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CVAS Officers

CVAS
PO Box 11
Chagrin Falls, OH 44022
https://cvas.space

THE VALLEY SKYWATCHER

The Official Publication of the Chagrin Valley Astronomical Society
Est. 1963

Wrapping Up the Last VSW Issue for 2025

Chris Powell, Editor

This is a brief letter to welcome the several new members that have joined CVAS this past year and have picked up active roles in the Society. When I joined CVAS in 2018, Marty Mullet was President and I expressed concern about the age of the membership. He responded that it might seem like that, but assured me that there was always new, younger blood joining and the membership was actually stable. I believe that many, like myself, finally had the time (and disposable income) in retirement to actively become involved in a field that had interested us since our youth.

This is my 29th issue as VSW Editor, starting with the Fall issue of 2018. Every time I get concerned about sufficient content of interest by publishing time, members come through with articles and astro-photos. For this issue, I want to thank the on-going input by Dan Rothstein and Steve Fishman, and specific entries by Jeff Ratino, Russ Swaney, Marty Mullet, and new member Willie Stickley.

Chris Powell, Editor

Observer's Log #1

Jeff Ratino

NGC 6914

Sent November 30th, 2025

NGC 6914, also nicknamed Eyes of Cygnus, is a nebula complex located near the Sadr region in Cygnus. The "Eyes" are two reflection nebulae, VDB 131 and VDB 132. They appear blue because they reflect the light of nearby hot, young stars. The surrounding region has a reddish or pinkish glow caused by ionized hydrogen gas from the massive Cygnus OB2 association causes the red glow. Cosmic dust filaments and dark nebulae are interspersed throughout the region, creating contrast with the bright nebulae.

Shot with my Stellarvue 102T telescope, Mono cameras, LRGB and Ha filters from Starfront Observatories in TX.

Total Integration: 27 hours 18 mins

Jeff Ratino

LBN 437 - Gecko Nebula and a Portion of Sh2-126, The Great Lacerta Nebula

Sent November 30th, 2025

LBN 437 also called the Gecko Nebula is a molecular cloud in the constellation Lacerta, which interestingly is Latin for "lizard". It is located at the edge of the much larger emission nebula Sh2-126. Which you can see a portion of here. Next year I plan on imaging a wider FOV of this region. Shot with the same setup as NGC 6914.

Total Integration: 35 hours 40 mins.

Jeff Ratino

Sh2-174, LRGB-NB

Sent November 30th, 2025

Sh2-174 or the Valentine Rose is a very faint but large Planetary nebula located in Cepheus. A planetary nebula is created when a low-mass star blows off its outer layers at the end of its life. It is almost 1000 light years away from Earth.

I initially started off just shooting this in narrowband but then came across several images showing all the surrounding dust. So I shot several hours of broadband data as well. I processed the NB as HOO, adding in the SII (there isn’t very much) using ImageBlend script in Pixinsight. I then processed the LRGB data combining the two again in ImageBlend. As much time as I have in NB, I could probably use another 20 hours in Ha-OIII. Definitely will revisit this area in the future, with a different FOV.

Total Integration: 47 hours 52 minutes.

Jeff Ratino

Sh2-96, The Scarlet Letter Nebula

Sent November 30th, 2025

Sh2-96 is an extremely faint emission nebula in Cygnus. It is also known as The Scarlet Letter Nebula and just like the letter in the novel "The Scarlet Letter" by Nathaniel Hawthorne, the letter in this nebula is a scarlet capital A. I have also seen it referred to as Fire and Water. The "A" portion being the fire and the blue nebulosity the water. The brighter portion of the capital A is also designated as Lynds Bright Nebula (LBN) 066.

This object was very faint. Even with over 41 hours of data, it still pretty noisy.

Total Integration: 41 hours 24 minutess.

Notes & News

- **Random Notes from the Editor's CVAS Meeting Scribbles**
  - September 7th Meeting
    - Porta-Potty's installed at Indian Hill with 30 gallons of sanitizer. Lights will be addd.
    - The Super Star Party at Penitentiary Glen had a poor turnout of perhaps 25% of before.
    - St. Lawrence Event had 45 people and may become an annual event.
    - Russ Swaney reported that there were 800 hits on the CVAS website.
    - Big Creek Star Part at Swine Creek only had Gus Saikaly and Rosanne Radgowski participate with ~1000 people attending.
    - The CVAS mail box address will be moved from Chagrin Falls to Geauga County but will require a change to the Constitution. It was agreed to wait until the Christmas Party.
    - Willie Stickley was proposed for the vacant position of CVAS Vice President.
  - October 4th Meeting
    - New member Dennis Semik introduced.
    - The CVAS setup location at the Nature Night at the North Chagrin Nature Center on Sept. 20th was not considered optimal as couldn't see Polaris. Propose to move back to location from 2024 which was an open field.
    - It was agreed to have the CVAS Meeting and Christmas Party on December 6th at 4 PM at Observatory Park. Members were requested to attend to vote on changes to the constitution to allow change to the mail box location. (Required for tax exempt filing reasons).
  - November 2nd Meeting
    - First winter meeting for the season on Sunday at 4 PM at Observatory Park.
    - Google Teams Meeting Guest, Natasha Davison from the University of Texas at Austin and Producer of the Documentary "Touching the Sun" was introduced and explained their effort to complete the production due to loss of Federal funding of PBS.
    - Willie Stickley presented "32 Hours of M31" as part of the AD ASTRA Project. (The presentation is provided on the following pages of this issue of the Skywatcher).
    - A proposal was made to change the CVAS organizational structure to a Board of Directors structure, similar to that used by the Mahoning Club. Trustees appoint the Officers. This requires change to Article IV, Section I of the Constiturion.
    - Also proposed to repeal Article IV, Section II which required a vote to accept new members.
    - Also proposed to eliminate the position of Observatory Director.
    - Marty Mullet will end his role as Geauga Park Liaison but will remain active in Nassau Nights.
    - 2026 OTAA date was proposed for June 13, 2026.

32 Hours of M31

by Willie Stickley

Editors's Note: The following is a presentation given by Willey at the November 2025 CVAS Meeting. It is reproduced here for the benefit of those members who were unable to make the meeting. These slides have been processed and reduced in size for the Valley Skywatcher. For better quality photos, see the November 2025 Meeting Agenda in the Members section of the CVAS Website.

Continued on following page

32 Hours of M31 (cont)

by Willie Stickley

Why waste your time on M31? Everyone's seen it before!

But have they really?

M31 in Ha + Oiii

Credit: Collaboration Effort

M31 in X Ray+UV+Optical+IR+Radio (This was June this year!)

Credit: NASA Chandra

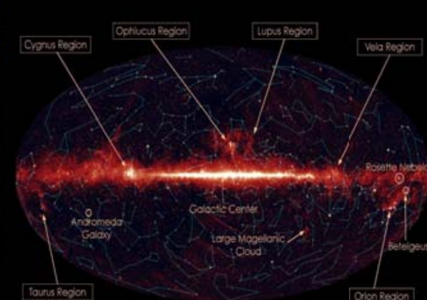
Hubble's Famous Shot

Credit: Carnegie Archives

The Universe has ***much more*** to offer than just what our eyes can see!

The Andromeda Galaxy (M31) may be our closest Galactic neighbor but that doesn't mean we know everything about the region, rather it gives us a prime hunting ground for discovery! Since we have been able to capture different wavelengths of light we have been able to do useful research on the universe around us, and it was a picture of M31 that allowed Edwin Hubble to say with confidence that the Andromeda Nebula was indeed its own Galaxy! (Plate H335H)

That leads into the decisions made in imaging M31 and its surroundings, in particular how to reveal as much information as possible. Andromeda is surrounded by faint Hydrogen dust clouds and our target SDSO was made exclusively of Oiii light, so Dual Narrowband Ha+Oiii filters seemed like the logical choice. Oiii is EXTREMELY faint relative to Hydrogen so fast scopes and as long exposures as possible were the name of the game. Ultimately what I could manage was a f2.2 system and 10 minute sub exposures to even attempt to image this Ghost Planetary Nebula.



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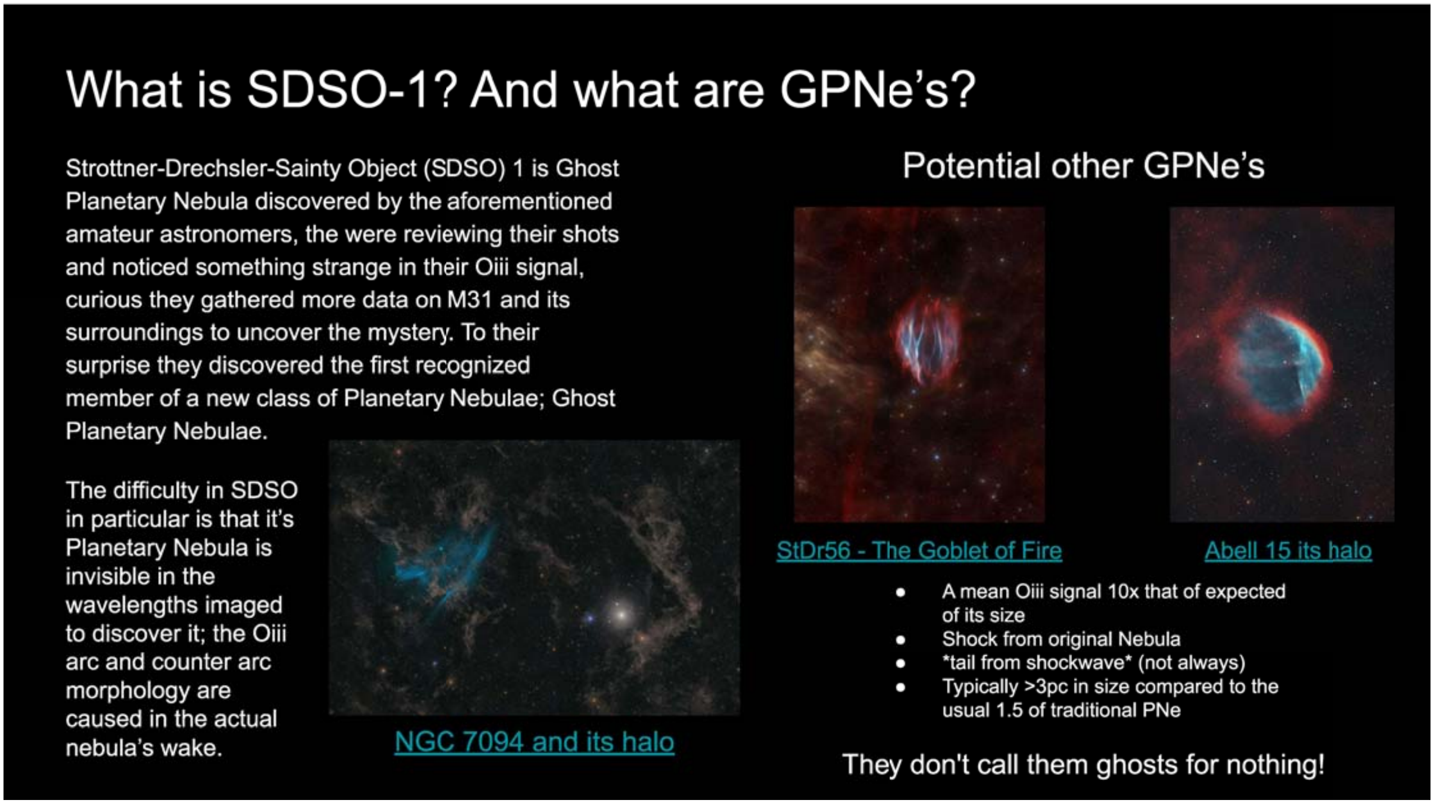
32 Hours of M31 (cont)

