Minutes of the Kansas City Area Grotto
March 2021 Business Meeting

Tuesday, March 16, 2021 – 6:30 to 8:00 P.M.
Meeting Held Remotely Via Zoom

The meeting was called to order by president Seth Colston. The following members and guests were present: Jen B, Seth Colston, Jim Cooley, Julie Cottrell, Ginny Friedrich, Bill Gee, Kristen Godfrey, Matthew Hernandez, Rick Hines, Laura Jaynes, Gary Johnson, Jay Kennedy, Nick Kennedy, Richard Raber, Sara Taylor, Hou Zhong

Presentation:

The presentation of the evening was a talk by Bill Gee on caving headlamps, a follow-up to his presentation last month on batteries.

Using a similar setup to the one that he used to test the batteries, Bill compared five lights: Princeton Tec Apex, Stenlight S7, Wowtac A2S, an unbranded 2-cell light, and an unbranded 3-cell light (see the end of the document for direct links to each). For each light, he looked at how much light was produced and how long the light would run on a set of batteries. In addition, he looked at how different batteries change the runtime.

The basic Princeton Tec Apex is probably the most popular light among cavers. At eighty-five dollars, it is moderately expensive, but it comes with a lifetime replacement warranty (which the KCAG has taken advantage of before). It offers a choice of either a spotlight or side lights, each with multiple brightness levels. This light runs on four AA dry cell or rechargeable batteries, weighs 166 grams without batteries, and is reasonably sturdy and waterproof. Over the years, various editions of this light have been released, with some variation in light output between versions.

The Stenlight S7 is also quite popular among cavers, but at $310, it is by far the most expensive light on the list. It runs on two 18650s wired in series, and the price includes one battery and a charger. The Stenlight is small, lightweight (124 grams without batteries), very sturdy, and thoroughly waterproof. It offers four brightness settings, though Bill did not test the brightest setting since the amount of heat produced interfered with his testing rig. The Stenlight gives constant light output due to its regulator circuit and can run on any battery between 6 and 14 volts, including AA and 9-volt batteries, but it requires a specific charger for 18650s, will run batteries down to zero without warning, and has a magnetic switch that can interfere with survey instruments.

The third light that Bill tested is the Wowtec A2S, which looks and functions much like a Zebra or Fenix light. This light costs only thirty dollars and includes one battery with a built-in charger. It runs off a single 18650 battery, is lightweight (85 grams without the battery), and is very sturdy and waterproof. The Wowtec A2S has three brightness levels and a strobe mode, and its beam is wider than the Apex spotlight but not as wide as the Stenlight.

The last two lights that Bill tested are two unbranded batteries that Rick Hines purchased from eBay. Both are very inexpensive and very large, and they give a very broad beam of light. Neither is thoroughly waterproof. Both are made of plastic and are likely not very sturdy, though both come with a built-in battery charger.

The two-cell unbranded battery ($7) can run on either one or two 18650 batteries, weighs 163 grams without batteries, and has two brightness levels and a strobe mode. It will not run batteries down to zero.

The three-cell unbranded battery ($14), on the other hand, can run either one, two, or three batteries. At 232 grams without batteries, it is quite heavy. This light will run batteries down to zero. It offers two brightness levels, a red strobe, and a blue strobe.

There are four common units used to measure light output: three official units (lux, lumen, and candela) and one obsolete unit (candlepower). For his measurements, Bill chose lux, which is a point measurement of light intensity, similar to voltage. A lumen, on the other hand, is one square meter illuminated at one lux of intensity. A lumen depends on the size of the beam, while a lux doesn't, which makes lux a better measurement for comparing lights. This difference can be visualized by imagining water coming out of a hose: the quantity of water put out is similar to a lumen, while lux is the pressure.

In an emergency, 20 lux is enough to get a person out of a cave; 200 lux is sufficient for a cave camp; 2,000 to 3,000 lux is a useful amount of light, especially with a wide beam pattern; and 10,000 lux is "the lap of luxury." For comparison, a UCO candle lantern is about 2 lux. But it is not only brightness that is important in caving: Cavers also need a light that delivers a wide beam rather than a narrow spotlight. The Princeton Apex spotlight beam, for instance, is very bright but is too narrow for most caving, and it is disadvantageous that the side lights and spotlight cannot be turned on at the same time.

For his testing, Bill used several different types of batteries. He tested three 18650 batteries: lithium-ion Garberiel (1000 mAH, though they claim to be 5000 mAh), lithium-ion unbranded purple (3000 mAh), and the batteries that come with the Stenlight (2400 mAh at 7.2 volts). To measure brightness and runtime, he used an old Rasberri Pi Model B (though anyone who wants to create a similar setup can use any Raspberri Pi model) hooked to a TSL2561 sensor. The sensor and light were both placed in an old picnic cooler to block outside light: With the lid on, less than 1 lux of room light entered. A simple Python program recorded the brightness at regular intervals. Bill set an arbitrary cutoff of 20 lux to end the test, though some lights turned themselves off prior to reaching 20 lux.

