuming public has to be cognizant of the credibility of the site they are reading. Along with instant access comes also the ability for cranks to publish without any editorial restraint. So, it is always caveat lector for the web browsing amateur. There are massive catalogs of data on line for serious amateurs to work with, photographic atlases, the AAVSO's chart library is on line now. You used to have to send away for charts, and then you'd get by mail something duplicated on a blueprint machine. They're now sharp, crisp and instant.

One of the newest fields of innovation is putting astronomical information in your palm. Literally – in your Palm. The "PDA" now can hold planetarium software, data catalogs, special lunar and planetary applications, articles and even websites. Some amateurs are using their Palms to control their "Go to" telescopes. Personally, before our new dog, Kosh, decided to destroy it in his "jaws of death", I habitually downloaded local satellite information daily into my "Visor" so that I would have it in the field if needed. After Christmas, I plan to renew this on my new Clie.

One final area of revolution I want to mention is in astronomical imaging. In the 1970's and 1980's, we were limited to film. The time required to capture an image was longer than the stable time of astronomical seeing. Consequently, even short lunar and planetary images could not match the clarity of visual observations. Deep sky images required long manual guiding, and were limited by the reciprocity characteristics of film. But along came the CCD chip – an electronic device that gathered light like film, but with a much greater quantum efficiency. Hook it up to a big telescope and a computer, and you're in business. The ability of some CCD's to "autoguide' eliminated much of the drudgery from astrophotography. Images could be electronically processed to increase contrast and bring out previously invisible details. Amateurs began taking spectacular images of both planetary and deep sky objects. Computer intensive techniques such as stacking images and unsharp masking helped average out the effects of the atmosphere. Even the lowly video camera became a great boon to the amateur – allowing him to shoot the moon and planets at 30 frames per second and keep the best ones. They can then be stacked and more detail can be brought out. Look at some of the stuff on the Club's web page – great stuff. I am still amazed that in our quest for 5391 Emmons, we were able to image down into the 15's on a 10" scope in a 2-3 minute exposure. Absolutely wondrous stuff.

Revolutions? We've seen plenty. It has been a wonderful time to be an active amateur astronomer.

Another Roar from the Leonids

by Phillip J. Creed

Now I know a lot of my articles tend to be lengthy, so I've provided an alternative HORIZON entry for those that want the short version of the 2002 Leonid Meteor Extravaganza:

The Leonids rule. Peace. Out.

For those that still get some form of amusement (or bemusement) of actually delving into the mind of a bachelor astronomer at the north end of his 20s, here goes.

After having witnessed the 2001 Leonid Meteor storm (see the 2001/2002 Winter Solstice HORIZON) from Spruce Knob, I didn't think there was anything that could top what I saw that night. But several experts were predicted another round of Leonid storms for the morning of November 19, 2002. The predicted rates varied between 2,200 and 10,000 ZHR.

Problem was, ZHR (Zenith Hourly Rate) assumes 2 key conditions—(1) the radiant is at the zenith (Leo's radiant at our latitude was above 60 deg. above the horizon, so no big deal), and (2) a naked-eye limiting magnitude of 6.5 (Uh-oh. The predawn sky would have a waxing moon, 1 day from full. D'OH!!). Needless to say, this resulted in a rather interesting and troubling scenario—yes, a productive storm was all but certain, but how much would survive the strong moonlight?

All this discussion was a moot point if the weather was bad. Sure enough, a front was forecast to be moving through the Great Lakes right at "game time". I knew that some traveling would be needed to see it, but I could not find anyone that was willing to travel to see the Leonids; after all, it was near a full moon and on a weeknight. Dave Miller of the Astronomy Club of Akron, however, was willing to give it a go despite his sinuses acting up at a rather inopportune time, so we agreed to look within a 500-mile radius for clear skies.

Dave and I guessed that the front moving through IL and IN at the time (and clouding out our beloved Ohio and points south and east), being a cold front, would not only have a sharp clearing line, but the precipitation and cold air behind it would result in good transparency, thus reducing scattered moonlight. I have found that the best transparency is typically JUST behind a cold front, and so decided to roll the dice. To further reduce as much light pollution as possible, I chose Moraine View State Park, about 15 miles east of Bloomington, IL, due to its relatively remote location. We had a hunch MVSP would be in the clear due to the marvelous Clear Sky Clock Homepage, which predicts near-future satellite imagery.

