Science AMA series: We're scientists at NASA studying the sun, planets and solar system; ask us anything about the spring equinox (happening today), the sun and the total solar eclipse in August 2017!

NASASunEarth [1] and r/Science AMAs[1]

[1]Affiliation not available

April 17, 2023

Abstract

EDIT, NOTE FROM THE MODS: The Spring Equinox 2017 will occur in the Northern Hemisphere at 6:28 AM EST on Monday, March 20, NOT today. The date of the AMA was moved and the headline was not updated! Apologies to anyone we've confused! – THANKS EVERYONE!! – We appreciate the great questions, comments and support. It's been wonderful engaging with your enthusiastic content and we look forward to speaking with everyone again during future Reddits or any of our multitude of other NASA social media events. Our scheduled time for this event has ended, though some of us may continue to answer questions throughout the day, weekend or when our schedule allows. However, please feel free to continue to talk amongst yourselves. One great thing about our NASA fans is the depth of your combined knowledge and willingness to share it with the world. Thanks everyone and good luck with your Solar Eclipse viewing. Don't forget to follow us on our social media channels, as we will have several opportunities to discuss the Solar Eclipse event, as well as other topics. :-) Sincerely, The NASA Goddard and NASA Marshall teams Hi reddit! We are scientists at NASA are studying heliophysics and how the sun, heliosphere and planetary environments function as a single, connected system and how elements of the system like space weather affect solar, planetary and interstellar conditions. Heliophysics is the study of the sun's influence throughout the solar system, and its connection to the Earth and the Earth's extended space environment. Answering your questions today: Dr. Linda Habash Krause I am a space plasma physics experimentalist at NASA Marshall's Science and Technology Office and Project Scientist of a joint US-Brazil satellite mission entitled "Scintillation Prediction Observation Research Task" (SPORT). This mission, due to launch into low Earth orbit in 2019, will observe plasma turbulence in the ionosphere responsible for operational outages in our GPS navigation systems and some of our satellite communication systems. This is form of "space weather" that is a result of the interactions between the sun, magnetosphere, ionosphere, and upper neutral atmosphere, and I have been studying it for over 20 years. My activites have included installation of an ionospheric observatory in Nigeria, invention of space plasma instruments for satellites, and performing both scientific and mission operations duties for sounding rockets, the Space Shuttle, the ISS, tethered satellites, and free-flying satellites, and data mining and analysis of large space weather data sets. Mitzi Adams I'm a heliophysicist at NASA's Marshall Space Flight Center and co-author of a paper published in Nature that deals with solar jets seen in solar coronal holes. I study various solar phenomena, like the jets, but also prominences, sunspots and sunspot magnetic fields, in an attempt to understand solar variability and space weather. Understanding space weather is important for protecting our satellite resources, mobile phone communications, and Earth's power systems. Nicki Viall I'm Nicki Viall, and I'm a solar physicist at NASA Goddard. I study the solar corona, the part of the sun that we will see during the total solar eclipse in August. I also study the solar wind – the part of the solar corona that continuously flows off the sun. I primarily use data taken with NASA's Solar Dynamics Observatory and NASA's STEREO (Solar Terrestrial Relations Observatory). One of the instruments on STEREO is called a coronagraph and works by artificially creating an eclipse so that we can continuously observe the corona. Eric Christian I design and build instruments to study energetic sub-atomic particles in space, and use the data from these instrument to improve our understanding of the Sun, the heliosphere, and the

distant galaxy. These particles give clues to the origin and evolution of our Sun and planets, and other solar systems. They are also an important part of Space Weather that can be dangerous to satellites and astronauts, and even to technology down on Earth, and can affect the habitability of planets throughout the galaxy. For more information: https://www.nasa.gov/mission_pages/sunearth/overview/index.html https://www.facebook.com/NASASunScience https://eclipse2017.nasa.gov We'll be back at noon EST to answer your questions! AUA!

the WINNOWER

REDDIT

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NASASUNEARTH R/SCIENCE

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Answering your questions today:

Dr. Linda Habash Krause

I am a space plasma physics experimentalist at NASA Marshall's Science and Technology Office and Project Scientist of a joint US-Brazil satellite mission entitled "Scintillation Prediction Observation Research Task" (SPORT). This mission, due to launch into low Earth orbit in 2019, will observe plasma turbulence in the ionosphere responsible for operational outages in our GPS navigation systems and some of our satellite communication systems. This is form of "space weather" that is a result of the interactions between the sun, magnetosphere, ionosphere, and upper neutral atmosphere, and I have been studying it for over 20 years. My activites have included installation of an ionospheric observatory in Nigeria, invention of space plasma instruments for satellites, and performing both scientific and mission operations duties for sounding rockets, the Space Shuttle, the ISS, tethered satellites, and free-flying satellites, and data mining and analysis of large space weather data sets.

Mitzi Adams

I'm a heliophysicist at NASA's Marshall Space Flight Center and co-author of a paper published in Nature that deals with solar jets seen in solar coronal holes. I study various solar phenomena, like the jets, but also prominences, sunspots and sunspot magnetic fields, in an attempt to understand solar variability and space weather. Understanding space weather is important for protecting our satellite resources, mobile phone communications, and Earth's power systems.

Nicki Viall

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For more information:

https://www.nasa.gov/mission_pages/sunearth/overview/index.html

https://www.facebook.com/NASASunScience

https://eclipse2017.nasa.gov

We'll be back at noon EST to answer your questions! AUA!

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Serious question: With current technology, how close could unmanned vehicles get to the sun, and aside from light/heat, what other factors limit our ability to go near it? Also, do we understand more about the impact of the sun on the solar system the closer we get, or further away?

Less serious question: How frequent are Uranus-themed jokes in your office?

Sexymcsexalot

Next year, NASA is launching the Solar Probe Plus mission, which will get within 4 million miles of the surface of the Sun (25 times closer than the Earth). That will be much closer than any previous mission. It does it by using a large carbon-fiber heat shield. The scientific instruments (I'm building one of them) stay at room temperature hiding in the shadow behind the shield. Heat and light are dangerous, but radiation (sub-atomic particles) can be as well. We shield against the radiation as well. There are things we can only learn by getting that close. -- Dr. Eric Christian

What courses/education do I need to try and have a future with NASA, as a scientist?

wolvescartel

Beyond classes, here is my advice. First, pick a field of science that you love. You will need a LOT of education to have a thriving career as a scientist in NASA. It's a long haul, so pick something you love. Chemistry, biology, geology, astronomy, psychology, physics... you name it! Next, use "google scholar" to look up your favorite field and add "NASA" as a keyword for your search. Look up the names of the authors that come up on these papers. Find out what universities they are at and in which departments. These are the schools you want to target for your PhD. Find the course descriptions of the graduate programs you are interested in. Then find the prerequisites. Call up or email the professors, if you are so inclined. Many will respond. You might even find out about research opportunities that way.

Also: Get involved in local science/engineering hobby clubs! Learn ham radio, find a star party, join the chemistry club... This is a great way to show colleges that you love what you do.

Cheers, Linda

What courses/education do I need to try and have a future with NASA, as a scientist?

wolvescartel

I have a Masters in Physics and was able to obtain my position with NASA through the co-op program, which I believe is called Pathways. In high school, I took as much math and science as I could. I also took two years of German and three years of Latin, both of which I am still trying to learn. Latin I feel, gave me a better ability to understand English grammar and gave me a head start with the vocabulary of other languages. -- Mitzi

We've heard for years about a potential catastrophic solar storm that has the potential to wipe out electrical grids across the globe, and how NASA monitors the sun's activity. What signs are you looking for to predict these storms? Also, didn't your mother ever tell you to not look at the sun?

Edit:A word. Thanks for the gold kind stranger

ChrisFromSeattle

Solar coronal mass ejections do have the potential to disrupt electrical grids. A predictor of these events is the complexity of sunspot magnetic fields. More complex fields can store more energy. There are more sunspots during solar maximum, but a large coronal mass ejection could occur during solar minimum.

My mother did tell me not to look at the Sun, but I did not listen. Seriously, there are safe ways to look at the Sun, e.g., special solar filters, but the types that screw into an eyepiece are NOT safe.