The results for Bill's testing are summarized below. Several points are worth noting: First, the Apex side lights have a much wider beam, so their brightness is significantly lower than that of the spotlight. Second, the 3-cell battery showed a much lower output on high than on low since the light ran for some time before being measured on high. And lastly, the 215 lux that the Stenlight, for instance, generates on its low setting is not useful for active caving but can get a person out of a cave.

	Output on high (lux)	Output on medium (lux)	Output on low (lux)
Apex spotlight	21,497	13,226	2,642
Apex side light	1,196	~200-1,200 (variable)	147
Stenlight	6,027	5648	215
Wowtac	8,383	2809	447
2-Cell	1,156	no medium mode	449
3-Cell	920	no medium mode	1,151
Stenlight Turbo Mode	12,052	n/a	n/a

See the end of the minutes for more detailed results in the form of annotated graphs. The data files and original presentation document can be found at https://kcgrotto.caves.org/?p=309.

In conclusion, you get what you pay for, and good regulation of light output costs money. The Stenlight is the most expensive light, but it generates a much steadier light output and runs for much longer. Lights powered by 18650s last longer, but AA-powered lights are more convenient since the batteries can be picked up at a store on the way to caving.

Officer Reports:

President: Seth informed the group that the Spring MVOR has been scheduled for April 23-25 in Waynesville, Missouri. Jessica Self is heading the effort, and there will be more details to come.

Vice President: Jim has again been busy scheduling and cancelling trips due to various factors. The Atchison mine trip, for instance, was cancelled due to the collapse of the mine entrance.

Treasurer: Membership dues were due beginning on January 1st and will be overdue at the end of March. Dues can be paid online via Paypal on the grotto's web page (kcgrotto.caves.org) or can be mailed to Bill Gee.

February beginning balance = $2763.87 (Commerce Bank)
Deposit = $
Checks = $
Debit card = $
Bank fee = $5.00
End balance = $2758.87

Income:
Dues - $
Apparel = $
Expenses:
Bank fee = $5.00
==========
February beginning balance = $1239.74 (Paypal)
Merchandise purchase = $
Dues = $30.00
Fees = $1.26
End balance = $1268.48
==========
February beginning balance = $67.00 (petty cash)
End balance = $67.00

Secretary: The January meeting minutes were accepted. I (Ginny) will be moving out of town this year, most likely in May, so anyone interested in picking up the position of secretary from May to the end of the year is encouraged to contact Seth or me.

Quartermaster: No updates. As always, Seth can be contacted about any equipment.

Novice Trip Coordinator: No updates. Jim noted that Krista Bartel was planning to lead a scout trip to Cleveland Cave on the weekend of March 20th.

Fundraising: No updates. Contact Seth Colston (swcy92@gmail.com) or Bill Gee (bgee@campercaver.net) for more information.

Presentations: Please contact Seth Colston at swcy92@gmail.com if you are interested in giving a meeting presentation or have a topic idea. For online meetings, presentations should be in the half hour range rather than an hour long.

The *Guano*: No updates. Anyone interested in contributing a submission to the publication is encouraged to contact Julie Cottrell (origami_fold@yahoo.com) or Seth Colston (swcy92@gmail.com).

MeetUp: There have been few events on MeetUp since there have been no recent open-invitation novice trips, but Seth (swcy92@gmail.com) can still be contacted for any trips to add to the MeetUp schedule.

White Nose Syndrome: See https://caves.org/WNS/ for the most current map of the spread of WNS.

International Year of Caves and Karst (2021): Contact Seth Colston if you have ideas for presentations or want to lead a trip in 2021.

Organization Updates:

NSS: The NSS convention in 2021 may be virtual like the 2020 convention; the decision will be made around May. If it is virtual, the date may be moved to the end of July. (Since the meeting, the decision has been made for the convention to be virtual. See NSS website for more details.)

Carroll Cave Conservancy: Pic's memorial shelter house was discussed at a Zoom meeting early in March. The participants determined that more money is needed before anything can be accomplished, so Shawn Williams volunteered to lead an online donation drive. The plan is to pour a twenty- by thirty-foot concrete pad and build a shelter atop it. Max White is planning to donate sheet metal for the roof of the structure, and Rick Hines will pick up the materials from Carthage once they are available. The dimensions of the sheet metal needed are dependent on the dimensions of the shelter, so more planning may be necessary before Max can donate the metal.

Rita Warden has ordered forty trees to plant around the silo area**,** and a work day was scheduled to plant the seedlings, as well as to remove nails from the lumber currently in the schoolhouse and to move this lumber to the silo.

Missouri Speleological Survey (MSS) and Missouri Caves and Karst Conservancy (MCKC): The next MSS meeting will be held on June 6th in conjunction with a weekend of cave survey in a show cave at Ozark State Park. Jim plans to bring a boat down that weekend to check out some vertical caves and finish some QC work.

Project Updates:

Hickory County: Seth and Gary searched for new caves in Mule Shoe Conservation Area, which previously contained no known caves, on February 28th. On a previous canoe trip, Gary noted twenty or more holes, three to ten feet in height, in a bluff. Upon investigation, Gary and Seth found several potential caves, though due to issues with Hickory County's caving permit system, they were not able to enter any. One of the potential caves had a large entrance, fifteen feet across by 12-15 feet tall, and appeared to have been extensively disturbed by archaeological looters. The other six or so potential caves included a three- to four-foot tall entrance that curves off to the side, a curving opening with flowstone walls, and a promising entrance with a column that appears to be a weathered cave formation.

