# Autora 2022

Alaska's Northern Lights



Special Feature

UNIVERSITY OF ALASKA GEOPHYSICAL INSTITUTE Professor Neal Brown Answers your aurora questions

An Alaska Photographers' Calendar



	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	26	27	28	29	30	31	1 NEW YEAR'S DAY
Todd Salat GETTING the SHOT	2 New moon	3	4	5	6	7	8
In January 2015, during the peak phase of the last solar cycle, a massive coronal hole on the sun spewed vast amounts of aurora- generating energy toward Earth, putting the aurora alert on high. Before midnight on this spectacular night, a faint green aurora band developed over the moonlit Chugach Mountains while I framed an inviting silhouette from deep within some spruce trees. Suddenly, the aurora erupted beyond belief and began dancing dramatically	9	10	11	12	13	14	15
	16	17 MARTIN LUTHER KING, JR. (Observed) Full moon	18	19	20	21	22
above the Cook Inlet, reflecting on the waters below. I took picture after picture, bouncing back and forth between two cameras.	23	24	25	26	27	28	29
composing, re-composing, glancing at the exposures, thrilled to the bone. It's like a dream come true every time I see such a show. I felt enveloped by nature's forces and had the sensation of looking through a spruce-framed window into a "Whirled View," turbulent yet calming.	<b>DECEMBER 2021</b> 1 2 3 5 6 7 8 9 10 12 13 14 15 16 17 19 20 21 22 23 24 26 27 28 29 30 31	31 New moon FEBRU FE	JARY 2 3 4 5 9 10 11 12 6 17 18 19 3 24 25 26		JA	NU	2022 ARY



	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	30	31	1 Chinese New Year	2 Marmot Day (Alaska)	3	4	5
Marketa 5 Murray GETTING the SHOT	6	7	8	9	10	11	12 Abraham Lincoln (1809-1865)
After a week of cloudy weather, heavy snow, and driving over 100 miles looking for clear skies, we finally got a break. When the skies are clear in Interior Alaska, you are halfway to seeing the aurora, and there is nothing more torturing than	13	14 Valentine's Day	15	16 Elizabeth Peratrovich Day (Alaska) Full moon	17	18	19
seeing green lightsabers flashing behind a cloudy sky! After driving away from the city lights to avoid light pollution, we stepped out of the van into a winter wonderland— clear sky, shining bright stars, fresh glistening snow, and a faint green	20	21 PRESIDENTS' DAY	22 George Washington (1732-1799)	23	24	25 Heritage Day (Yukon Territory)	26
band of light hovering over the spruce trees. We hiked amidst the frozen wonderland looking for a compelling composition. After approximately 20 minutes, the aurora slowly escalated from the southwest and suddenly erupted in the northwest Green and purple	27	28	1	2	3	4	5
bands and ribbons danced across the sky like waves building bigger and bigger and then peacefully disappearing.	JANUARY 2 3 4 5 6 7 9 10 11 12 13 14 16 17 18 19 20 21 23 24 25 26 27 28 30 31	MAI 1 1 1 7 8 6 7 8 4 15 13 14 15 1 22 20 21 22 2 3 29 27 28 29 3	RCH 2 3 4 5 9 10 11 12 6 17 18 19 3 24 25 26 0 31		FEI	BRU	ARY



	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	27	28	1	2 Ash Wednesday New moon	3	4	5 Susan Butcher Day (Alaska)
Amy J Johnson GETTING the SHOT	6	7	8	9	10	11	12
A unique feature highlights a mountain ridge in the Eastern Brooks Range, and I long wanted to capture the aurora hovering above the protruding spire of Mt. Snowden. The location requires a 7-hour drive from my home on the	13 Daylight Savings Time begins	14	15	16 Purim begins	17 St. Patrick's Day Full moon	18	19
notorious Dalton Highway, situated well above the Arctic Circle. Extra warm clothes and lots of hand warmers are always with me on these kinds of ventures, especially on solo trips. On this chilly -15 below zero night, while moving	20 Spring Equinox	21	22	23	24	25	26
between some ot my tavorite aurora photography locations, the sky exploded with swirling green auroras. While most of the aurora action appeared in the northwest, I noticed striations over Mt. Snowden in the eastern sky. I took a test shot at about 2 AM, and to my surprise.	27	28 Seward's Day (Alaska)	29 <sup>Vietnam Veterans'</sup> Day (Alaska)	30	31 New moon	1	2
a variety of colors popped up on my display. I always take test shots if I don't see colors—you never know what the camera might pick up that	FEBRUARY 1 2 3 4 6 7 8 9 10 1 13 14 15 16 17 18 20 21 22 23 24 25	APF 4 5 1 12 3 4 5 8 19 10 11 12 1 5 26 17 18 19 2	RIL 1 2 6 7 8 9 3 14 15 16 0 21 22 23			$\mathbf{V}$ AF	2022 2022
the human eye can't see.	27 28	24 25 26 2	7 28 29 30		Ĩ		