by Willie Stickley



Hewett 1 (Potential GPNe)

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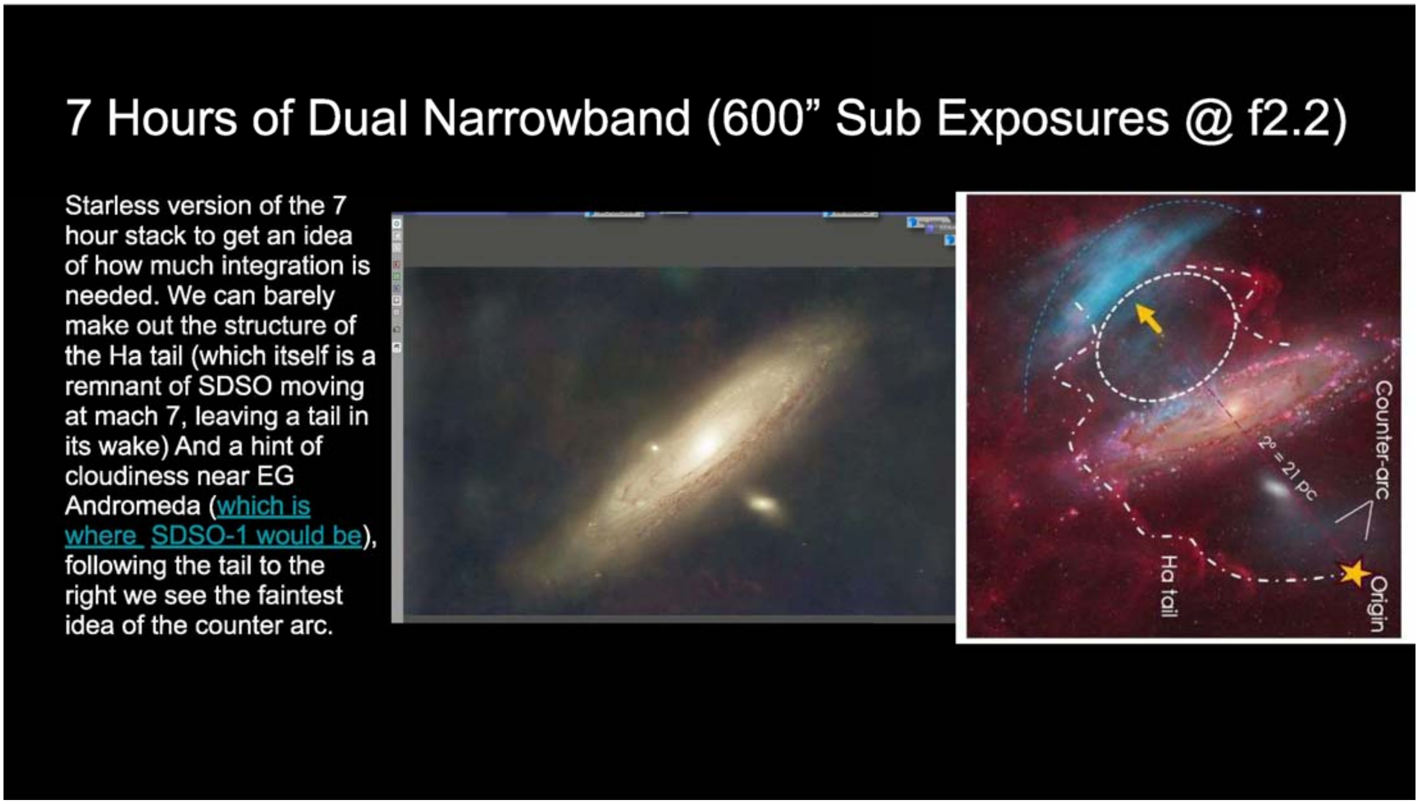
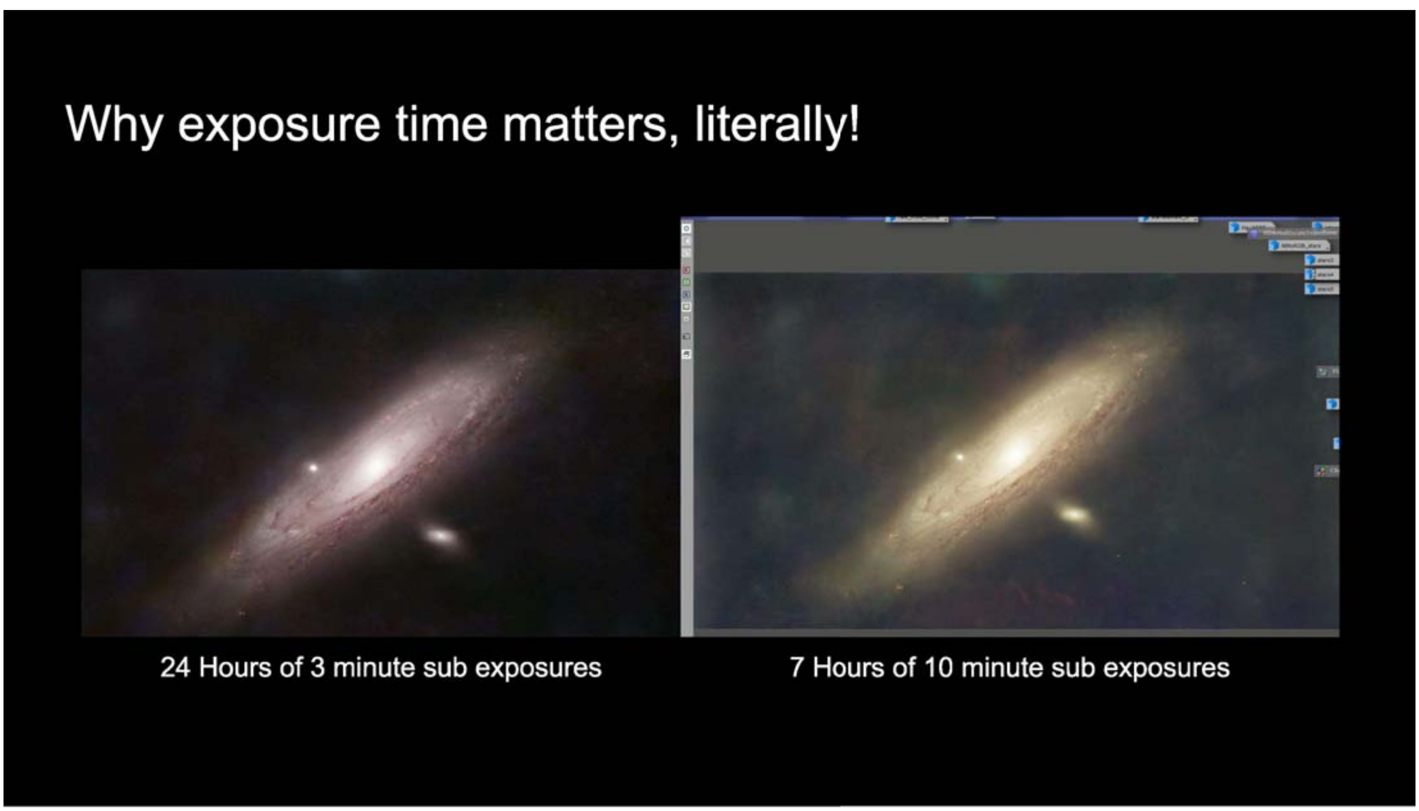
32 Hours of M31 (cont)