It was a gamble, and it worked, though that wouldn't be apparent for some time later. The clouds thickened as we hit Indiana as dusk fell, and it rained as we drove through western Indiana and the easternmost counties of Illinois, but a call from fellow Ohio amateur Mike Henry proved invaluable by reaffirming the position of the approaching clearing line. As we arrived at our motel the rain had stopped and the winds had shifted from southerly to westerly.

The skies started to break around 12 a.m. CST at our selected site, and were completely clear by 2 a.m. CST. No obvious sources of skyglow were present, though we probably would have seen Bloomington's skyglow to the west were it not for the slowly-sinking moon. From about 2 a.m. to 3 a.m., nothing spectacular, perhaps one shooter every other minute. By 3:30 the shower was starting to pick up noticeably, with maybe 1-2/min in spurts, but nothing sustained above 1/min. There were quite a few meteors that were hanging close to the radiant, and the moonlight had prevented the long smoke trails from being seen. The 2002 Leonids seemed noticeably fainter than their 2001 counterparts.

As the moon started sinking in the west the sky transparency and darkness was noticeably improving, due in part by the rain-cleaned air. All stars in the Little Dipper were visible with the naked eye despite the faintest of those being mag. 4.9 and near lower culmination. Thankfully the sky in the vicinity of the radiant seemed to be the darkest, with a NLM close to 5.5. The steps taken to get a good naked-eye-limiting magnitude would prove critical to our observed rates in the following hour.

By 4 a.m. CST (5 a.m. EST) the jury was still out, with the rates struggling to maintain a little over 2/min by this time. The area around Ursa Major and the SE horizon seemed to be comprising the brunt of the storm at this time. By 4:15 a.m. it became apparent that our 8-hour drive would

not be in vain, as the rates started to shoot upwards. We noticed our first "doubles" (two Leonids simultaneously) at this time. Five minutes later, the rate seemed to hit 5/min—yet we had effectively surrendered the western sky entirely in our observations!

The 30 minutes between 4:30 and 5:00 CST just went by too fast. By 4:30 a.m. a solid 6-8/min rate was established, and it was about this time I saw a most unusual spurt—4 Leonids in 2 seconds, all within 5 degrees of Alphard (Alpha Hydrae). While Dave was furiously trying to photograph the event, I was just taking it all in; you could call it the existential pleasure of meteor observing. We had trouble maintaining even 1-minute counts by 4:45 a.m. CST (5:45 EST), which is where our best guess was of the peak time. At that time between the two of us we were easily seeing 20-25 meteors/min (for an observed rate of 1,200 to 1,500 per hour), and Dave alone observed a burst of 7 in 15 seconds (we almost never aimed at the same spot in the sky). Some appeared green, but most of the brighter ones had a distinct reddish hue. There was a noticeable drop in rates after 4:55, and considering the declining rates akin to the partial eclipse phases after third contact, we decided to crash at a nearby motel.

Needless to say, I was surprised at the high rate we observed, and how disappointing the show was in other time zones, especially the favored Eastern Time Zone. I think part of that is due to the following:

(1) Many observers in the Eastern Time Zone had to deal with either cirrus clouds (or worse, rain!) from the advancing front. Those far enough east or south of the cirrus deck were already in twilight by the time 5:45 EST rolled around. There was a nice chart on page 98 of the Nov. 2002 SKY & TELESCOPE, showing where twilight would begin at the predicted peak time of 10:36 UT. Being about 10 minutes late, the peak effectively put the optimum observing zone for the U. S. about 110-150 miles further west (depending on latitude)—and largely in the evil clutches of the afore-mentioned cold front. Owing to the narrowness of the peak, some people might have simply gone inside at the wrong time.

(2) In Illinois, the radiant was relatively high (about 65 deg. elev.) and the moon was relatively low (about 15 deg) at the time of the peak, and the relatively late peak proved to be a plus in both these regards.

(3) A cold front had just wiped clean the air over Illinois. A NLM of 5.5 near overhead is tough to achieve on a night of a full moon, esp. east of the Mississippi.

(4) Our location was relatively remote, to squeeze out whatever darkness could be achieved on a moonlit night. I think too many observers, knowing it was full moon, underestimated the importance of their observing location.

Was it as good as the 2001 display? I'd have to say no, but it was a given that anything even close would have made the drive worthwhile. The 2002 rates were comparable in spurts to the 2001 storm, but they didn't have the broad peak and brilliant fireballs of the display the year prior. Was it worth the 8-hour drive? Most certainly. Eight hours is the blink of an eyelash compared to waiting until 2098!