Cloud 9 Ranch: No updates.

Stark Caverns Survey Project: No updates.

Geronimo Cave: No updates.

Devil's Icebox: There will be one trip in April for the pink planarian count. If there are enough people, the group will split into two teams: one for the planarians and one for surveying. Note

that the number of people is limited for Devil's Icebox trips due to gray and Indiana bat hibernation.

New Membership Nominations: None.

Trip Reports and Other News: In October, Jim will lead a gate-building project in Camden County. There will be an additional trip in April, May, or June to put a gate in the landowner's fence so that the cave gaters will be able to access the cave in the fall. This spring/summer trip may also involve a visit to Fiery Fork and/or Flippen caves.

New Business: Bruce Archenbolt, a landowner, previously announced that he has sold his property ahead of a move to Florida. Jim was recently informed that Bruce's grandson, Chase, was struck by a car in western Missouri and is not expected to survive. Please keep Bruce and his family in your thoughts.

Unfinished Business: Seth Colston confirmed that there was no unfinished business, and the meeting participants chatted briefly before disconnecting.

Upcoming Trips and Events

COVID-19 update: Check with the trip leader before you set out to attend any of these events. Many of the "stay at home" restrictions have been lifted. Restrictions or not, please make your own decision regarding your health. The caves are not going anywhere.

2021 April 23 to 25 – Spring MVOR
Ruby's Landing at Waynesville, MO
For details email to self.caver@gmail.com

2021 May 23 – TENTATIVE! Celebration of Life for Pic Walenta.
2pm to 5pm at The Legacy at Green Hills, 10243 North Green Hills Road in Kansas City, MO
This event is likely to change, so keep checking back.

2021 July 10 – Carroll Cave data logger service trip
Contact bgee@campercaver.net
Fairly easy trip, suitable for newbies to Carroll Cave.

2021 July 11 – Carroll Cave biology and rescue cache service trip to Upper Thunder River
Tough trip, not for newbies. Contact bgee@campercaver.net

2021 July 26 to 30 – NSS National Convention in Weed California
This will be a VIRTUAL convention! http://nss2021.caves.org/

2021 July 23 to 29 – 18th International Congress of Spelology
Lyon, France. http://uis2021.speleos.fr/

2021 July either 24 or 31 – Annual members meeting of Carroll Cave Conservancy
Place and time are not yet determined. This will probably be a Zoom virtual meeting.

2021 Fall MVOR – To be determined.

2021 October. Date not yet determined. Cave gating project in western Camden County, Missouri. Contact Jim Cooley for more information.

2021 October 30 – Carroll Cave annual bat census trip to the Mountain Room
Tough trip, wetsuit required
Contact bgee@campercaver.net.

2022 January 8 – Carroll Cave data logger service trip
Contact bgee@campercaver.net.

2022 – NSS National Convention in the Black Hills of South Dakota
Probably June or July. The web site is not up yet.

2023 – NSS National Convention in Elkton, West Virginia
This is a retry from the canceled/online 2020 event. Dates are not yet determined.

Additional Presentation Information:

Light sources:

Princeton Tec Apex: https://princetontec.com/product/apex/

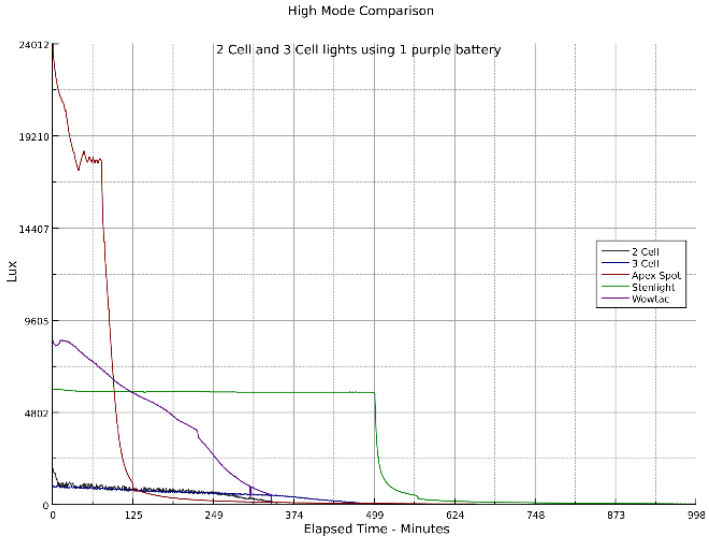
Stenlight S7: http://www.stenlight.com/products.htm

Wowtac A2S: https://www.amazon.com/gp/product/B071HW5XQH

Unbranded 2-Cell: https://www.ebay.com/itm/USB-Rechargeable-Led-Headlamp-Headlight-Head-Lamp-Torch-Flashlight-Waterproof/174578449107