How big of a concern is the build up of debris in LEO for space based operations?

painfulplumber

In LEO, there are two primary concerns. One - Large space vehicles that are dead, and Two - very small objects that are bullet size or smaller. For the large ones, we want to drag it up to the trash orbit, which is 2,000km, that requires an external tug. For the small particles, we are looking at using electrically charged space tether tapes to attract the small articles like fly paper. That's the idea, we haven't used this yet, but it'll be cool when we do. -- Linda

Within the next few years, what is something that you would like to figure out/understand better?

Voyager_7

Solar Probe Plus has three big questions that we're hoping to learn a lot about in the next few years: 1) Why is the corona (the atmosphere of the sun) hotter than the surface (photosphere); 2) How is the solar wind accelerated to a million miles per hour; 3) how are solar flare particles accelerated up to a good fraction of the speed of light. -- Dr. Eric Christian

Within the next few years, what is something that you would like to figure out/understand better?

Voyager_7

I would like to better understand jets that we see in coronal holes, what causes them to explode and whether there is a link to the solar cycle. The solar cycle is the eleven-year rise and fall of the number of sunspots. -- Mitzi

Bringing things back to Earth a bit, what kind of work do those from the social sciences and humanities do within NASA?

Theoretically, what is the largest number of stars that can coexist within a stable system?

jddbeyondthesky

With regards to social sciences, I can at least speak for psychology. My first degree was actually a B.A. in Experimental Psychology, and as a NASA space scientist, I am still using my education in my present space weather research. More generally, on the technical side, we have opportunities for people with expertise in artificial intelligence, perception research, human factors, industrial psychology, and psychophysics. Regarding the clinical side, well... we are preparing for long-term space missions, and, for the Star Trek TNG fans, there was a reason why Counselor Troi was part of the senior staff!

Nicki, I saw the 2012 solar eclipse in Australia, it seems like a long time between eclipses to gather data. Wouldn't studying images of the sun from outside our atmosphere give more constant and unobstructed data?

galacticshock

Yes, and in fact we do exactly that! NASA has several missions currently observing the Sun in which we create artificial eclipses. These instruments are called coronagraphs. The instrument blocks out the light of the main body of the Sun, just like the moon does during a total solar eclipse, so that we can see the much more faint solar atmosphere. With the space missions we can study the Sun's atmosphere continuously. We can also study the Sun's atmosphere in other wavelengths, such as ultraviolet and Xray. -Dr. Nicki Viall

Eric, I'm sure that there are many challenges as to build an instrument. What is the biggest challenge & out of the instruments you've built, is there a favorite one ?

backinthepast

It seems that you never have enough mass, power, money, or time to build the instrument that you'd like to build, so they all do have challenges. All my children are my favorite :-) but when they work right from the beginning and last 20 years (like the Cosmic Ray Isotope Spectrometer, CRIS, on the Advanced Composition Explorer, ACE), you can really get a lot of science out of them. -- Dr. Eric Christian

Is there something scientific in the fact that the moon just covers the sun precisely to show just the

corona to us due to some laws of physics, or are we just lucky, and most eclipses cover the main star completely or only partially?

isny

We are lucky. The Moon will not always "appear" to be the same size as the Sun. This effect of relative sizes is due to the Sun being so far away and the Moon so close. Actually, because the Moon's distance from Earth fluctuates a bit, sometimes it is farther away, appears smaller, and we have an annular eclipse, so named because there is an annulus of solar light around the edges of the Moon. We do not see the corona in that case. --Mitzi

Eric, how close are we to developing maybe better technologies in order to protect our satellites, etc, from solar activity? Do you think there may be a day when we can build things that can better withstand space weather? Or possibly some kind of substitute for satellites?

CarBowie

NASA's space engineers and scientists have been working together for decades to develop better technologies to protect our spacecraft from solar activity. We use a combination of engineering design standards and space weather prediction to keep our spacecraft (and astronauts!) safe. That said, research is needed when we are going to a new environment and/or to protect new technologies.