by Willie Stickley





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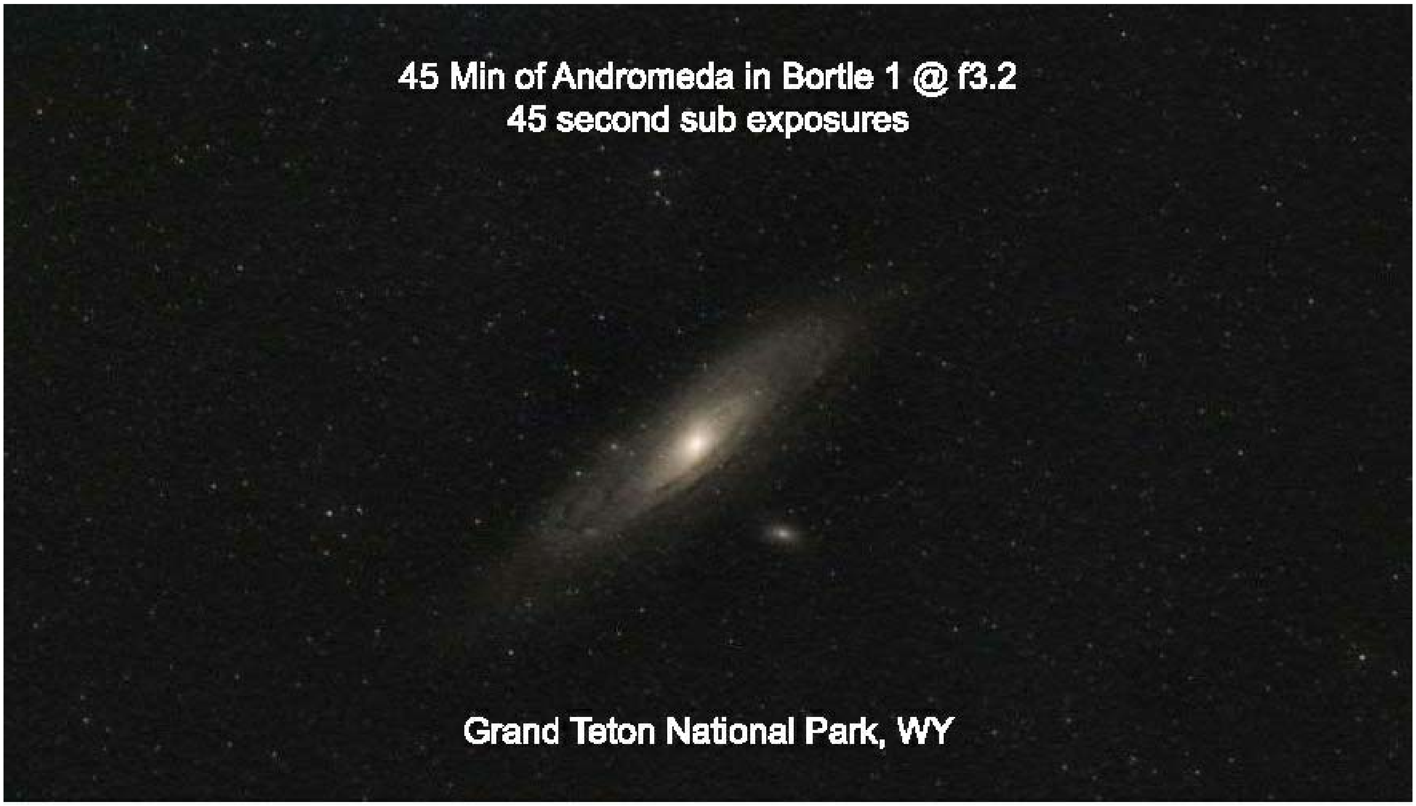
32 Hours of M31 (cont)

by Willie Stickley



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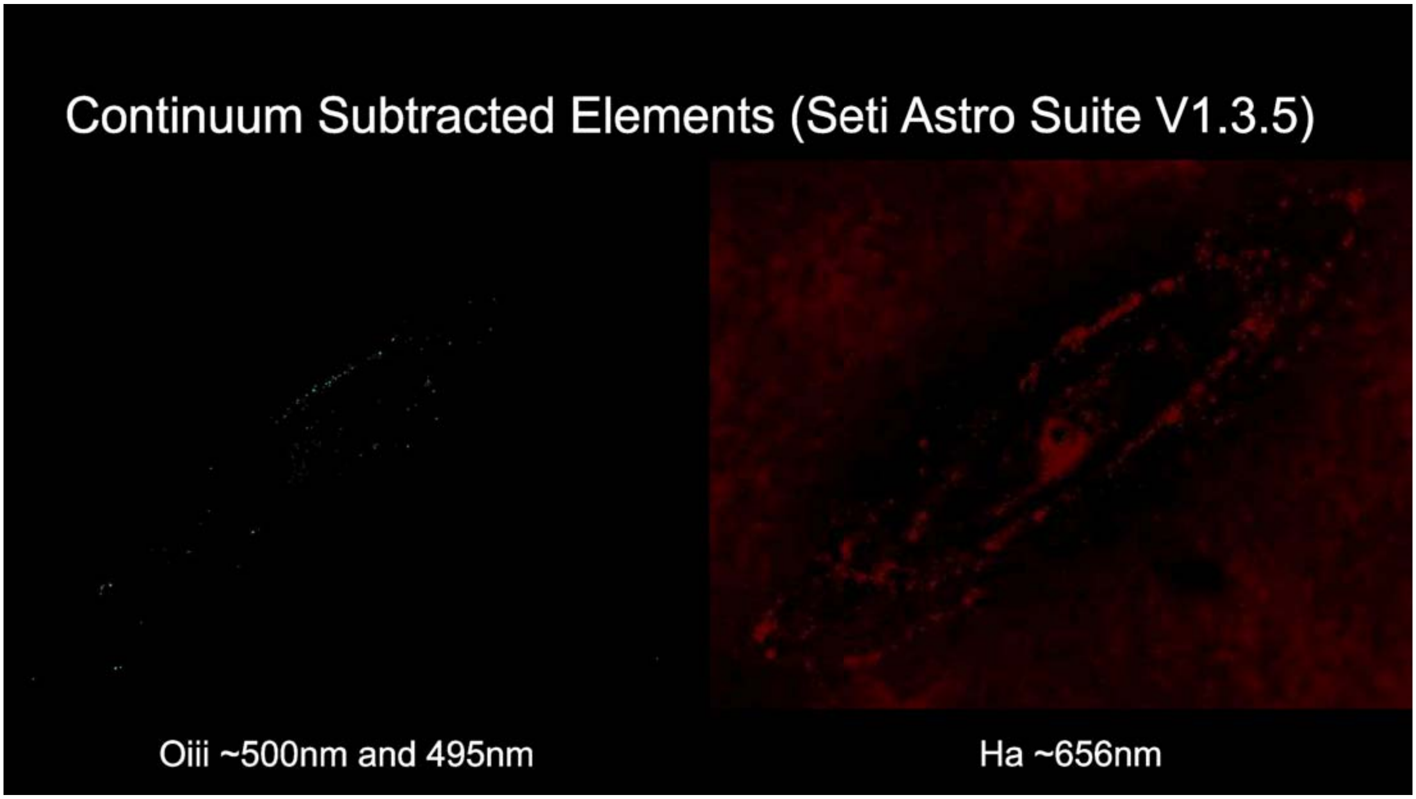
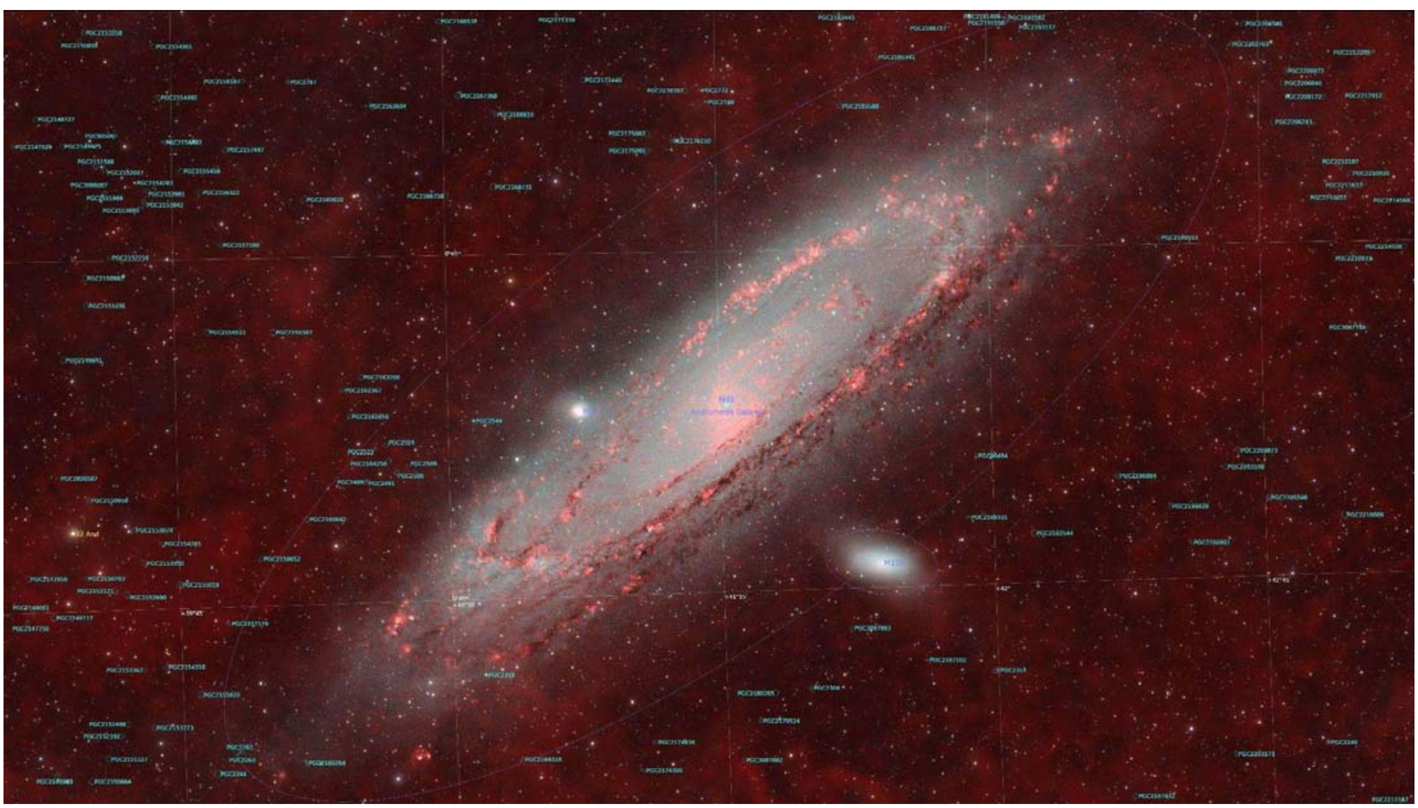
32 Hours of M31 (cont)