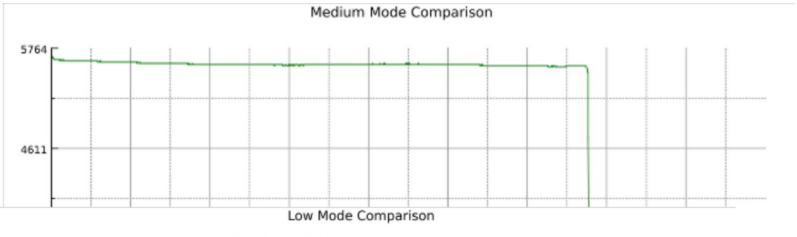
Unbranded 3-Cell: https://www.ebay.com/itm/LED-Headlamp-COB-High-Bright-Head-light-Work-Flashlight-Super-Bright-Waterproof/363249193609

Graphs:



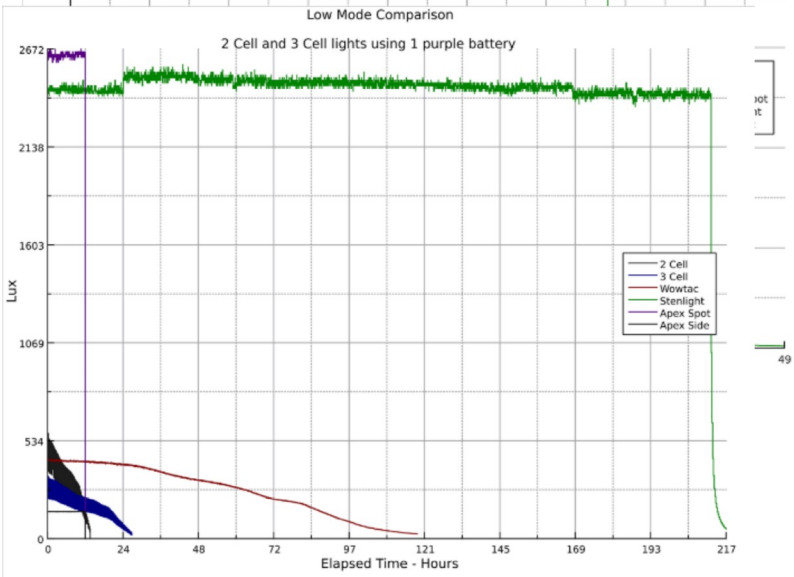
Notes:

The Apex spotlight doesn't last long, the Wowtac output is never flat, and the Stenlight keeps going at a very low level after 500 minutes.



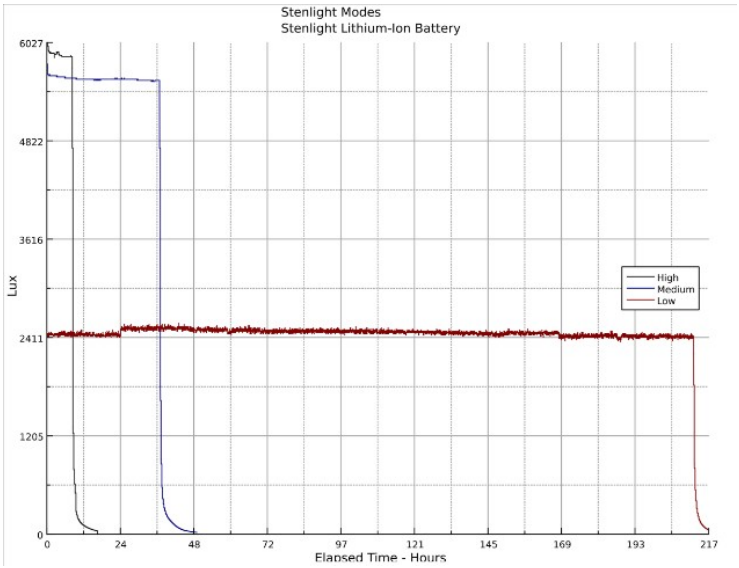
Notes:

The Wowtac shows a steady decline.



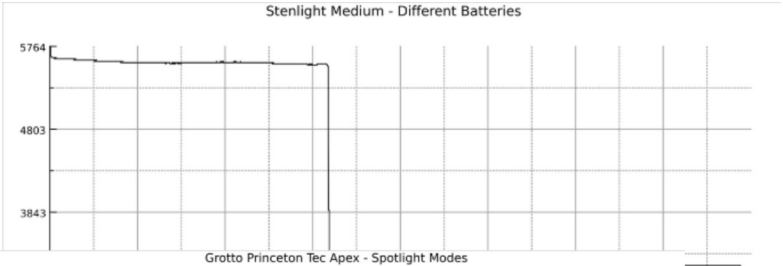
Notes:

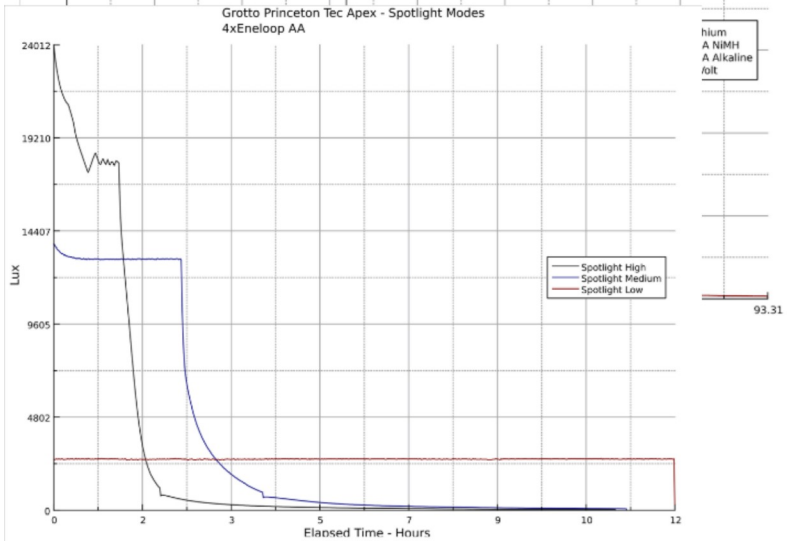
The Stenlight lasts for 8-9 days. The light output is extremely variable for the 2-cell and 3-cell lights.



Notes:

All modes on the Stenlight give a very steady light output.



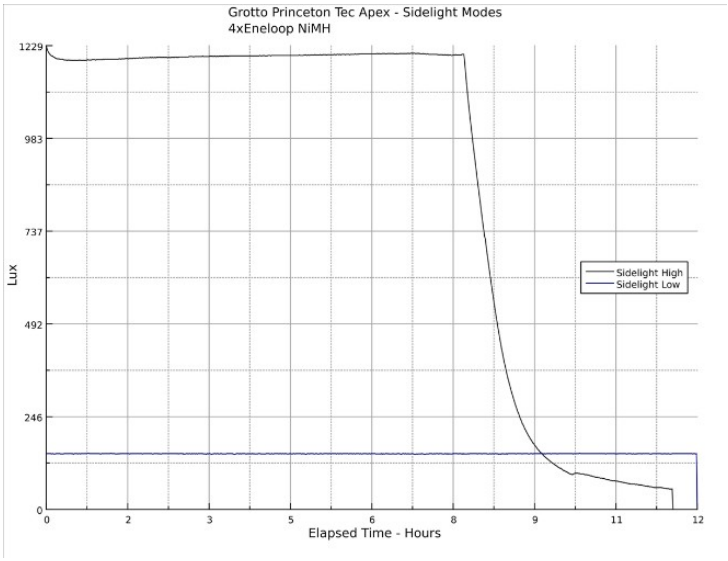


Notes:

Medium is where Bill does most of his caving. The brightness is very dependent on the battery used, but even with the 9-volt battery, the light lasts an impressively long time.

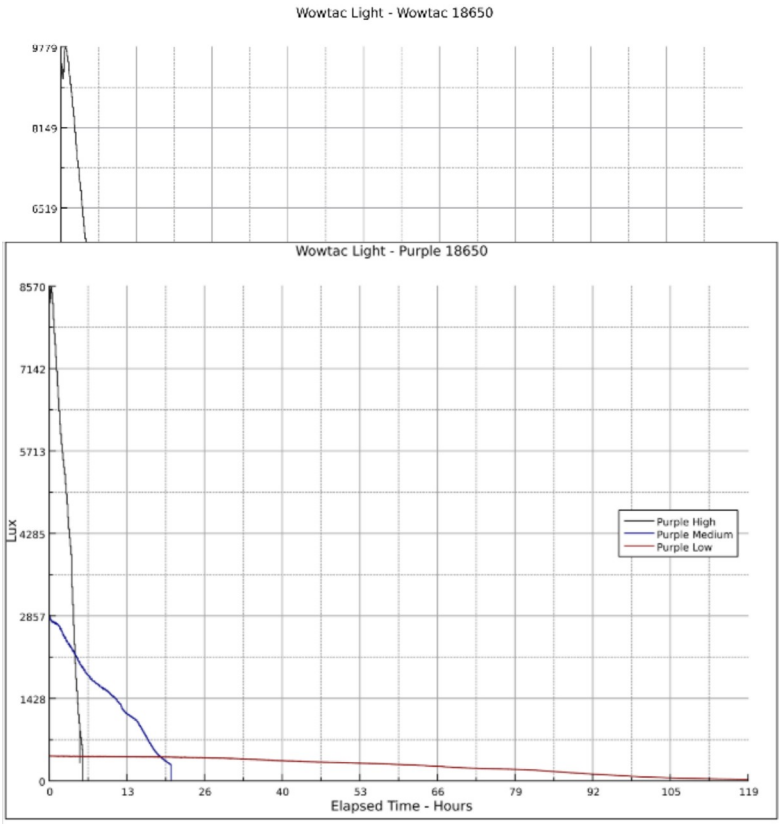
Notes:

Bill was surprised that the spotlight stays at a constant level for so long on low.



Notes:

No true medium mode. It is surprising that the runtime is so similar for high and low mode.