	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	27	28	29	30	31	1	2
Marketa S Murray GETTING the SHOT	3	4	5	6	7	8	9
Aurora photographers rely on coronal holes that allow fast- moving particles to escape the sun's atmosphere. When the charged particles collide with the Earth's atmosphere, flashes of light occur that we call aurora. On the	10 Palm Sunday	11	12	13	14	15 Good Friday Passover begins U.S. tax returns due	16 Full moon
night of August 30th, 2017, we had 4 hours and 37 minutes of astronomical twilight at the end of Alaska's light-filled summer. Although not yet fully dark, the sun is still ionizing the upper atmosphere, which can produce beautiful sunlit	17 Easter	18 Easter Monday (Canada)	19	20	21	22 Earth Day	23
purple auroras. When the sky gets more energized, and the aurora moves faster, the chaos below begins—everybody watching starts screaming, cheering, laughing, or crying tears of joy. Then, without warning comes a moment when everybody stands still and watches	24	25	26	27	28	29 Arbor Day	30 New moon
the night sky dance. That's when you feel quiet inside and warmth in your heart. It is experiencing these special moments that energizes our continual quest for the mystical aurora borealis.	MARCH 1 2 3 4 6 7 8 9 10 11 13 14 15 16 17 18 20 21 22 23 24 25 27 28 29 30 31	N 4 5 1 2 3 1 12 8 9 10 1 3 19 15 16 17 1 5 26 22 23 24 2 29 30 31	AAY 4 5 6 7 1 12 13 14 8 19 20 21 5 26 27 28			AI	PRIL







	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	29	30	31	1	2	3	4
Ronn Murray GETTING the SHOT	5	6 D-Day, 1944	7	8	9	10	11
I have a rule in my aurora photography, if I can make one or two great photos a season, I am happy—this was one of them. This particular evening was extra special because we would memorialize a young couple's engagement under	12	13	14 Flag Day Full moon O	15	16	17	18
the aurora. We traveled south hunting for clear skies and found an opening just long enough to capture the proposal portrait while the aurora danced overhead. The clouds immediately moved in, so we drove further south to discover clear	19 Fathers' Day	20	21 Summer Solstice	22	23	24	25
skies in Nenana. The aurora display was initially mild, which allowed time for everyone to get set up and experiment. About an hour later, the skies lit up with color, and I snapped this shot. Content that I secured a photo for the best of the season list, I shouted out with excitement to our	26	27	28 New moon	29	30	1	2
group, saying, "well, you all keep shooting—I'm done; I can't get a better shot than that!"	MAY 1 2 3 4 5 6 8 9 10 11 12 13 15 16 17 18 19 20 22 23 24 25 26 27 29 30 31	JU 5 7 5 14 3 4 5 5 21 10 11 12 1 7 28 17 18 19 2 24 25 26 2 31	LY 1 2 6 7 8 9 3 14 15 16 0 21 22 23 7 28 29 30			J	JNE



	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	26	27	28	29	30	Canada Day (Canada)	2
Kevin Smith GETTING the SHOT	3	4 INDEPENDENCE DAY	5	6	7	8	9 Alaska Flag Day
Planning, preparation, and perseverance—this is the mantra for northern lights photography. Are the forecasts promising, and will the skies be clear? Are my camera batteries charged, and can I operate my cameras in the	10	11	12	13 Full moon	14	15	16
dark? Am I willing to drive far to find clear weather and stay up all night for multiple days? If I get skunked, will I keep trying? And so the story unfolds. During late spring, I knew the Denali South view turnout along the Parks Highway would have a	17	18	19	20	21	22	23 Ted Stevens Day (Alaska)
sunset glow in the northern sky. I arrived early to set up and scout a composition. As daylight faded, the aurora appeared in the deep blue sky overhead, and I started shooting when the light intensity of the sunset and aurora reached a balance. My planning paid off this time, but	24 Parents' Day 31	25	26	27	28 New moon	29	30
experiencing a subarctic sunset alone in the wilderness is itself a reward even if it hadn't.	JUNE 1 2 3 5 6 7 8 9 10 12 13 14 15 16 17 19 20 21 22 23 24 26 27 28 29 30	AUGU 4 1 2 1 11 7 8 9 1 18 14 15 16 1 25 21 22 23 2 28 29 30 3	JST 3 4 5 6 0 11 12 13 7 18 19 20 4 25 26 27 1			J	ULY ULY