by Willie Stickley





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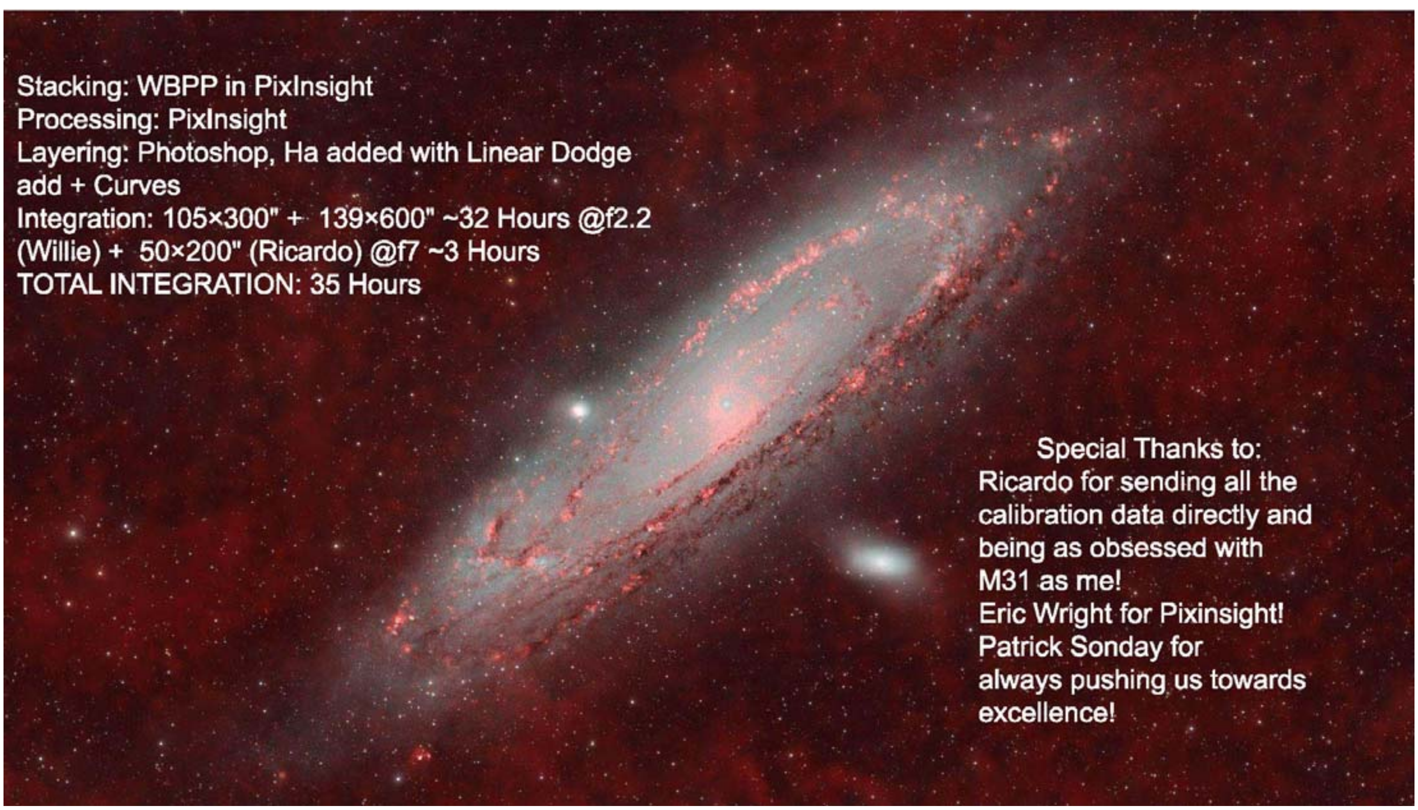
32 Hours of M31 (cont)

by Willie Stickley



End

The Extremely Distant Quasar APM 08279+5255

by Russ Swaney

Twelve billion years ago (87% of the way back to the beginning of time itself!) APM 08279+5255 shot light toward an Earth that **wouldn't exist for another 7.5 billion years**.

Our two locations have been moving apart faster and faster. It's hard to get your head around but the "lookback time" of 12 billion years implies that APM 08279+5255 is now 24 billion light years from "here" (wherever that is).

In our sky, APM 08279+5255 appears as a tiny red 15th-magnitude object in the constellation Lynx.

Image captured with Seestar S50 "smart telescope" – 50 mm F4.5 - 2 hrs. total exposure

It looks red in the photo, but it really shines almost entirely in X-rays that have been stretched out so far that they are visible as red to our eyes. Most of the radiation reaching us from APM 08279+5255 is actually in the infrared, but we can't see that.

The other little faint fuzzy things in the picture are unnamed galaxies that are so tiny and far away that my software can't identify them.

(Continued on next page)

The Extremely Distant Quasar APM 08279+5255 (cont)

by Russ Swaney

The word "Quasar" was coined when I was a child for "Quasi-Stellar Radio source." Quasars were originally detected as super-powerful radio beacons in the sky that showed up as tiny pinpoints of light in the most powerful telescopes of the day. When I first learned about them, nobody could quite figure out what they were.

But science moves on, now I'm old and astronomers know that Quasars are actually supermassive black holes in the centers of galaxies.

One last thing. APM 08279+5255 is probably the most distant object that can be photographed with amateur backyard equipment. It's so insanely far away that even a monster galaxy-eating black hole ought to be too dim for us to image. Luckily, there's another humongous galaxy partway out there in APM 08279+5255's direction that just happens to lie on the same line of sight. That intervening behemoth acts as a gravitational "lens" to focus the light of APM 08279+5255 to a point and makes it WAY brighter than it would otherwise be.

Year-End Carbon Stars

by Martin Mullet

Carbon stars are similar to red giant stars but are differentiated by the large amount of carbon in their atmospheres. They are variable stars- mostly long-period variables- whose color generally varies with magnitude, becoming deeper red at minimum and orange or yellow at maximum. This updated list includes stars well-placed for viewing over the next few months. Some are bright and easy to find, some you'll have to hunt down. Color perception will vary with aperture, magnitude, and your eyes. Remember to take your time: The rods in your eyes are slow to adapt to red light especially at higher magnitudes.

R.A.	Dec.	Star	
18:32.3	**+37.0**	**T Lyr**	Irregular; 7.8«9.6 Mag; spectral class C6
18:42.8	**+37.0**	**HK Lyr**	Irregular; 9.5«11.6 Mag
18:58.6	**+14.4**	**UV Aql**	Period 340 days; 8.6«9.6 Mag; spectral type N
19:04.4	**-05.7**	**V Aql**	Period 353 days; 6.6«8.4 Mag; spectral class N6
19:21.6	**+76.6**	**UX Dra**	Period 168 days; 6.0«7.0 Mag; spectral class N0
19:34.3	**-16.4**	**AQ Sgr**	Period 200 days; 9.1«11.4 Mag; spectral class N3
19:40.9	**+32.6**	**TT Cyg**	Period 118 days; 7.8«9.1 Mag; spectral class N3e
19:57.2	**+44.3**	**HD 189256 Cyg**	7.8 Mag; spectral class N7
20:02.4	**+21.1**	**BF Sge**	Irregular; 8.5«10.0 Mag; spectral class N3
20:05.1	**+20.7**	**X Sge**	Period 196 days; 7.0«8.4 Mag; spectral class N3; 50' to SW of BF Sge
20:10.4	**+36.0**	**RY Cyg**	Irregular; 8.5«10 Mag; spectral type N
20:13.4	**+38.7**	**RS Cyg**	Period 417 days; 6.5«9.3 Mag; spectral class N0
21:35.2	**+78.6**	**S Cep**	Period 487 days; 7.4«12.9 Mag; spectral class N8
21:43.3	**+38.0**	**RV Cyg**	Period 300 days; 7.1«9.3 Mag; spectral class N5
21:56.4	**+22.9**	**RX Peg**	Period 630 days; 8.0«9.5 Mag; spectral type N
23:46.4	**+03.5**	**TX Psc**	Irregular; 5.5«6.0 Mag; spectral class C5; Eastern star in the 'circlet'
00:01.3	**+60.4**	**WZ Cas**	Period 186 days; 8.0«11.0 Mag; spectral type N
00:04.6	**+43.5**	**SU And**	Irregular; 8.0«8.5 Mag; spectral type N
00:14.5	**-07.8**	**AD Cet**	Irregular; 4.9<5.1 Mag; spectral class M3
00:17.6	**+50.3**	**ST Cas**	Irregular; 9.0«10.5 Mag; spectral type N
00:19.9	**+44.7**	**VX And**	Period 376 days; 8.0«9.5 Mag; spectral class N7
00:27.6	**+35.6**	**AQ And**	Period 332 days; 6.9«8.2 Mag; spectral type N

(Continued on following page)