For example, as electronic components become smaller, they become more susceptible to ionizing radiation that short-circuits junctions inside the component. So, a digital bit that is supposed to be a "zero" becomes a "one" when a high-energy particle ionizes junction barrier material and causes a false current - thus causing that "bit flip". Imagine if that bit controlled a thruster for attitude control, and the satellite started to spin out of control! This is called a single event latchup. We protect against that with a combination of better shielding and redundant components. (That is, even if ionizing radiation penetrates the shield, it would have to go through both of the thruster control bits simultaneously to activate the thruster.)

Cheers, Linda

Eric, how close are we to developing maybe better technologies in order to protect our satellites, etc, from solar activity? Do you think there may be a day when we can build things that can better withstand space weather? Or possibly some kind of substitute for satellites?

CarBowie

I don't know about a substitute for satellites, but we're always trying to improve instruments and electronics to better protect them from solar activity. It's usually a question of how to do that with the minimum amount of mass and money. NASA is also improving the science that will lead to space weather prediction. As on the ground, if you know when a storm is coming, it is easier to protect your satellite. -- Dr. Eric Christian

Is there any way that a person at home without a degree but with enthusiasm about space, help NASA? Or at least be able to connect to them?

hari2897

Great question, thanks for asking. We appreciate and enjoy working with and talking to anyone and everyone who's interested in NASA and space exploration. :-)

A couple suggestions include:

1.
Volunteering to support events at a local NASA center, as well as an area science center, museum, etc. We have NASA centers across the nation, and many have events that can use volunteers, docents, etc. Plus, the science centers often host events working with NASA programs. (ISS downlinks with astronauts, #STEM educational programs, etc.)

2.
There are also "Citizen Science" programs offered, at times. Here are a few that I know of:
https://www.nasa.gov/feature/goddard/2016/nasa-launches-new-citizen-science-opportunity
https://science.nasa.gov/citizenscientists

3.
NASA also has a Solar System Ambassador program for motivated volunteers to share science:

http://solarsystem.nasa.gov/ssa/home.cfm

4.
Also, you can contact your specific "state space grant consortium." They work with NASA to fund school/university projects and may be interested in volunteers, support, etc. https://www.nasa.gov/offices/education/programs/national/spacegrant/home/Space_Grant_Consortium_Websites.html

5.
NASA Socials It's a great opportunity to attend a great NASA event, meet like-minded people and share the success of NASA programs. We look for people who have active social media accounts, like to talk NASA on them, have a great following, etc. https://www.nasa.gov/connect/social/index.html

6.
Follow and join our online social media discussions on our Twitter and FB pages. The NASA Main accounts are great, but each center, as well as several missions have active pages. Find one you like and start talking. It's a great way to share knowledge, engage in conversation, etc.

Hope this helps. We appreciate your interest. Good luck. :-)

Thanks, CB

Nicki, the footage from STEREO is mindblowingly beautiful. What types of interactions are responsible for the shapes and dynamic behaviors of the plumes that appear to dance off the surface of the sun?

And what do we learn about the sun by studying them?

verticalfuzz

I agree, the STEREO images are amazing! I use them to study the solar corona -the Sun's atmosphere- and the solar wind -the part of the solar corona that continually flows from the Sun and interacts with Earth.

The magnetic field on the Sun is what drives most of the shapes and dynamics that you see in the corona. The magnetic field has a lot of energy in it! With these images we can study explosive releases of magnetic energy called magnetic reconnection. -Dr. Nicki Viall

Hello and thank you all for doing this AMA!

What advice would you have for a highschool senior that will start his bachelor degree in biology next year that wants to work with NASA as an Astrobiologist?

Vizceral_

Thanks for asking and being interested in working with NASA. There are MANY opportunities for students to get involved. This includes all ranges of students from traditional, non-traditional, K-12, community college, university, HBCU's, MSI's, fellowships and more.

We have a diverse and talented workforce with the obvious need for engineers and scientists. But, also have many opportunities for accountants, lawyers, security personnel, computer artists, graphics, multimedia experts, medical professionals, facility maintenance teams, electricians, etc.

This answer isn't specific for astrobiology, but generic for all fields with NASA.