	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	31	Civic Day (Canada)	2	3	4	5	6
Tim Grams GETTING the SHOT	7	8	9	10	11 Full moon	12	13
Designated as a Wild and Scenic River in the Arctic National Wildlife Refuge, the Wind River flows out of the south side of the eastern Brooks Range in Alaska's Arctic. During a float trip with some friends down this beautiful river, we enjoyed the	14	15 Discovery Day (Yukon Territory)	16	17	18	19	20
traditional variety pack of weather during this time of year—from gorgeous days to rain and snow. We had more rain and snow than sunshine, so our hopes were high to see the northern lights when a clear night finally unfolded. The aurora	21	22	23	24	25	26	27 New moon
developed slowly in the evening but eventually ramped up to form beautiful waves pulsating across the southern sky. The most active period of mostly green colored aurora lasted approximately an hour. The tipi cooking shelter and campfire brought together the elements of an autumn river trip in Alaska topped off with a grand gurga display.	28 JULY	29 Septer	30 MBER	31	1	2	<sup>3</sup> 2022
on wiin a grana aurora aispiay.	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$ \begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$		A	<b>\UG</b>	UST



	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	28	29	30	31	1	2	3
Daryl Pederson	4	5	6	7	8	9	10 Full moon
GETTING the SHOT							
In the early morning hours of September 11th, I set out in the pursuit of happiness. Autumn is an excellent time of year for reflection shots, and I also like shooting in locations around the city of	Grandparents' Day	12	13	14	15	16	17
Anchorage that offer a nice mix of human-made light to illuminate a scene. Running west along the edge of Lake Hood, I ran into another of Alaska's top northern lights photographers who was briskly walking east. After a quick change	18	19	20	21	22 Fall Equinox	23	24
of niceties, I was back on my way, thinking to myself that he was heading the wrong way. My choice paid off within a few minutes, and I lined up several brilliant aurora shots balanced by unique Alaskan foregrounds.	25 Rosh Hashanah begins New moon	26	27	28	29	30	1
	AUGUST	OCT	OBER				2022
	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$5  6 \\ 2  13 \qquad 2  3  4 \\ 9  20 \qquad 9  10  11  1 \\ 6  27 \qquad 16  17  18  1 \\ 23  24  25  2 \\ 30  31 \\ \end{array}$	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		SEPJ	ΓΕΜ	BER











	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	27	28	29	30	1	2	3
Patrick J Endres GETTING the SHOT	4	5	6	7 Pearl Harbor Day Full moon O	8	9	10
On a reasonably warm 14 °F (for Fairbanks, Alaska, that is) winter evening, I was sitting in my living room enjoying a glass of wine after a long day of office work. At 7 PM, my neighbor messaged me that the aurora was visible, but more	11	12	13	14	15	16	17
importantly, she could see the color red with her naked eye. If you know anything about aurora photography, you know that when the naked eye can see aurora colors, the camera will see a LOT more! So, I quickly ran downstairs, threw on a coat,	18 Hanukkah begins	19	20	21 Winter Solstice	22	23 New moon	24
grabbed my camera and tripod, and ran outside. I'm fortunate to have a beautiful birch forest adjacent to my home, so I stepped into the snow, pointed my camera up, and clicked a few shots. After 15 minutes, the colors faded, the clouds moved in, and I went back inside	25 CHRISTMAS	26 <sup>Boxing Day (Canada)</sup>	27	28	29	30	31 New Year's Eve
to finish my glass of wine. It is fair to conclude that this was not one of the more common, logistically complicated sleepless nights in my aurora photo ventures!	NOVEMBER 1 2 3 4 6 7 8 9 10 11 13 14 15 16 17 18 20 21 22 23 24 25 27 28 29 30	JANUAR 5 1 2 3 12 8 9 10 1 19 15 16 17 1 26 22 23 24 2 29 30 31	Y 2023 4 5 6 7 1 12 13 14 8 19 20 21 5 26 27 28		DEC	CEM	BER

#### SCIENTIST NEAL BROWN answers your aurora questions

#### NEAL BROWN

Professor Emeritus & Scientist University of Alaska Geophysical Institute

Neal Brown worked as a researcher/scientist for 47 years at the world-famous Geophysical Institute of the University of Alaska Fairbanks. He was director of Poker Flat Research



Range 1971 to 1989, taught science for nonscience majors, initiated several educationoutreach programs while at UAF, and was director of the State of Alaska Space Grant Program from 2002 to 2008. He is currently the director of Alaska Science Explained (www. alaskascience.com).