Year-End Carbon Stars (cont)

by Martin Mullet

04:40.4	**-19.7**	**54 Eri**		4.32 Mag; spectral class M4; ADS 3380
04:51.2	**+68.2**	**ST Cam**		Period 195 days; 7.0«8.4 Mag; spectral class N5
04:51.6	**+28.5**	**TT Tau**		Period 166 days; 8.0«10 Mag; spectral class N3
04:59.6	**-14.8**	**R Lep**	**Hind's Crimson Star**	Period 432 days; 5.9«11 Mag; Mira-type
05:03.2	**+60.6**	**EL Aur**		Irregular; 8.5«8.7 Mag; spectral class N5
05:05.4	**+01.2**	**W Ori**		Period 212 days; 8.6«11.1 Mag; spectral class N5
05:09.1	**+39.0**	**TX Aur**		Irregular; 8.5«9.2 Mag; spectral class N4.5
05:27.1	**+34.2**	**S Aur**		Period 590; 8.2«13.3 Mag; spectral class N5
05:33.2	**+07.2**	**RT Ori**		Period 321; 8.0«8.9 Mag; spectral class N5
05:41.0	**+68.8**	**S Cam**		Period 327; 7.7«11.6 Mag; spectral class N6
05:35.8	**-25.7**	**SZ Lep**		Period 83; 7.4«7.9 Mag; spectral class N3.5
05:45.6	**+20.7**	**Y Tau**		Period 242; 6.5«9.2 Mag; spectral class N5
05:48.1	**+30.6**	**FU Aur**		8.3«8.5 Mag; spectral class N6
06:10.9	**+26.0**	**TU Gem**		Period 230; 7.4«8.4 Mag; spectral class N5
06:24.0	**+47.7**	**V Aur**		Period 333; 8.5«13.0 Mag; spectral class C6
06:25.5	**+14.7**	**BL Ori**		Period 154; 6.0«7.0 Mag; spectral class N5
06:26.2	**+19.1**	**AB Gem**		Period 223; 9.3«10.5 Mag
06:34.7	**+42.5**	**RV Aur**		Period 229; 9.9«10.4 Mag; spectral class C5
06:36.5	**+38.5**	**UU Aur**		Period 235; 5.1«7.0 Mag; spectral class N5
06:42.1	**+31.5**	**VW Gem**		Irregular; 8.1«8.5 Mag; spectral class C5
06:53.2	**-04.6**	**GY Mon**		Irregular; 8.1«8.5 Mag; spectral class N5
07:01.0	**-03.3**	**V614 Mon**		Period 60; 7.0«7.4 Mag; spectral class J3.5
07:06.9	**-07.5**	**RY Mon**		Period 456; 7.5«9.2 Mag; spectral class N5
07:08.1	**-11.9**	**W CMa**		Irregular; 6.4«7.9 Mag; spectral class N5
07:08.7	**+10.0**	**R CMi**		Period 338; 7.3«11.6 Mag; spectral class C4
07:21.7	**+69.6**	**RU Cam**		Period 22; 8.1«9.8 Mag; spectral class C0
07:31.9	**+24.5**	**NQ Gem**		Period 58; 7.4«8.0 Mag; spectral class C6
08:55.3	**+17.2**	**X Cnc**		Period 195; 5.6«7.5 Mag; spectral class N5
08:56.7	**+19.9**	**T Cnc**		Period 282; 7.6«10.5 Mag; spectral class N5

If you're successful with these, the Astronomical League has a Carbon Star Observing Program of 100 carbon stars. Check it out at www.astroleague.org/content/carbon-star-observing-club .

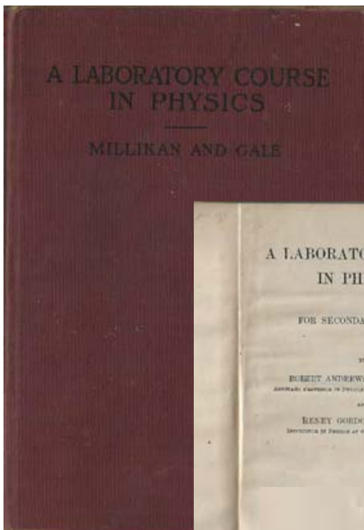
A Laboratory Course in Physics (circa 1906)

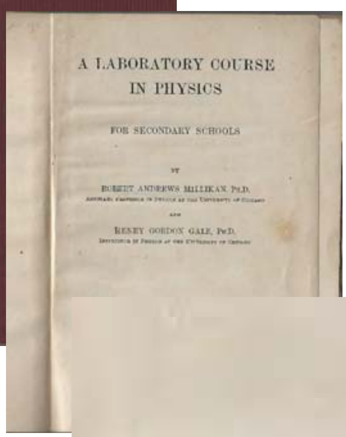
Chris Powell

As mentioned in the fall 2022 issue of the VSW, I picked up a battered copy of "A Laboratory Course in Physics" by Robert Andrew Millikan, PhD (Noble Prize for Physics in 1923) and Henry Gordon Gale, PhD, published in 1906 (cover and title page below). This work was selected by scholars as being culturally important, and part of the knowledge base of civilization as we know it. The work is in the public domain in the United States, and it was encouraged to be freely copied and distributed. The book includes fifty-one experiments starting with the determination of Π (pi) and ending with an experiment on photometry. This series of excerpts started with the ten experiments on optics which I thought might be of the most interest to our members. Having concluded these in past issues, we proceeded to the earlier experiments. In this issue we have Experiments No. 19, Specific Heat; and No. 20, The Mechanical Equivalent of Heat.

As before, homework will be left as an exercise for our members.

(Begin below and on the following pages)





A LABORATORY COURSE
IN PHYSICS

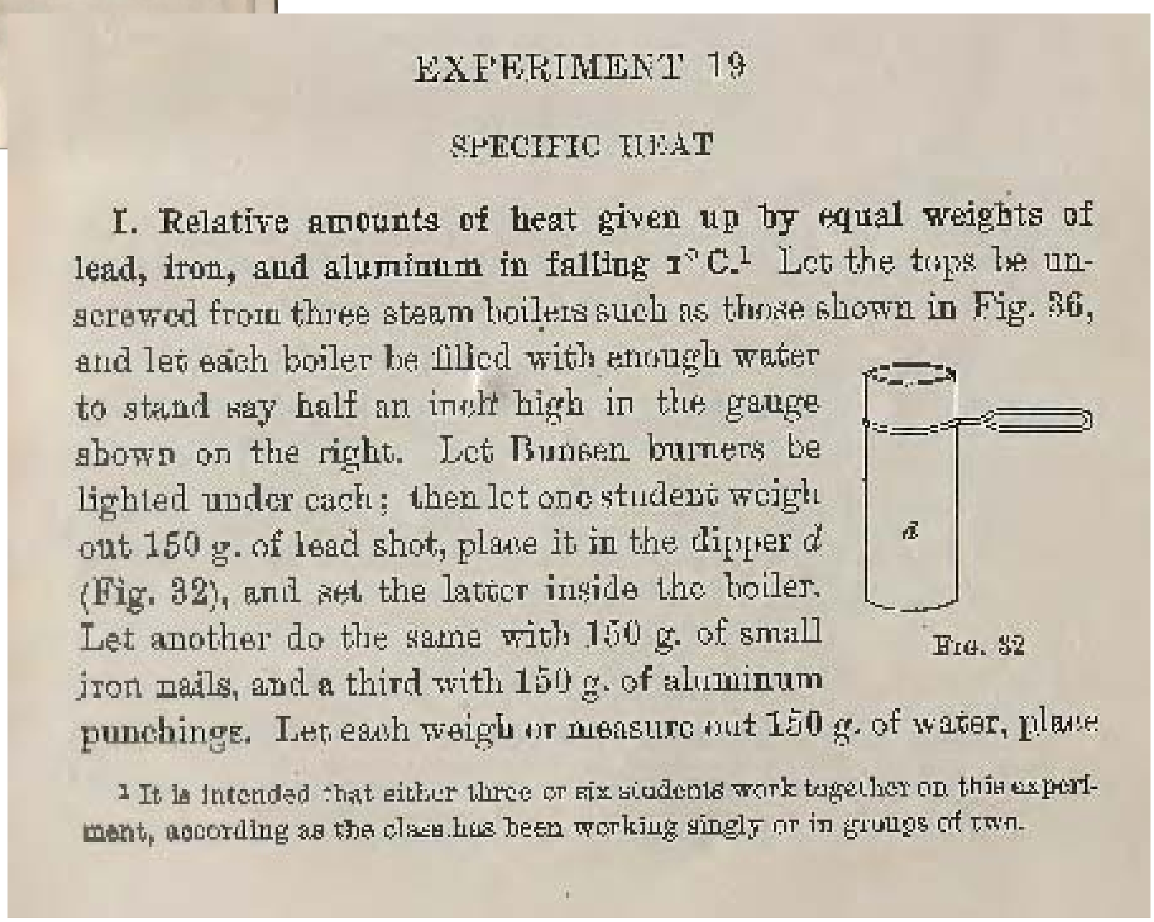
FOR SECONDARY SCHOOLS

BY

ROBERT ANDREWS MILLIKAN, PH.D.

AND

HENRY GORDON GALE, PH.D.



EXPERIMENT 19

SPECIFIC HEAT

I. Relative amounts of heat given up by equal weights of lead, iron, and aluminum in falling 1° C.[1] Let the tops be unscrewed from three steam boilers such as those shown in Fig. 36, and let each boiler be filled with enough water to stand say half an inch high in the gauge shown on the right. Let Bunsen burners be lighted under each; then let one student weigh out 150 g. of lead shot, place it in the dipper *d* (Fig. 32), and set the latter inside the boiler. Let another do the same with 150 g. of small iron nails, and a third with 150 g. of aluminum punchings. Let each weigh or measure out 150 g. of water, place

Fig. 32

[1] It is intended that either three or six students work together on this experiment, according as the class has been working singly or in groups of two.

A Laboratory Course in Physics (Circa 1906) (cont)

it in one of the cylinders used in Experiment 3, and bring it to the temperature of the room. Let each student take and record the temperature of the water in each of the three cylinders.

After the water has been boiling for about five minutes in each boiler, let each student quickly pour the contents of his dipper into the water in his cylinder; then let him stir the mixture for at least half a minute and take the final temperature in each of the three vessels. (At this point let each student, in preparation for II, fill his dipper with dry shot until dipper and shot weigh between 800 g. and 900 g.; then let him take the weight exactly, place in the boiler, and sink his thermometer in the shot so that the bulb is well down toward the bottom.) Since, in the above experiment, equal weights of the three metals have been raised to the same temperature and then plunged into equal quantities of water at the same temperature, if the final temperatures are different, what conclusion must you draw regarding the capacities for giving out heat which equal weights of different bodies have per degree fall in their temperatures?

The number of calories of heat required to raise the temperature of 1 g. of a substance 1° C., or the number of calories given out by 1 g. in cooling 1° C., is called the specific heat of the substance.

Record in your notebook what, in a general way, your experiment shows about the relative specific heats of different metals, and about how many times it shows the specific heat of aluminum to be greater than that of iron, and that of iron to be greater than that of lead. (These specific heats must be approximately proportional to the three temperature changes, since each metal has fallen through approximately the same number of degrees, i.e. from about 100° to about the temperature of the room.)