Our gut instincts and a little luck (not to mention insanity) resulted in our witnessing a splendid meteor display. I'm working on a time machine to take me back to November 17, 1966, but knowing my luck I'll end up in Ohio again that night...

★★★★★★★★★★★★★★★★★★★★★★★★

Book Review

BY MIKE ROSSETTI

Comets: Creators and Destroyers

by David Levy

I'm in graduate school now, but I still look for ways to avoid studying. I'd like to share my most recent endeavor.

You may have guessed already that I read the book Comets: Creators and Destroyers by David Levy. I give it 9 out of 10. Briefly stated, the book is written well. Each chapter is partitioned into small sections, yet the text flows nicely. One quarter of the way through the book (of 200 pages), Levy began to captivate me with a less objective and more dramatic style. For the following two days, I could not put the book aside.

This was my first comet book, so I don't know how well it compares with others. For me, it was a great starting source, and I want to recommend it to fellow WCAC novices. Also, this is my second Levy read. There will be more!!

A Sense of Perspective

by Dave Gill

One of the most important lessons that anyone studying astronomy needs to learn is the sense of scale in the cosmos. The problem is that the numbers are mind-numbing. When we talk about many millions of miles or millions of light years, we end up losing our anchor in reality. We cannot comprehend these kinds of numbers in our daily experience. To paraphrase an entry in the journal of Thoreau, *"When the astronomer talks about the sun being 93 million miles away, it means nothing to me because I've never walked it."*

As an aid to bringing the universe into a somewhat more comprehensible size, the use of scale models is useful. And when I use a scale model for this, I believe it is essential to scale it properly in both size of objects and their distance. One of the concepts that quickly comes home in doing this exercise is the emptiness of the universe. If one does not scale both parameters – size and distance – the same you do not get the same impression. We see many pictures in books portraying one or the other of these parameters to scale. But to do both really requires much more real estate than a book allows.

With this in mind, early in the history of the WCAC, we set out to use some of TWC's real estate to make a scale model of the solar system. This has become more popular in recent years and such scales have been set up in a number of places. But I like to think of ours as being rather original. Ours was not permanent, but was put on sign posts that were placed for special events. The original scale was set up along the Pond Trail - TWC's most popular trail. We placed the sun at the top of the parking lot steps on the sidewalk. Our selected scale was one foot equals a million miles. Other recent scales use the more "scientific" scale of 1:1 billion. But I still like our scale factor – it has two advantages. First, it makes the planets visible – the terrestrials are still tiny – but they can be seen and have notable differences in size. But I think that the more important reason is that walking so that every foot you go is a million miles is more memorable than some other number – probably metric – that comes from a one to a billion scale. When we built the new sundial in front of the AEB, the copper sun disk in the gnomon is the proper size for our foot equal a million miles scale. Next time we set it up, we will start our solar system walk at the sundial and use the copper sun as our starting point.

The other part of the scale is planetary sizes. The first set of signs we made were done by Roy Preece. They contained some facts about the body and a circle of the appropriate size for the planet at that distance. These were paper-on-cardboard signs, and didn't respond well to precipitation or dew. Roy made a more durable set silkscreened on masonite a couple years later. In the more recent past, John Waechter updated them with color graphics and photos. But they still contain a circle of the appropriate size.

So, on this scale, we get the following distances:

	Distance in feet	Diameter in inches
Sun	0.0	10.440
Mercury	36.3	0.037
Venus	67.0	0.091
Earth	93.0	0.096
Mars	141.4	0.051
Jupiter	483.6	1.065
Saturn	887.2	0.900
Uranus	1783.7	0.384
Neptune	2795.6	0.365
Pluto	3667.9	0.017

The moon is 0.027" in diameter and about three inches from Earth. On the old trail using the Interpretive building as the origin, Pluto was on down the pond trail nearly to the second pond.

We then asked the question – how far to the nearest star? Well, on this scale, Alpha Centauri is another pie-plate 4780 miles away. We figured that you could walk to Rio, or to San Francisco and back. And that's the nearest star. Do you begin to feel the emptiness of interstellar space?

We're about 2/3 of the way out from the center of the Milky Way. On our scale, the center of the Milky Way is about 33 million miles away – or

about 1/3 of the way to the sun! And our friendly neighbor in space, the Andromeda Galaxy is about 2.8 billion miles away – about at the orbit of Neptune.

Now note what we just did – we collapsed our solar system down to a digestible size. But in order to think in terms of our galaxy and its neighbors, we have to make reference to the REAL solar system. It is one of those self-reference loops that can give you a headache!