The NASA OSSI site would be your first stop. Build a profile and maintain it each semester. One key is to always keep it updated with current information. https://intern.nasa.gov/ossi/web/public/main/index.cfm%3FsolarAction%3Dview%26subAction%3Dcontent%26contentCode%3DHOME_PA

Another potential idea is to get involved in as many NASA projects as you can. Often, when we review internship applications, we may look for students who have an experience, understanding and awareness of the NASA culture, expectations, etc. We refer to this as the "NASA Pipeline" and we encourage students to get in and stay involved. It helps show who's passionate and serious about a career with NASA. This NASA Education page provides all the activities and opportunities for students and teachers. https://www.nasa.gov/offices/education/programs/descriptions/All_Alpha.html

Also, you could follow some NASA social media accounts to get a behind-the-scenes look from students. https://twitter.com/nasajscstudents

The NASA Education Twitter account shares updates, details, etc. https://twitter.com/nasaedu

Be aware that NASA contractors (there are many) may also offer internship opportunities. You can find

them online.

Also, contact your specific "state space grant consortium" and get to know what programs they are working. They work with NASA to fund school/university projects and may be interested in volunteers, support, etc.
https://www.nasa.gov/offices/education/programs/national/spacegrant/home/Space_Grant_Consortium_Websites.html

You can also try to volunteer to support events at a local NASA center, as well as an area science center, museum, etc. We have NASA centers across the nation, and many have events that can use volunteers, docents, etc. Plus, the science centers often host events working with NASA programs. (ISS downlinks with astronauts, #STEM educational programs, science nights, etc.)

Hope that helps. Thanks and good luck. CB

Hello and thank you all for doing this AMA!

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Vizceral_

You are more than welcome!

The "word on the street" is that Astrobiology is one of the hottest topics for NASA exploration - and for one of the most profound questions that people have asked since the dawn of time: "Are we alone in the Universe?"

You are in the PERFECT place in your life to get in on this research. Work hard, keep your eye on the prize, and you will get there.

Best wishes to you!

Cheers, Linda

In they hypothetical sense the solar storm of 1859 hit earth today. Could things be relatively catastrophic due to our dependency of electronics?

Gainz_and_Games

A solar storm as big as the 1859 "Carrington" event would probably cause a lot of damage to the power distribution infrastructure and to satellites. How catastrophic depends upon a lot of things. There are permanent effects (power transformers blowing up and satellites failing completely) that can be mitigated (the power grid can be set in a mode that reduces such damage, and satellites can be powered down, which makes them much less susceptible). That is one of the reasons why NASA does space weather science, which NOAA uses to try and predict when such events are possible. -- Dr. Eric Christian

i'm actually planning to take a trip to south carolina for the solar eclipse, so this is a perfect time to ask some questions that might help me in regards to traveling:

Do you have any recommendations in the Charleston area to observe the solar eclipse? I was thinking of staying at around 33.01471 -79.45175 (Northeast of Charleston, at a place called bulls bay / cape island), but i'm not sure if it is open to the public.

Also, do you know of a website that lists the major/official groups of observer meetups? Or is it more of a "find a place on the path" sort of deal?

Will people sell the solar eclipse glasses at the path of totality or should you purchase them beforehand at eclipse2017.org?

Lastly, and this is an unrelated question to the eclipse, but more about looking into the field of physics: Is there a lot of essay writing during your time as a physicist, and if so, are there alternative fields that uses physics or observes space without the massive writing requirement that you may recommend (orbital analyst, astronomer, etc.)?

Anyways, thank you for this AMA. Have a nice day!

pianoboy8

I do not have any recommendations for the Charleston area, but there are eclipse-viewing events listed on the NASA website, with interactive maps.
https://eclipse2017.nasa.gov

Regarding eclipse glasses, some amateur astronomical clubs are selling them and they are available online. Look for an ISO number when you purchase them to be certain of the quality.