II. Accurate determination of the specific heat of lead. Weigh the inner vessel *i* of the calorimeter of Fig. 31; then prepare some water whose temperature is about 12° C. below that of

A Laboratory Course in Physics (Circa 1906) (cont)

the room. Pour about 200 g. of it into the calorimeter. Weigh again, and replace the calorimeter in its jacket *o* (Fig. 31).[1]

With a glass rod or a pencil stir the shot in the dipper, and after it has been heating for fifteen minutes or more record the temperature indicated by the thermometer immersed in it.

Transfer the thermometer to the cold water in the calorimeter and stir thoroughly. When its temperature reaches some convenient point, which should not be less than 8° C. below the temperature of the room, quickly pour the shot from the dipper into the water. (If dew has collected on the outside of the inner vessel, wipe it all off just before mixing.)

Stir the mixture for about two minutes, then take the final temperature. Weigh the dipper, then tabulate results as follows:

Weight of dipper + shot	= 1201 g.
Weight of dipper alone	= 103 g.
∴ Weight of shot alone	= 1098 g.
Weight of calorimeter	= 157 g.
Weight of calorimeter + water	= 415.9 g.
∴ Weight of water alone	= 258.9 g.
Temperature of room	= 22° C.
Temperature of shot	= 98.5° C.
Initial temperature of water	= 12.8° C.
Final temperature of mixture	= 22.3° C.
Rise in temperature of water	= 9.5° C.
Water equivalent of calorimeter, from Experiment 18	= 14.7 g.
Weight of water + water equivalent	= 273.6 g.
Number of calories absorbed by water + calorimeter	= 2599
Fall in temperature of shot	= 76.2° C.
∴ Heat given up by shot per gram per 1° C. = specific heat of lead	= .0311
Accepted value	= .0315
Per cent of error	= 1.3

[1] If the laboratory is not equipped with calorimeters, use instead the cylinder of Part I without any jacket. In this case make the weights of water in the cylinder and of lead in the dipper one half of the above amounts.

A Laboratory Course in Physics (Circa 1906) (cont)

State in your notebook what you understand to be represented by the quantity which you have found.[1]

When the shot and the water were mixed the changes in the temperature of each took place very rapidly at first, but very slowly as the temperature of each approached the final value. Can you see a reason, therefore, why it was advisable to choose the conditions so that the final temperature should be close to the temperature of the room? Remember in your answer that it was necessary to wait two or three minutes for the mixture to reach its final temperature, and that a body which is hotter than the room is always losing heat to the room, while one which is colder than the room is always gaining heat from it. It is these losses of heat by radiation which constitute the greatest difficulty in the way of accurate measurements by the method of mixtures.

[1] A further very interesting experiment which may be inserted for the benefit of those who have time and inclination for extra work is the following.

To find the temperature of a white-hot body. By means of a thin copper wire suspend from a support placed from 50 cm. to 100 cm. above the table a piece of copper rod about 2 cm. long and 12 mm. in diameter. Adjust the length of the suspension so that the copper hangs in the hottest part of a Bunsen flame (just above the inner cone).

Weigh a calorimeter of 300 cc. capacity; then fill it about half full of water whose temperature has been reduced 12° or 15° below that of the room, and weigh again. Then replace it in its jacket.

After the copper has been heating for about ten minutes take the temperature of the water very carefully (it should now be from 8° to 10° below the temperature of the room); then, all in the same second, remove the flame and lift the calorimeter so as to bring the white-hot copper to the bottom of the vessel of water.

Stir the water thoroughly for one or two minutes; then take the final temperature.

Weigh the copper rod and with it as much of the copper wire as was immersed.

Assuming that .095 calories (the specific heat of copper) came out of each gram of copper for each degree of fall in its temperature, calculate what was the temperature of the white-hot copper.

Duplicate conditions as nearly as possible and see how closely two observations will agree.

A Laboratory Course in Physics (Circa 1906) (cont)

Why was it unnecessary to attempt to weigh the shot to tenths of a gram?

After the experiment spread out the shot in a thin layer on a cloth to dry.

EXPERIMENT 20

THE MECHANICAL EQUIVALENT OF HEAT

The object of this experiment is to show that when a falling body strikes the earth the kinetic energy of the moving mass is transformed into the energy of molecular vibrations, i.e. into heat, and to find how many gram meters of mechanical energy must disappear in order to produce 1 calorie of heat. This quantity is called the "mechanical equivalent of heat." It is obtained by finding the rise in the temperature of shot when it falls through a known height.

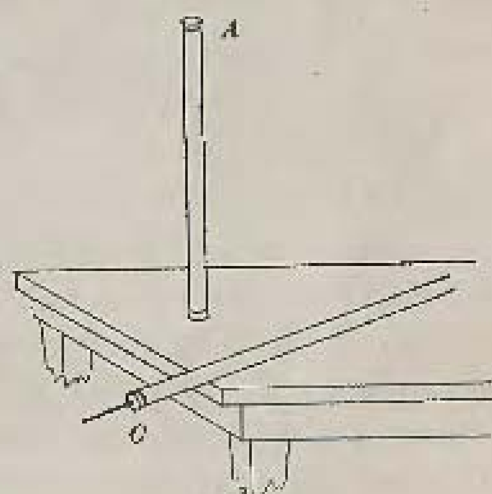


FIG. 33

Pour about 2 kg. of dry shot into a metal vessel and set it in a cool place, e.g. in a bath of ice water, until its temperature is 5° or 6° below that of the room.

Pour this shot into a paper tube (Fig. 33) about a meter long and 5 cm. or 6 cm. in diameter, made by rolling up a large number of turns of heavy brown paper and then securing them with glue and string. The tube should be closed with two tightly fitting corks.

Mix the shot very thoroughly by shaking the tube, and by slowly inclining it so that the shot will run from end to end.

A Laboratory Course in Physics (Circa 1906) (cont)

In so doing, however, grasp the tube near the middle rather than at the ends, for it is desirable that the temperature of the ends be not influenced by the heat of the hands.

After inverting in this way from five to ten times, remove the upper cork *A* and insert cork *C* (Fig. 33), through which passes a thermometer; then gradually incline the tube until all the shot has run down to the thermometer end and there completely surrounds the bulb.

Holding the tube inclined as in the figure, twist the thermometer about in the shot for about two minutes, and then take the temperature. If this is more than 2° or 3° below the temperature of the room, continue the shaking and rolling of the shot from one end to the other until its temperature has risen to within about 3° C. of that of the room.

Record this temperature, quickly replace cork *C* by cork *A*, hold the tube upright as in the figure, and turn it completely over say seventy times in rapid succession, placing the lower end on the table at each reversal, so that the falling shot may not force out the corks. At each reversal the potential energy acquired by the shot in being lifted the length of the tube is converted into kinetic energy in the descent, and this kinetic energy is all transformed into heat energy at the bottom. On account of the poor conductivity of the cork and paper practically all of this heat goes into the shot, and but an insignificant portion of it into the corks and tube.

After the seventy reversals very quickly replace cork *A* by cork *C*, and take as before the final temperature of the shot.

Remove cork *C*, set the tube on end, and measure the distance from the top of the shot to the position which was occupied by the bottom of cork *A*. This is the mean height through which the shot has fallen at each reversal.

The total quantity of work which has been transformed into heat is the weight W of the shot $\times$ the height h of fall

A Laboratory Course in Physics (Circa 1906) (cont)

(expressed in meters) × 70. The number of calories of heat developed is the weight of the shot W × its specific heat (.0315) × the rise in temperature $(t_2 - t_1)$. Hence, if J represent the number of gram meters of energy in a calorie, we have

$$J \cdot W \times (t_2 - t_1) \times .0315 = 70 \cdot W \cdot h.$$

$$\therefore J = \frac{70\,h}{(t_2 - t_1)\,.0315}.$$

It will be noticed that the weight W of the shot cancels out; hence it need not be taken.

In the above directions the attempt is made to eliminate radiation and conduction losses by making the initial temperature of the shot about as far below the temperature of the room as the final temperature is to be above it. This is the usual way of eliminating radiation, when, as in this case, the change in temperature between the readings of the initial and final temperatures takes place rapidly and at a uniform rate.

Repeat the experiment several times if time permits. Record the results thus:

		First trial	*Second trial*	*Third trial*	
Temperature of room	=	18.5° C.	18.5° C.	18.5° C.	Mean value
Initial temperature	=	16.0° C.	17.1° C.	16.7° C.	= 437 g. m.
Final temperature	=	21.7° C.	22.6° C.	21.0° C.	Accepted value
Number of reversals	=	100	100	80	= 427 g. m.
Height of fall (h)	=	.70 m.	.76 m.	.76 m.	
Mechanical equivalent	=	423 g. m.	439 g. m.	449 g. m.	% of error = 2.4

What conclusions do you draw from your experiment?

The chief source of error in the experiment arises from the fact that the thermometer requires considerable time to come to the temperature of the shot. During all this time the shot is gaining or losing heat by conduction and radiation, so that the temperature indicated may not be quite the mean temperature of the shot. This source of error is unavoidable.

Why did we attempt to have the initial temperature as far below the temperature of the room as the final temperature was above it?

EXPERIMENT 21

COOLING THROUGH CHANGE OF STATE

I. Solidification a heat-evolving process. The object of this experiment is to show that just as it requires an expenditure of heat energy to melt ice or any other crystalline substance, so when water or any liquid freezes, i.e. changes back to the crystalline form, heat energy is given up to the surroundings.

Support vertically in a burette holder or other clamp a test tube in which has been placed enough loose crystals of acetamide to fill it about a third full. Then heat gently with a Bunsen burner until the crystals are all melted.[1] Slowly insert a thermometer into the liquid, but watch the thread all the time, and if it rises to within half an inch of the top of the bore, instantly remove the bulb from the liquid. *The thermometer will burst under the force of expansion of the mercury if the thread reaches the top of the bore.* If there is an expansion chamber at the top, this danger is of course avoided. If there is no expansion chamber, it will be safer to melt the acetamide by dipping the tube into boiling water rather than by applying the flame directly.