Our scale is linear – we lay it out on a trail. But the solar system is three dimensional. We'll ignore the third dimension for now. If we took our distance to Pluto and drew a circle of that radius, it would encompass the equivalent of 940 football fields. If the sun was a pie plate on the 50 yard line of the central football field, the earth would be a seed about 1/10 of an inch in diameter on about the 20 yard line of that same field. Our entire orbit would be on that same field. Forget about the other 939 football fields. Remember now, the nearest stadium complex (i.e. star system) to our is another one down around Rio.

Now, to get a better feel for intergalactic space, we need to shrink the universe by another factor of a billion. On this scale we make the Milky Way about the size of a football stadium. Our friend Andromeda is another, some what bigger stadium, about a mile and a half away. Where is our sun in all of this? We and Alpha Centauri are a couple specs of dust on about the 20 yard line – about 4 mm apart.

So, here's an interesting concept to come out of all this. Interstellar space - the space between the stars - is vast and empty compared to size of its inhabitants. Think of pie plates in Wilmot and Rio. But intergalactic space - the space between the galaxies - is much more crowded when we consider the sizes of its inhabitants. Stellar collisions are extremely rare. Galactic collisions and interactions are pretty commonplace. But even then, the stars of the individual galaxies seldom collide. They pass through each other interacting gravitationally. They may steal each others gas, dust and stars. They may trigger waves of star formation. One may even be captured. But the stars probably do not collide.

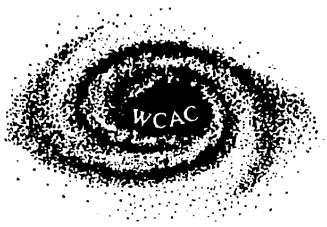
OK, finally, how big is the observable Universe? If we use an age of 12 billion years, we can see to a horizon 12 billion years in all directions. On our stadium equals Milky Way scale, this equates to a sphere about the size of the earth containing hundreds of billions of objects on the order of the size of a stadium.

Think about that next time you're out under a starry sky.

When the Hubble Deep Field photo appeared… some people came up to me and said, "It makes me feel so insignificant." No, no, I insisted, that is exactly the opposite of how we should feel. The Hubble Deep Field photo is a product of human science, the culmination of thousands of years of wondering at the night sky…. We believe that what the photograph reveals is actually <u>out there</u>… But a transfer has been made across that thin film in the eye that separated the mind from the world. The universe of the photograph exists <u>in here</u>, in our minds. We carry 50 billion galaxies in our heads, and that makes us pretty significant, it seems to me.

This new knowledge of the galaxies is exhilarating and terrifying, beautiful and dreadful. Yes, it can be emotionally deflating if we continue to insist that we are the measure of all things. But if we accept that the human physical scale is an inadequate measure for creation, then the Hubble Deep Field photo opens us to a cosmos of capacious grandeur. A universe of 50 billion galaxies blowing like snowflakes in a cosmic storm is astonishing, but even more astonishing are those few pounds of meat - our brains - that are able to construct such a universe of faint light and hold it before the mind's eye, live in it, revel in it, praise it, wonder what it means.

— *Chet Raymo - <u>Skeptics and True Believers</u> - pp 243-4*



The Evolution of an Amateur Astronomer: My Journey with the WCAC

by Dave Gill

In the other article I did for this issue, I wrote about the advances in the hobby of astronomy during the twenty years since we first started our club at TWC. This got me to thinking about the personal journey I've made during these same twenty years. In particular, I want to explore my journey through the valley of the shadow of astronomy – and how I've changed and adapted during that time. So please bear with me while I take this trip.

When we started the club, I was 25 years old. I had been lecturing at Hoover-Price Planetarium for several years. I had been a member of the old Stark County Astronomical Society as a teenager. I had built a 6" f/8 Newtonian as a kid – with lots of help from my dad and others. I had studied a little astronomy and a lot of physics at Mount Union. All in all, I felt pretty sophisticated as an amateur astronomer. Ha!

One of the catalysts in starting a relationship with TWC was that I was interested in trying my hand at teaching. I didn't want to make a commitment – like a career decision or something like that – I just wanted to do something informal like workshops. TWC seemed a great alternative once I was turned down at Hoover-Price (for reasons not of my own making). The idea was warmly embraced at TWC, and Robin and I put together our first "Backyard Astronomy" workshop. The response was very positive, so we proposed a special interest club dedicated to astronomy. It seemed a natural fit with the dark, rural skies of Wilmot.