In the field of physics and astrophysics, there can be a lot of writing, but not typically essays. We write research-based papers and proposals that have to pass peer review (not an easy process). There are support roles for engineers and those trained in physics with an undergraduate degree that do not require as much writing, but even in those careers, some is required. -- Mitzi

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Anyways, thank you for this AMA. Have a nice day!

pianoboy8

The NASA eclipse site has a page for events https://eclipse2017.nasa.gov/event-locations. I don't know the Charleston, SC area, but you want to be as close to the centerline as possible, so that the eclipse is longer. If you are at one of the major sites, I imagine there will be eclipse glasses for sale, but they are probably cheaper if you order them in advance (lots of places sell them).

As far as "essays", the thing that surprised me the most about becoming a physicist is how much reading, writing, and editing I do. I would say that engineers do less than many scientists, but even they do a fair amount. -- Dr. Eric Christian

Thank you so much for taking the time to do this!

How viable are solar sails for space travel within our solar system? What kinds of constraints are there when it comes to creating one? Do you think we'll see them being used more often in the future?

Also, how many eggs have you balanced on end today?

aDeadzePlin

Solar sails are viable for travel within the inner solar system, but are not so efficient far from the Sun. I do think they will be used in the future, but am not sure how frequently.

Eggs balance on end at any time of year. Although not a NASA scientist, Dr. Phil Plait has busted many myths. See his discussion and demo here:
http://www.badastronomy.com/bad/misc/egg_spin.html. -- Mitzi

It seems like the NASA budget gets cut almost every year. How does this affect the scientists who work there, and what kinds of things do you think we would have accomplished (in space exploration or technology on earth) by now if we still cared as much as we used to?

KingEdTheMagnificent

The best place to look for information on the NASA budget is nasa.gov/budget. -- Dr. Eric Christian

Is it true that it is extremely difficult to recognise coronal heating in AIA channels that are strongly multi-thermal?

Robo-Connery

Thanks for your question! I study coronal heating using the Solar Dynamics mission and the AIA channels. While they are multi-thermal, each channel has a unique peak sensitivity. We have even devised a method to watch the coronal plasma evolve from the hot channels, through the medium channels, and into the cooler channels of AIA, which is a diagnostic of how that plasma was heated. - Dr. Nicki Viall

Mitzi: How do changes in solar weather affect solar power generation? How close are we to a switch in the earth's magnetic poles? How do we prepare our tech for that event?

RedCheekedSalamander

Changes in "space weather" do not affect solar power generation. During sunspot maximum, the amount of ultraviolet and X-ray radiation from the Sun increases, but the amount of visible light is more-or-less the same.

I do not know how close we are to Earth's magnetic poles switching and I am not certain how we prepare for that event. -- Mitzi

Are there any disadvantages to the use of nanosatellites? Do you think they could be used for exploration?

WaterfallFiend

Nano satellites are awesome! They definitely can be (and already are!) used for space exploration. From my research and experience in CubeSat development, it seems that the two major challenges are power and attitude control. That said, we (NASA + the global space engineering community) are working on improving power system and attitude control technologies, as well as making more power-efficient electronic components and space instruments.

Another solution is operational: There is a mother-daughter(s) paradigm that is very helpful. The idea is to have a large satellite deploy a lot of little ones, and the little ones communicate back to the mother spacecraft, which then has the "big transmitter and receiver" to communicate back to Earth.

Cheers, Linda

For Nicki, coronas extend millions of kilometres and are highly ionized iron, I thought iron was one of the elements that are in the centre in the sun so how is ionized iron making it so far out on the surface?

Also what small changes in the earths tilt, orbit, proximity to the sun etc could have made life very unlikely the way it is today? And how did people before modern technology predict Milankovitch cycles?

And just for fun how close could we get to the sun with current or near future technology, what are the major problems with getting close to the sun apart from just the heat?

eXiled

There is iron all throughout the Sun. The Sun has the elemental composition of the gas cloud that created it, which includes iron.