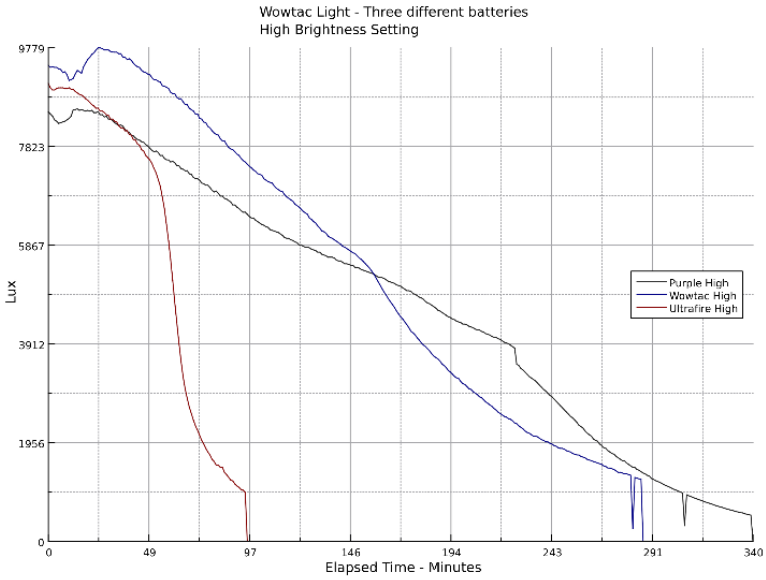


Notes:

This test used the ~2,600 mAh (claims to be 3,400 mAh) battery that came with the Wowtac. The light lasted for a very long time on low mode, which makes the 5.5-hour runtime on high look less impressive than it actually is.

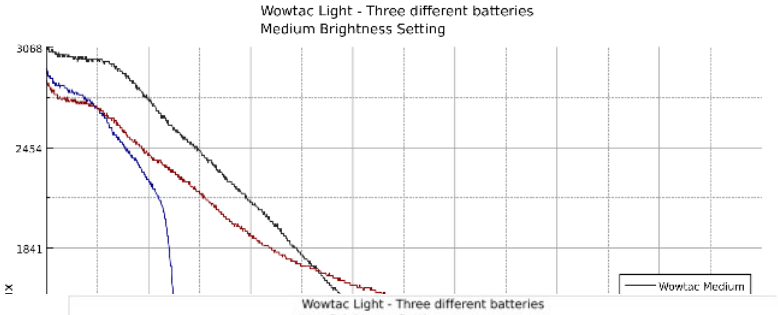
Notes:

The results for high and medium modes were similar between the Wowtac battery and the purple battery, but the light ran for surprisingly long (over four days) at low with the purple battery.



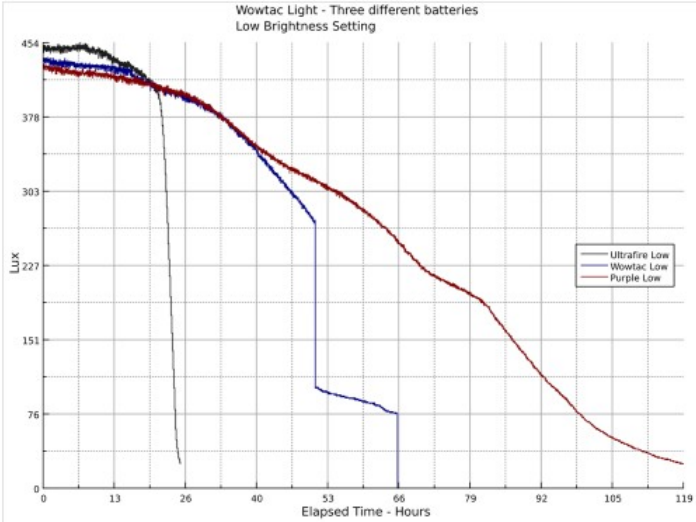
Notes:

Unexpectedly, the light started dimmer but ended up brighter with the purple battery compared to the Wowtac battery.



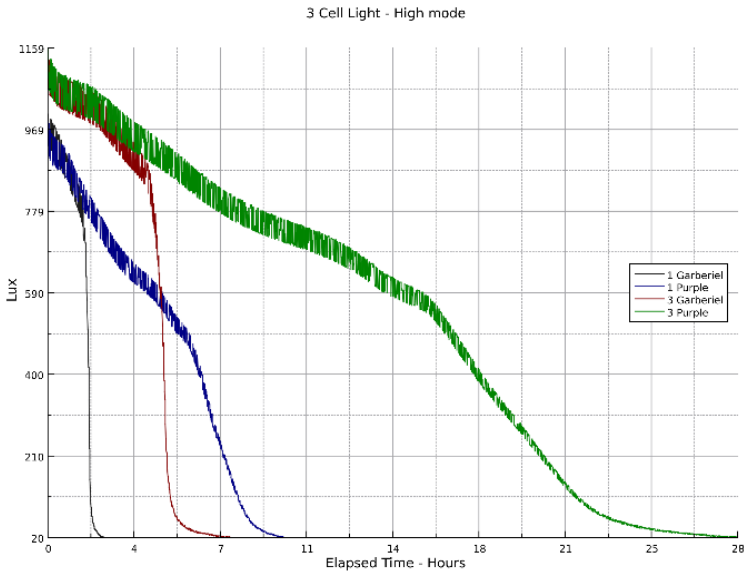
Notes:

The runtime was similar between the Wowtac battery and the Ultrafire battery because the mAh ratings are similar.