Reaching back to those early days, I find it hard to sift through the rubble and memories to pick up real shards of my earlier self. One of the joys of participating in a club is the chance to mix and mingle with folks of all levels of interest and experience. We soon developed a core of good people. Some are still here – like Drew Miller, Roy Preece and Ralph Geschwind. Many others passed through leaving memories – George Iden, Dave Mancini, Darwin Boyd and Terry Barnhill. In subsequent years we slowly built the nucleus – many of whom remain with us today – Kent Rothermel, Dave Ross, Tom Kolar, Eric Mast, Dean Wilson, Terry Kirby, Ronnie Stroup, John Waechter,

In these early days, I soon learned that with my 6" scope and pipe mount I wasn't so sophisticated. Bigger scopes began to surround me. I found that I wasn't so good at finding things in the sky as I thought I was. But the constant exposure to these good folks and good scopes taught me many things. I soaked up advice like a sponge. I attended OTAA events and listened to the speakers. I started amassing a library (just ask Robin – I still am…), Through observing events, I got better. And I got aperture fever.

I bought a 10.1" f/4.5 Coulter mirror in 1984. Again with my dad's help, I built it into a classic early Dob. That scope and its later reincarnation has served me extremely well over the years – it is still my primary instrument because of its portability. The larger aperture of my Dob and the wise investment in a good finder helped my observing immensely. Since then, I've had other telescopic infatuations. In 1991 I purchased the 14" telescope from Dick Emmons. It had become too heavy for him to lug around. Because of its pedigree, I wanted it. I totally rebuilt it, saving only the primary mirror and the front half of the mirror cell. The rest was replaced by a Dob – a seriously overbuilt Dob, unfortunately. It is a wonderful telescope, but heavier to lug around than a person of my limited patience can deal with on a regular basis. So it largely sits – brought out on special occasions like for Dick's asteroid quest.

I've had infatuations with other telescopes as well. My first exposure to Tom Dobbins left me interested in tilted-component telescopes. Subsequent articles in Telescope Making magazine fired my desire for a tri-schiefspiegler – a three-mirror off-axis reflector with no central obstruction. I went so far as to buy a set of three mirrors from a man who made them commercially for a short while. But I never pulled the trigger on making a telescope out of them. I designed many of the tube parts and the mirror cells. I had the tube layout done life-size on CAD by a friend at work. But I never felt brave enough to try to make the telescope. I finally sold those mirrors for as much as I

paid for them almost 10 years later. Beyond that, I've had brief but manageable spasms of interest in other telescopes. In recent years, these have become mercifully scarce.

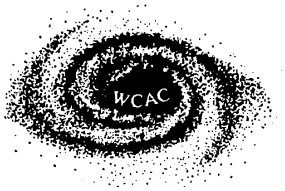
The club and the Center provided many outlets and opportunities for my urge to teach. There were a number of different workshops and lectures that I prepared over the years. And I don't want to count how many articles I've written for HORIZON. Each of these projects was an opportunity to learn something new myself – whether it be a new topic to dive into, more depth on something already familiar, or a new perspective on an old "friend". I've always found teaching to be beneficial to me. This ended up being the one area where I was willing to stretch myself. Through the help of Joann, I worked up the nerve to prepare a couple different courses for teachers which were available for college graduate credit at TWC. These required extensive preparation – and I was very proud of the resulting courses. But they left me hungry for more. Through the Club's on-going relationship with Mount Union, I started discussing the possibility of doing some adjunct teaching at night. It was left in the talking stages because of work travel conflicts until the spring of 2001 when through the intervention of Mike Rossetti, I got the chance to teach astronomy at Walsh. Then I changed jobs and was able to finally make the Mount Union dream a reality. This has been a great deal of fun (and work…) but it seems like the natural result of the last 20-plus years.

There has been a darker, more frustrating side to the story, however. In my late-night dreams and schemes about the club, I always envisioned a club that was filled with highly competent amateurs with great technical knowledge on many different areas. You see, that was the kind of club I secretly lusted for. I wanted to be surrounded by those people so they could help take me to that next level – from a dabbler to a REAL astronomer. I tried dabbling in many areas – variable stars, asteroids, lunar observing, planetary observing, deep sky observing, telescope making, photography – you name it. I even wrote about many of these topics in HORIZON as if I really knew something about them. But it finally dawned on me that what I wanted was to be a catalyst – the person who could bring the right people together and introduce them to a topic and POOF – instant passion. And I'd get caught up in it and discover something that I really wanted to do. And we'd all live happily ever after. Unfortunately, it hasn't worked that way. Instead of getting swept away in a torrent of technical accomplishment, I'm still here wandering through the desert, searching.