In the future, NASA is working on a mission called Solar Probe Plus, which is scheduled to launch in 2018. It is a really cool mission that is going to get extremely close to the Sun! The Solar Probe Plus mission will get to 10 solar radii, and will touch the solar atmosphere. This is closer to the Sun than any spacecraft has ever been before. Previous missions have gotten into Mercury's orbit, which is about 30% of the distance between the Sun and the Earth. The other aspect of the mission that is unique to getting so close to the Sun, besides the intense solar irradiance, is the speed of the spacecraft. Due to orbital dynamics, Solar Probe Plus will be zipping past the Sun! -Dr. Nicki Viall

A question for the distinguished ladies: The prevalence of women in the STEM field is consistantly growing, but there's plenty of progress to be made. My 3 nieces are well enough into art, but my sister

and myself are curious what we can do to get them more involved and interested in the sciences.

My question is this: what got you involved and interested in your field, and what advice would you give to not only the girls, but myself and sister as well, in order to get them interested and excited about the sciences?

paulramon1992

Honestly, I have always been interested in science (except biology). When I was small, I wanted to know what those rocks were and of what were they made. I wanted to know what those stars were and which were planets. I wanted to know how things worked. I think that anything you can do to promote curiosity is a good way to create a scientist. And as an adult, I am curious about biology, but have too poor a memory to ever study it as a career.

You might suggest to your nieces that they look at popular science magazines, read an article that interests them, and contact the scientist whose work was being reported. It might be possible for them to even work with that scientist on a project. If they would like to contact me about the Sun, they may do so. I am googlable, I am at Marshall Space Flight Center.

I also read science fiction and love science fiction movies that make me think. My favorite movie is "The Day the Earth Stood Still" (the original with Michael Rennie), by modern standards though, there's not much action. I also really enjoyed "Rogue One". A sample of books that I like include "Dune", "To Save the Sun", "Flare", "The Martian", "Foundation", and all of Octavia Butler's books. --Mitzi

As a current middle schooler, what do you think of people like me who dream of space exploration to be advanced enough to move to other galaxies, or about joining NASA? Thanks for doing this AMA!

Techno_Wolf_Gaming

I graduated high school in 1971 and thought that my office would be on the Moon by the year 2000. I was a bit off. Going to other galaxies is VERY unlikely, but perhaps by the time you are my age, YOU could have an office on the Moon or be living on Mars. Good question! --Mitzi

I heard that the sun is in a cool period for a couple of years. Like it has a 11 year cycle where it decreases its heat generated towards earth. When that time is up and we have to deal with the ocean rise of global warming, will the suns cooling cause earth to go into a mini ice age?

Chickachic-aaaaahhh

There is a roughly 11-year cycle to solar activity, but there are also longer term variations that appear to be irregular. The short term changes get smoothed out at Earth, which doesn't respond quickly to those changes. For the last 20 years or so, the sun has been pretty quiet, compared to the last hundred years. This is most obvious in the sunspot number, which has been tracked for hundreds of years, but we can also see it in the solar wind and solar magnetic field. We can't predict the long term changes well enough to say how future variations at the sun will affect climate. -- Dr. Eric Christian

My house is at the epicenter of the eclipse in august. I have guest coming from all over the country to observe and hang out with me. What is the best way to observe/record this event? Want to come join us? Will you bring Bill Nye?

SGToliver

That is fantastic! The best way to observe the event is to get some eclipse glasses or number 14 welder's glass. You will use those during the partial phases of the eclipse. When totality happens, you can stop using those, but be sure to use them again as totality ends. For more information about the eclipse, eclipse events, and safe watching techniques, go to https://eclipse2017.nasa.gov.

This may be a stupid question, but how exactly do you define the equinox? You give a very specific time in this thread, but my understanding of "equinox" was that it occurs when the equator experiences exactly the same duration of sunlight and darkness in immediate succession.

TheSuperSax

That is a great question.

What happens is that Earth's orbit crosses the ecliptic from either below or above the plane. There are

two of these, they are called nodes. The effect is that the Sun rises due East and sets due West on the equinoxes and at that time every point on earth receives equal hours of night and day. At the poles, "day" and "night" are six months each. --Mitzi

I'm a junior in high school and I wanted to know do all astronomers and astrophysicists focus on things as specific as The Sun? Also, do astronomers and astrophysicists always have something specific to study (like a solar flare predicted to happen soon) or do they study more generally (like watching the sun and waiting for something new)?