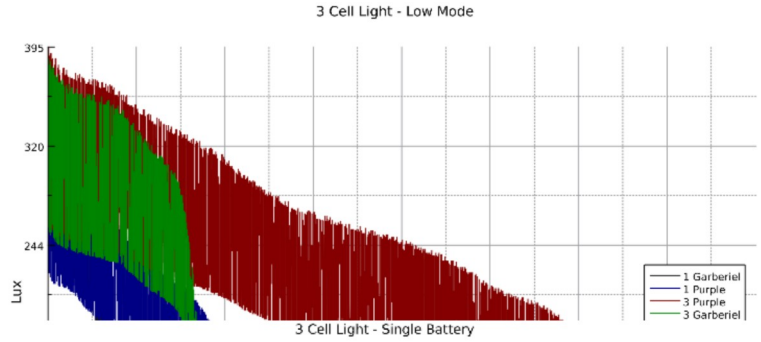
Notes:

Bill doesn't know why the light starts dimmer, becomes brighter, and lasts longer with the purple battery.



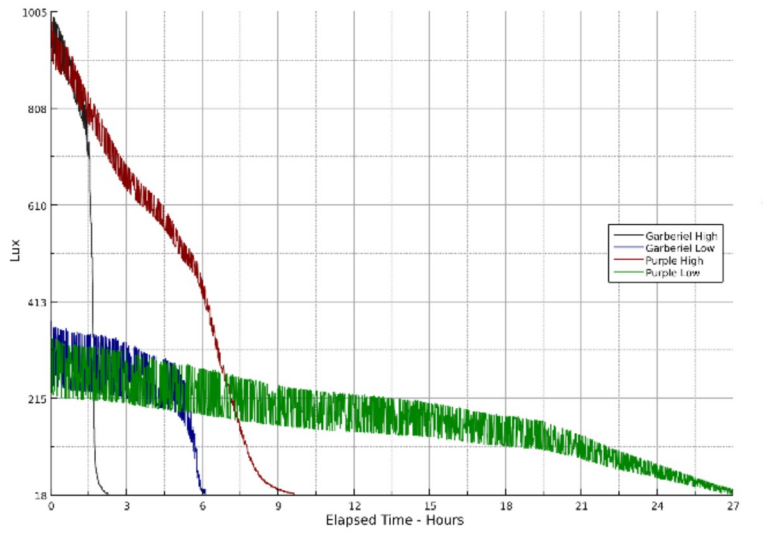
Notes:

You can clearly see how much the light varies: the 3-cell battery is just a poorly-regulated light. The three-battery test starts brighter than the 1-battery test, which is surprising, since Bill thought the brightness would be the same.



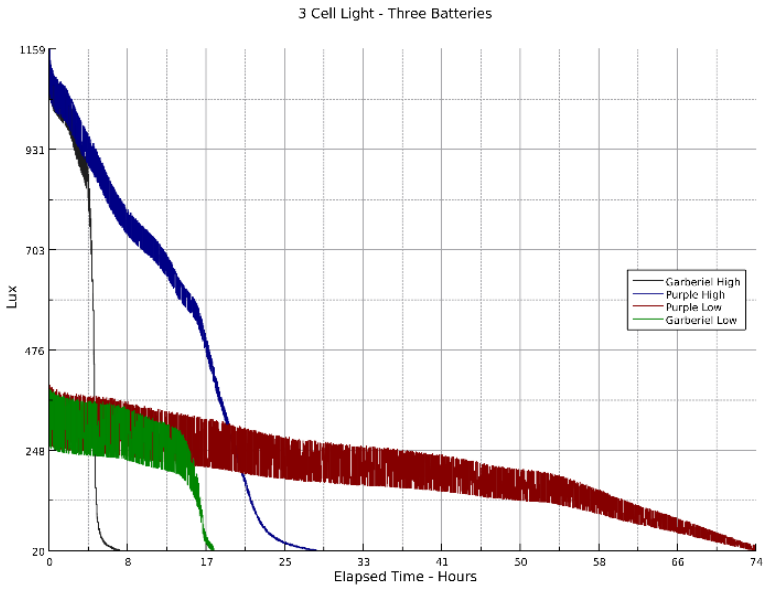
Notes:

Similar to above. The difference in runtime between the Garberiel and purple batteries shows that the purple battery is superior.