I don't observe much for personal satisfaction any more. I don't know why – but I don't. It is increasingly frustrating – probably because I'm not doing it and am getting rusty. We've taken several observing vacations to Star Hill in New Mexico. We love the place. But every time I go, I end up more frustrated because I arrive full of plans to observe, but end up not doing much. And I don't know why. The experiences I've had along the way have shown me that I have a talent for starting projects and not finishing them. So I am afraid to invest in the technology to do something interesting like CCD astronomy because I can see it sitting there gathering dust. So much of my observing these days consists of leading celestial tourists on public nights, outreaches, etc.

Where am I heading? I really don't know. I hope that my work will allow me to stick with the teaching – I find it enjoyable and still a challenge to improve. I've always enjoyed the writing I've done for HORIZON, but I find it increasingly difficult to get newsletters done on time. Maybe after 20 years I need a break. The weather and light pollution around here make it ever more difficult to get motivated on any sort of observing program – all the more reason to really admire those who do it like Dick, Ralph and Bill. It will be interesting how I will write a follow-up article to this in another ten or twenty years.

Finally, I want to thank all of you for your friendship. Despite all the personal frustrations and struggles, I have stuck with the WCAC and the hobby largely because I have made so many good friends here. I still believe that the friends we make under the stars are some of the best.



Variable Stars in Orion and Gemini

By Ralph Geschwind

With colder temperatures coming, it brings on the Winter constellations – Auriga, Taurus, Orion and Gemini. Here are some variable stars that I observe with my 10" f/5.6 Newtonian in Orion and Gemini

DESIGNATION	VARIABLE	TYPE	MAGNITUDE	PERIOD
0549+20a	U ORI	MIRA	6.0-11.8	372d
NEAR U ORI IS A IRREGULAR VARIABLE STAR SU TAU				
0543+19	SU TAU	R CRB	9.5-14.0	-
0543+07	R ORI	MIRA	9.5-13.0	318d
0500+03a	V ORI	MIRA	9.4-14.2	271d
0524-04a	S ORI	MIRA	8.4-12.9	419d
0547-05	CN ORI	U GEM	11.0-16.2v	15d.85
0557+16	RR ORI	MIRA	9.1-14.7	251d
0611+15	CZ ORI	U GEM	11.2-15.6v	25d.73
0655+30	RS GEM	MIRA	9.5-10.9	152d
0701+22a	R GEM	MIRA	7.1-13.2	370d
0717+13	V GEM	MIRA	8.3-14.3	276d
0737+23	S GEM	MIRA	8.8-14.0	293d
0743+23	T GEM	MIRA	8.7-13.7	287d
0749+22	U GEM	U GEM	8.9-14.0	105d

All are in the range of my 10" when I'm at TWC, except for CN Ori and CZ Ori which get too faint to see. If you are interested in starting to observe variable stars, contact me, Bill Castro or Dave Gill. And be sure to visit www.aavso.org.

The Event Horizon

January 2003

31st: WCAC Meeting - 7:30pm @ TWC
WCAC 20th Birthday Party
Refreshments provided by WCAC

February 2003

7th: Public Viewing Night - Saturn Observation Campaign - 7:30 @ TWC clear or cloudy

14th Saturn Observation Campaign at Hoover-Price

21st Saturn Observation Campaign at Hoover-Price

28th: WCAC Meeting - 7:30pm @ TWC IB
Program: Cassini / Saturn observing program
Refreshments: TBD

March 2003

7th Public Viewing Night - Saturn Observation Campaign - 7:30 @ TWC clear or cloudy

12th: Planning Committee – 7:00pm @ TWC AEB

March 2003 cont.

28th: WCAC Meeting - 7:30pm @ TWC IB
Program: Dave Gill, The H-R diagram
Refreshments: TBD

April 2003

4th Public Viewing Night - 7:30 @ TWC

25th: WCAC Meeting - 7:30pm @ TWC IB
Program: Show & Tell Gadgets & Books
Refreshments: TBD

May 2003

2nd Public Viewing Night - 7:30 @ TWC
clear or cloudy

14th: Planning Committee – 7:00pm @ TWC AEB

30th: WCAC Meeting - 7:30pm @ TWC IB
Program: NASA speaker ??
Refreshments: TBD

The Wilderness Center Astronomy Club
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