As soon as the liquid acetamide has cooled down to about 100° C., insert the thermometer in it permanently, and without touching further either the tube or the thermometer, watch carefully both the liquid and the thread of mercury as cooling takes place. The temperature may fall as low as 60° C. before crystallization begins. As soon as crystals begin to form, what sort of a temperature change do you observe? What conclusion do you draw from this observation? Watch the temperature for

[1] If the acetamide has absorbed much moisture, boil it.

A Laboratory Course in Physics (Circa 1906) (cont)

two or three more minutes and decide whether or not the temperature of a solidifying liquid remains constant during the process of solidification. Since it is giving up heat rapidly all this time, it must get it from some source. What must this source be?

II. The curve of cooling. Again raise the temperature to 100°C, taking the precautions mentioned above against breaking the thermometer. Record the temperature every half minute as the

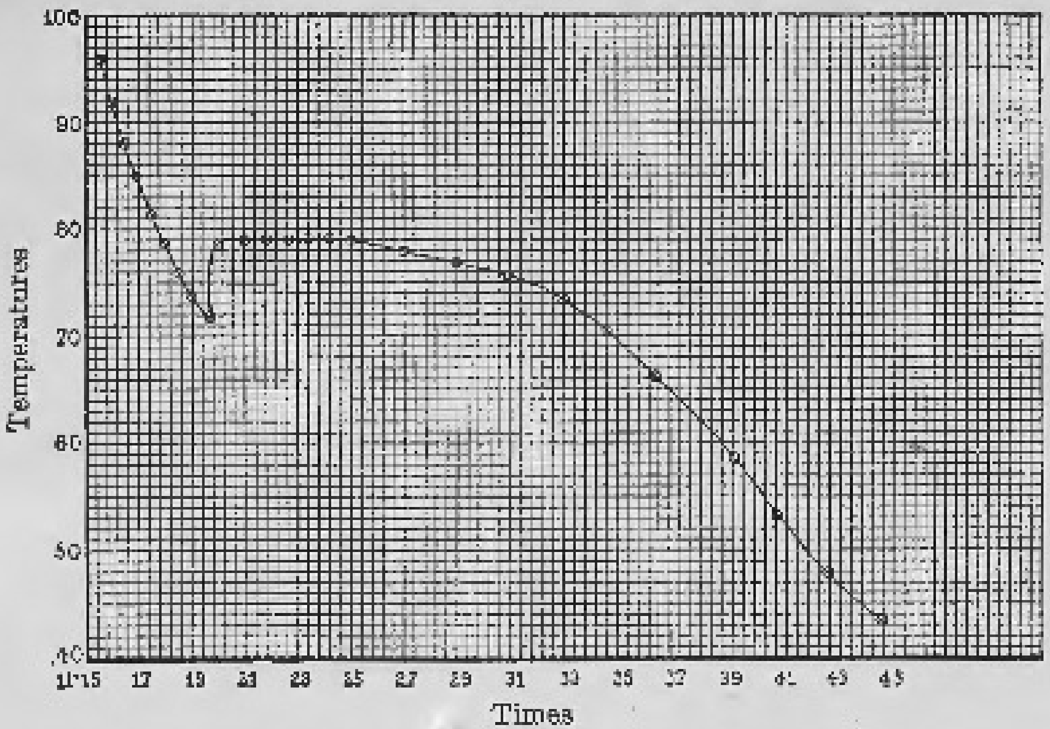


Fig. 34

substance cools from about 100° C. to 45° C. Plot these observations in the manner shown in Fig. 34, temperatures being represented by vertical distances and times by horizontal distances. Thus the observations plotted in the figure began at 11:15 A.M. and continued to 11:45 A.M. The curve shows that between 11:15 and 11:19.5 the temperature fell rapidly from 100° to 71.8°, that it then rose suddenly to 79°, remained there five minutes, then fell slowly during the next twenty minutes from 79° to 43.5°.

2007 - North Observatory Construction Part II

Steve Fishman

2007 had one major and one smaller project at Indian Hill. In April, Marty Niemi reported that electrical outlets at Indian Hill were in operation, and we had wireless internet access at the Hill thanks to Russ Swaney. In early June, Marty brought a "Ground Hog Model HD 99" post hole digger with his truck to Indian Hill. Photos show Marty digging 2 piers inside the North Observatory which were installed with a 12 ½ inch and a 10 inch scope. On the outside, Marty along with Russ Swaney, Dan Rothstein, Steve Kainec and Vickie Ford with her husband dug holes behind the North Observatory to create a roll-off roof. The project was completed in August and a photo shows Marty enjoying the final project with the 2 mounted scopes, wiring completed and working interior outlets.

Above: Marty Neimi in the North Observatory, with a post hole digger for a pier.

Above Right: Marty making progress with the post hole digger.

Right: Marty working on the project to make a roll-off roof for the North Observatory.

2007 - North Observatory Construction Part II (cont)

Steve Fishman

Left: Marty and Dan Rothstein drilling more holes for the piers that will support the roll-off roof.

Above: Russ Swaney and Vickie Ford's (CVAS member not in photo) husband preparing the concrete mix.

Right: Steve Kainec cleans out the hole to prepare for concrete insertion.

Right: North Observatory needs railing on new on new construction to complete project.

Below: Marty enjoys 2 scopes in roll-off roof.

2007 - North Observatory Construction Part II (cont)

Steve Fishman

The smaller project was run by Dan Rothstein where he poured a pier near the North Observatory to mount a 12 ½ inch scope. A photo shows the pipe mount, scope and Dan putting the mirror in the scope.

Above: Dan Rothstein preparing a pier for the 12.5 inch scope near the North Observatory.

Above Right: Dan installs the mirror in the 12.5 inch scope.

Star parties were scheduled at multiple locations throughout the year starting at The Rookery in February, Swine Creek, North Chagrin, Astronomy Day at the Cleveland Museum of Natural History and the annual Pen Glen Super Star Party. Dan Rothstein noted that construction of the future Observatory Park was to start spring 2008 pending additional funding.

Above Left: Vickie Ford with the CVAS display during April Astronomy Day at the Cleveland Museum of Natural History.

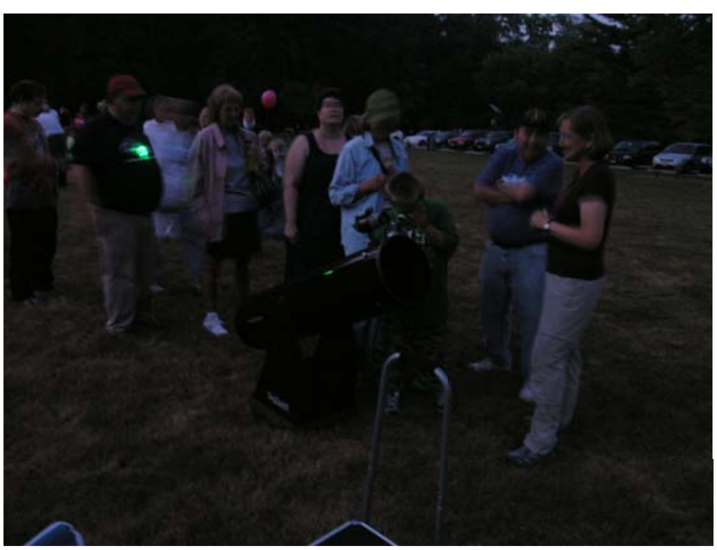
Above Right: Chagrin Library Display. CVAS display at the Chagrin Falls Library.

2007 - North Observatory Construction Part II (cont)

Steve Fishman

Left: June OTAA convention at Indian Hill. Joe Petrick, Mike Williams (from Cuyahoga Astronomical Association), Dale Chapman, Marty Niemi, Sam Bennici and Tom Quisenberry inspect the upgraded construction of the North Observatory.

Below: Two f three of Keith Richards children visit our OTAA convention. Kimmie at left and Keith Junior in olive shirt. Seated is Larry Boros.



Opposite Above: Dan Galdun, Ron Baker and Vickie Ford at Lake County Penitentiary Glen Super Star Party prepare for evening presentation.

Above: Steve Kainec (grey sweatshirt) and Mariah Pasternak on the observing field at the Pen Glen Super Star Party.

Left: Roseanne Radgowski at a July star party in North Chagrin Reservation.

2007 - North Observatory Construction Part II (cont)

Steve Fishman

Two other significant events to close out 2007. At the October meeting, CVAS awarded Marty Niemi the Backbone Award recognizing his many contributions from when he joined CVAS in 1998. And, second, below is an article from a mid-2007 Valley Skywatcher highlighting honorary member Larry Lovell. Per Ian Cooper, the teenage CVAS members discovered Larry from an article in Chagrin Valley Herald. Larry did lunar mapping (we have his maps) then photometry. Larry became a mentor to CVAS members in the mid-60's and I've included a few photos from that period where Larry discusses various astronomy topics with much younger CVAS members. Art Stokes (the namesake of our Stokes 16 inch reflector) is also in 1 of those photos. Ian also tells me that Larry had a 4-inch refractor, gave Ian a 10-inch Cassegrain that Ian gave to Observatory Park. Lastly, Larry gave Ian the 18-inch telescope which is now belongs to CVAS.

Below: From a 2007 Valley Skywatcher article noting CVAS acquisition of Larry's 18 inch.

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Hickox Observatory Closes

An important piece of Chagrin Valley Astronomical Society history ended in April of 2007 when Hickox Observatory was closed for the last time. Mr. Larry Lovell, who is the only one left of the three original three Honorary CVAS Members, had to sell his property on Munn Road in Auburn because he could no longer maintain it. Before he sold his home and observatory be gave his historic photoelectric photometry equipment to the Geauga Park system, his 18 inch reflector to a CVAS member, and all of his observatory records and assets (star charts and books) to CVAS or it's members.

Mr. and Mrs. Lovell took six teenage amateur astronomers and taught us how to do relevant science, and to become reliable variable star observers. They showed us how amateur astronomers can contribute to important research. Three of the six CVAS members went on to work for NASA .

The Latin inscription over the door to Mr. Lovell's observatory door read:

"Observo Ergo Sum"

which means

"I Observe Therefore I Am".