#### What causes the aurora?

The aurora are caused by solar storms that throw vast numbers of fast-moving electrons and protons away from the sun in a twisting



Microscopic charged particles from the sun's surface are carried along the solar wind and typically take two days to reach Earth's atmosphere.

mass of electric and magnetic fields. These microscopic particles typically take two days to travel the 150 million kilometers from the sun to Earth. These energetic electrons and protons initially move past Earth for several thousands of miles before traveling back along Earth's magnetic field lines into Earth's atmosphere. Then, through a process similar to that of a neon sign, they collide with the atoms and molecules of Earth's atmosphere to create the light we call the aurora. Not all solar storms produce aurora. We have a chance to see the auroras only when the solar storm's magnetic field couples with the Earth's magnetic field.

#### What's the 11-Year Solar Cycle?

The gigantic electric and magnetic sun storms that create the aurora follow an 11-year cycle of activity, with the last peak in 2013. It is an



Cycle 24 sunspot number prediction graph comparing the last few sunspot cycles from NASA Marshal Space Flight Center.

11-year cycle (or half of a 22-year cycle) because sunspots appear in pairs with a signature of magnetically "north" or magnetically "south." At the end of 11 years, the spots switch their signature from "south" to "north" (or vice versa) and begin a new solar cycle. The 11-year sun cycle is not always exact, and throughout history, it has seen periods of significant variation.

#### What is magnetic midnight?

Magnetic midnight is when the magnetic pole, which is offset 11 degrees from the geographic pole, is opposite the high-noon sun on Earth's other side. This actual time will vary based on your geographical position. This dark midnight sector makes the auroral crown of light that hovers over the northern hemisphere appear brighter. This is why the most brilliant aurora is visible not at midnight by the clock but at magnetic midnight. As Earth spins on its axis, during the half-hour before and after magnetic midnight, there is an arc of proton and electron light emissions that causes the aurora to go crazy and "break up" in bright, fast motions.

#### What causes aurora colors?

The aurora occurs most frequently from 60 to 200 miles (100 to 320 km) above Earth. Because the composition of atmospheric

		Neroge	m (Na)	Oxygen	O) Oxy	pen (O) N	trogen (N)	8
350	400	450	500	550	600	650	700	750

spectrum and are difficult for the human eye to see. gases varies depending on their distance from Earth's surface, altitude influences aurora color. The green and the deep red color that often occurs high in aurora appears when electrons collide with atomic oxygen atoms. The bluish-tinged vertical rays appear when electrons impact singly ionized molecules of nitrogen. The typical magenta lower borders appear when electrons impact molecules of nitrogen and oxygen. A faint band of blue appears when protons impact hydrogen atoms in Earth's high upper atmosphere.

#### Can we predict auroras?

We cannot accurately predict when aurora will occur on Earth; however, we can indicate how



Artist rendition of the fleet of Sun-Earth observing spacecraft operated by NASA and its partners. These spacecraft take sophisticated measurements that help us understand the aurora.

close we are to the most active sun storms, based on the current solar cycle. The storms originate well below the sun's visible surface and can't be seen until they pop out to the sun's outer layers, where we can then use many kinds of instruments to diagnose what that storm consists of and what it might do. Using instruments aboard the broad array of Sun-Earth orbiting spacecraft, we can now estimate these sun storms' energy and determine if the solar storm will get to Earth and result in aurora.

#### Why is the Solar Cycle 27 days?

The solar storms that create the aurora often last several Earth months. Since active sunspots directed towards Earth produce auroras, they



The sun rotates every 27 earth days, so active, Earth directed sun spots have the potential to produce auroras will recur every 27 days.

recur every 27 days. The 27-day solar cycle is because the sun turns on its axis once every 24 Earth days. For example, a spot on the sun's face rotates once every 24 Earth days until it again faces Sirius, the dog star. But Earth orbits the sun once every 365 days. So in 24 Earth days, Earth will have moved its orbit such that the sun needs to rotate the equivalent of 3 more Earth days for the stormy sunspot to again line up with Earth. Why the aurora recurs on a 27-day schedule was a mystery until astronauts obtained images of the solar storms in ultraviolet light absorbed by Earth's lower atmosphere. Today, satellites regularly provide ultraviolet images of solar storms.

## 2023

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#### NOVEMBER

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DECEMBER
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31						

### Aurora 2022

#### Alaska's Northern Lights Calendar



Turnagain Arm

Clearwater River



Lake Hood, Anchorage

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Steven Miley

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# **Boreal Forest**

Marketa S Murray



Tanana River Bridge



Hugh Rose

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Amy Johnson



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Wind River, ANWR

Tim Grams



Amy J Johnson

Denali & Chulitna River







Ronn Murray

**Brooks** Range