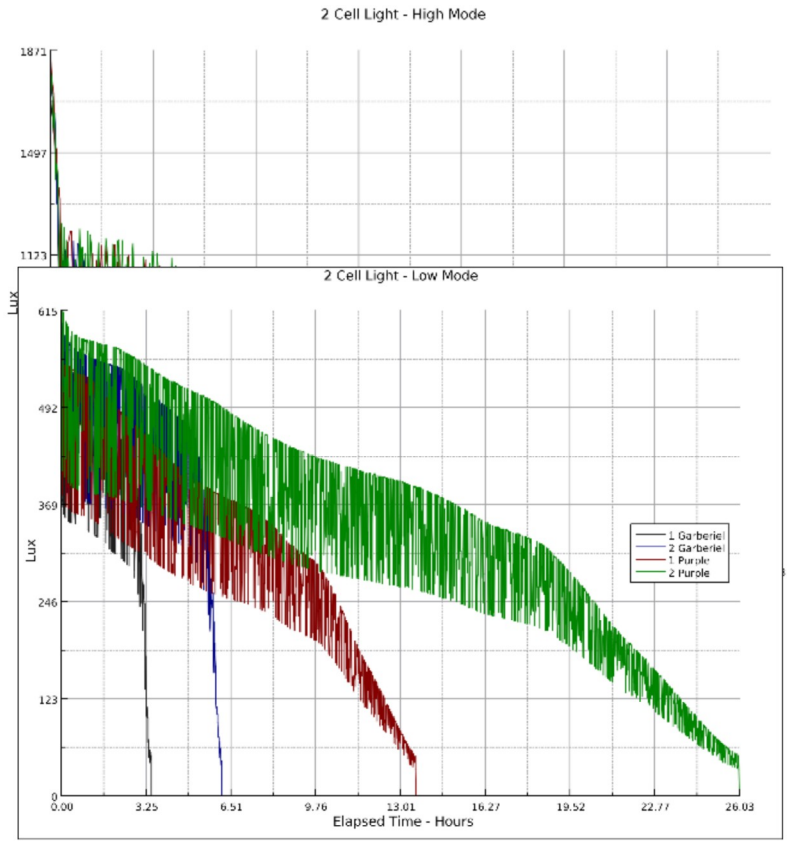
Notes:

Again, the purple is a better battery.



Notes:

As expected, three purple batteries lasted approximately three times as long as one purple battery.

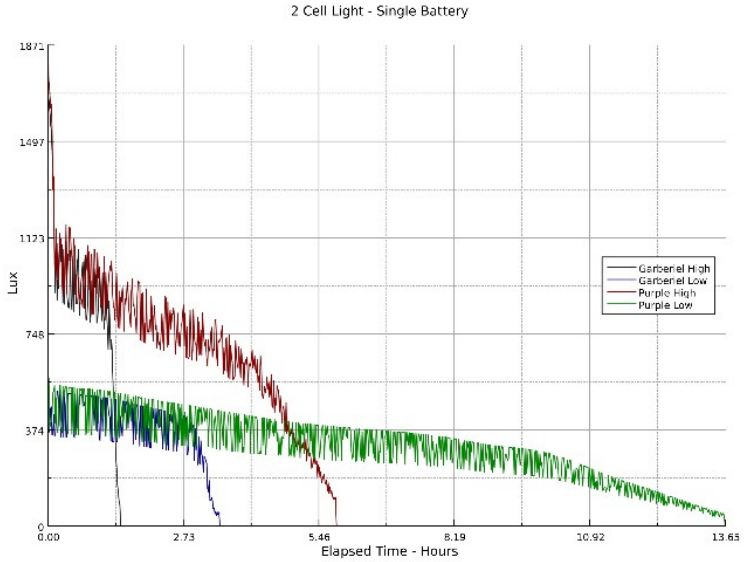


Notes:

All showed a 50% decrease almost within minutes. Otherwise, the 2-cell light is similar to the 3-cell light. Rick Hines noted that the light fluctuation for these two lights is not noticeable when caving.

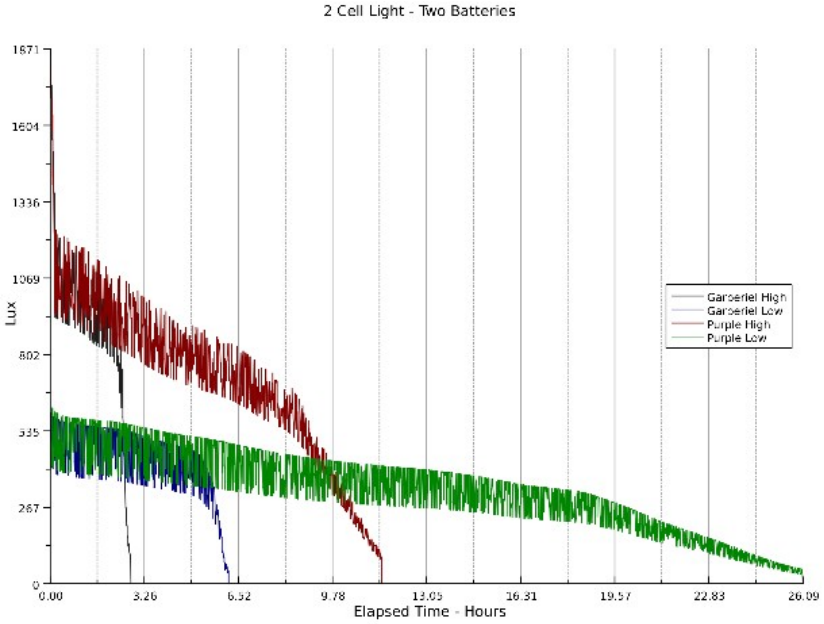
Notes:

Similar to 3-cell light.



Notes:

As usual, the purple battery is superior.



Notes:

The 2-cell light with 2 batteries had a much shorter runtime than the 3-cell light with all batteries.