2007 - North Observatory Construction Part II (cont)

Steve Fishman

Above Left: Marty Niemi receives the CVAS Backbone Award at October meeting to recognize his many years contribution to upgrading CVAS property and telescopes.

Above Right Tom Quisenberry displays a plaque at our June OTAA honoring Larry Lovell.

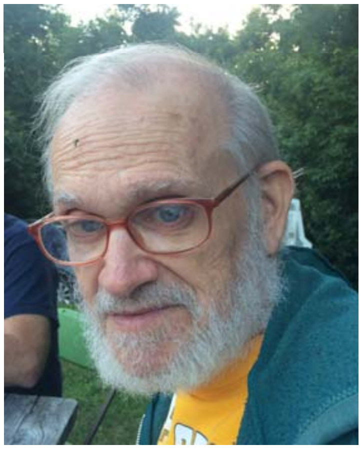
Left: Larry Lovell, mentor to CVAS members in the mid-60’s at his Auburn, Ohio observatory.

Left: Larry Lovell mentoring Denny Jefferson.

Above: Tony Mallama (in glasses at left) and Art Stokes at right reviewing (maybe) photometric observations.

Constellation Quiz

Dan Rothstein



This month's questions

1. Locate Iwa Keli'i, the Hawaiian asterism known as Chief Frigate Bird, whose shape is similar to one of our major groupings.
2. Find Al-Sufi's Nebula, described by a modern author as a "snail-like" asterism.
3. Identify the Southern Albireo.
4. here is the Japanese asterism composed of Gin-boshi (Silver Star) and Kin-boshi (Golden Star)?
5. Bonus: What is the only M object not in the NGC Catalog? This is less about the constellations as it is about nomenclature, since you don't need to observe anything to solve it. It is in all of the subsequent enlargements of the NGC, such as the IC. There are other M objects which were broken up into multiple NGC objects, that are not listed as a single NGC object.

Answers to last issue's questions:

1. Locate Proboscis Major.

   Proboscis Major and Proboscis Minor are the inner parts of the "wings" that are visible in the Orion Nebula at low to medium power. The names of regions of the nebula date to the drawings of the nebula in pre-photographic times by John Herschel with his 18 inch speculum in 1826 and by others who later elaborated on his observations with the largest telescopes of the day. The work was initiated to see if regions of the nebula exhibited any short-term changes in form or brightness, as some had claimed. None were found. Herschel's names given to different parts of the nebula are derived from "rude resemblance to the head, snout, and jaws of some monstrous animal." There are also regions named after various astronomers who made early observations of the nebula. Regio Huygeniana (Huygen's Region) surrounds the Trapezium. Herschel honored him because he mistakenly believed that Huygens had discovered the nebula in Newton's time. The southern part of this region corresponds to the upper part of the head of the monstrous animal. It was subdivided into several parts from west to east:, Occupus (back of the head), Frons (forehead), and Rostrum (beak). Extending eastward from the Rostrum are Proboscis Major and Minor (Greater and Lesser Trunks) with the darkness between them named Regio Messieriana. North of the Rostrum is a prominent dark bar called Sinus Magnus (the Great Gulf) corresponding to the open mouth of the monster (which we now know as the Fish's Mouth) which stretches west nearly to the Trapezium. The Greater and Lesser Trunks sweep away from the center of the nebula like arching wings, Major's wing running southeast with a sharp edge, while Minor's

(Continued on the following page)

Constellation Quiz (cont)

Dan Rothstein

wing sweeps northwest, but isn't so sharply sculpted, extending 2/3 of the way south to ί Orionis, like "a long, bright scimitar" (Lockyer, 1930). The areas of the nebula west of the Trapezium were named after prominent observers of the nebula: Le Gentil, Grand Jean de Fouchy, L. Godin, J. Picard, W Denham, and Huygens. George Bond (Harvard 1860's) wrote: "It is now impossible to see it in any other way as a maze of radiating spiral-like wreaths of nebulosity or filamentary tentacles, the center of the vortex being about the Trapezium."

From: John Ashbrook; Astronomical Scrapbook, The Visual Orion Nebula; Sky and Telescope, Nov, 1975. Alan MacRobert; A Star-Hop in the Heart of Orion; Sky and Telescope; Jan. 1988.

2. One name among many for this M Object is the Lobster. List its other names.

   The Lobster is one of at least a half dozen names for this object. It is also known as the Horseshoe or "The Two", or the Checkmark, or more commonly known as the Omega and the Swan Nebula. It is of course M17, NGC 6618.

   Hugh Bartlett; Binocular Targets for Late Summer; Sky and Telescope; Sept. 2010.

3. Where is the Baby Scorpion?

   The Baby Scorpion (not the Little Scorpion) is located 10° directly south of α Librae (Zubenelgenubi) and west of 3^{rd} magnitude σ Librae, although it is actually across the border in Hydra. It's shape is remarkably like that of it's larger namesake Scorpius 1.5 ° to the east, nearly parallel to it but only 5° long. It's stars are between 5^{th} and 8^{th} magnitude making it an easy target in binoculars. The body includes the tail 59 and 58, then turns northwest to 54 Hydrae. The head and arms are dimmer stars with no Flamsteed designations, twisted relative to the body There are several dimmer stars in between.

   Hugh Bartlett; Binocular Targets for City Nights; Sky and Telescope; June. 2011.

4. Find the Crouton.

   Whatever liquid the bowl of the Big Dipper is carrying, maybe soup, it's got a Sunken Crouton floating in it. The Crouton has the form of a triangle (nearly equilateral) located 3-4 degrees east of M97 and M108, about 4 degrees wide at the top, with the top side nearly parallel to the bottom of the bowl (the 8 degree line between Merak and Phecda). The other two sides meet below the bowl with about 2/3 of the triangle being inside the bowl and 1/3 outside. The stars along the sides are from 5^{th} to 7^{th} magnitude, making the triangle a good target for binoculars. The sides are quite straight, with each side having at least 3 stars on it. Unfortunately, none of the stars have any designations in any of the 4 atlases that I own, so I can't identify any of the stars making up the triangle. There are lots of NGC galaxies in the 3600-4000 range along the sides, especially near the northeastern corner.

   From: Alan MacRobert; A Star-Hop in the Dipper's Bowl; Sky and Telescope, June, 1993. Hugh Bartlett; Binocular Sites for City Nights; Sky and Telescope, June, 2011.

Deep Thoughts on Engineering and Physics

Chris Powell

The following four items are an addition to our continued collection of "Physics and Engineering Folklore". As the term folklore implies, often the original author or source are not clear or known, and multiple and differing versions can be found. However, in the first submission, it is pretty clear that the author is suppose to be known. That in itself may be folklore. All of these have, at least, a bare minimum necessary content of physics or astronomy. And anyway, I thought all of them amusing.

As always, I welcome submittals for inclusion in future issues, which could be passed to me at any of our CVAS monthly meetings or directly to my email at **christopher.powell@earthlink.net**.

The first entry is probably forty years old. It is of course nuclear related and provided for Rob Beers particular amusement. Much of this is inside humor. Ask him to explain, although I think it originated at Clinton, the sister plant to Perry. Does "Cathy" even run anymore? The author did a nice job on the "Meatball".

The second item on the following two pages are circa 2000. I may have included it before, but it is seasonal and I think appropriate for this issue.

St. Nuke

Email from GE LSTG Engineer extraordinaire, Tom Miles
Circa January 4, 2000
From my Nuclear Folklore Folder

Twas the night before Christmas, when throughout the site.
Not a flanged joint was leaking - they was bound up reeeal tight.
Clearance tags hung from equipment with care
In hopes that plant maintenance soon would be there.

Engineering was home all snug in their beds.
"Dear God, please don't call me," they thunk in their heads.
OPS manned the control room. All systems were "go".
The reactor gave off a warm, holiday glow.

When out in the plant there arose such a clatter,
OPS sprang from their chairs to go empty their bladder.
Upper management mobilized "key" personnel
In fear that their bonus might soon be shot to hell.

Meanwhile, security knelt down to pray
That they'd be forced (justifiably) to blow someone away.
When whom should appear through the new metal detectors
But five guys in ties - why, they're INPO inspectors!

The managers shouted, "We've got to look good!
We need a 'SALP 1' like all top nukes should!"
Then they plotted and planned into early next morning
When they gathered the troops to issue this warning:

"Work FASTER! Work SMARTER! Use NTIP and STAR!
Work BACKLOG! Work SYSTEMS! And do your CRs!
Work outage mods, too! RO8 is next fall!
Now status it! Status it! Status it all!"

As swirls of papers from DCP's did fly.
Engineering pondered the problem as precious time flew by.
Oh heavens, Oh mercy what ever shall we do!
We'll bring in work destruction and remove some mods too.

And then a noise in the pipes caused such a fright.
It was going to be one hell of a night.
"The steam dumps are opening" shouted engineer Luke.
We all knew right then, it must be St. Nuke.

Chris Powell

He was dressed in yellow PCs from his head to his toe.
And his suit emitted a green eerie glow.
A bundle of tools he had stuffed in his bag.
He looked the Pentium processor II man getting ready to shag.

His eyes, how bloodshot, but his walk was so spry.
He knew that double time rates soon would apply.
He looked at the pump, all locked up and tight.
To any other engineer, this would take up all night.

With pump specs to guide him, he drew up a plan.
The 5 guys from INPO knew "he was the Man!"
He set straight to his work, no CR's in view.
He worked from the light of his own greenish hue.

With the end of a wrench held tight in his fist.
He banged on the rust heap and gave it a twist.
His hands worked so fast, the wires he did cut.
When he bent over to work and gave it a tuck.

As the dust started to settle, it was a sight to behold.
The new reactor pump stood there before us painted purple and gold.
With a flip of a switch, it started to purr.
The turbine above turned round with a whir.

He sprang to his cushman, to the girls gave a whistle.
And away he drove like a heat seeking missile.
But I heard him exclaim as he drove through the gate.
Call me next year and double the rate!

Merry Christmas!!!
>
……..And Happy Chinese New Year in the Year of the Snake!