CyberKia

All scientists as they proceed through school begin to focus more on a specific topic; however, it is not unusual for a new student in graduate school to be unsure of where he or she would like to focus. But eventually, one must focus on specific topics in order to get into the details. Interestingly, scientists then go even deeper into a specialty. Solar scientists can specialize in e.g., the solar interior, sunspots, surface flows, coronal mass ejections, flares, solar wind. Scientists are always making predictions, that is a part of science, but predicting if a solar flare will happen is difficult, it is done as a probability.

If we had knowledge of an incoming solar storm, how long would it take to feel the effects, what would we do to safeguard, and how would a human body be affected (sans environmental damage)? Thanks!!

QuiveryNut

When a coronal mass ejection occurs, there are some energetic particles that arrive pretty quickly, they are moving at a high percentage of the speed of light. The bulk of the particles though take a couple of days to reach Earth. We won't know though whether the magnetic field is pointed in the direction that will couple with Earth's until maybe an hour or so before they arrive.

When large coronal mass ejections happen, power stations pay attention and take some measures to protect their transformers.

A human body could be affected, if on a high-altitude-polar airline flight, if on a space walk, or on the surface of the Moon. Mostly, Earth's magnetic field protects us from solar storms. --Mitzi

Do you plan to watch the total solar eclipse? Where do you think will be best to view it from?

BaPef

I do plan to experience the solar eclipse from Clarksville, Tennessee. The greatest duration of the eclipse will be in Carbondale, Illinois, with the greatest extent in Hopkinsville, Kentucky...only a second or so difference in the times of totality. The closer you are to the center line of the path of totality, the longer the eclipse will be for your area, but the best place to view the eclipse will be the place with clear skies. For maps, go to our website: https://eclipse2017.nasa.gov. --Mitzi

How is the lack of solar activity in recent years affecting our magnetic field and atmosphere?

geekchops

When the Sun is active, the atmosphere heats up, puffs up, and orbits of spacecraft in low-Earth orbit tend to decay faster. Earth's magnetic field responds to the solar wind, which is always there. During times of high solar activity, there can be more coronal mass ejections that can cause magnetic "storms" in Earth's magnetic field and more aurorae. -- Mitzi

My great grandfather, Donald Menzel, was an astronomer who studied the sun. Just curious if you are familiar with his work.

Also, I am an engineer looking to get into astronomy, what advice do you have to get started into this as a hobby (particularly astrophotography)?

Thanks!

RedditDisco

Yes, I am very familiar with his work. As a hobby, I would suggest that you contact your local amateur

astronomical society for tips on astrophotography. --Mitzi

Are magnetic storm risks overstated or sensationalized? If not, why are no precautions taken? Certainly nothing has ever happened during my lifetime.

zot2007

There are real risks to magnetic storms, but it's always a better "story" if you describe the worst case scenario. Everything is a probability, and how much precaution you take depends upon a cost/benefit analysis, frequently looking at short-term return rather than long-term. In my lifetime (1989), a major power-failure in Ontario was caused by a solar storm. And that wasn't nearly as powerful a storm as the 1859 event, which actually fried telegraph lines. When is the next big storm coming? We can only look at a relatively short history to estimate probabilities, and try and learn more to improve short-term predictions. -- Dr. Eric Christian

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zot2007

The risks are not ovestated and precautions are taken and plans are being developed. Depending on how long you have been alive, there was an event in 1989 when Quebec lost power. --Mitzi

Let me ask what's your favorite planet?

genechem

Earth, then Mars. --Mitzi

I'm a senior physics major trying to build an electronic sound installation based off some live solar wind data provided by the NOAA. Are there any interesting solar phenomena that occur around this time of the year/cycle? Any interesting solar events in general you would recommend looking into? How do the sun and earth interact esp. at this time?

MrTheDoctors

Very intriguing! Can you say a little more about what you are building?

We are entering a time in the solar cycle called the "declining phase". This is a time where the sun forms "coronal holes" and the solar wind can form "high speed streams". This leads to some VERY interesting phenomena with respect to the magnetosphere and ionosphere. Waves can form in the ionosphere, and this phenomenon modulates very low frequency (VLF) beacons that are constantly broadcasting. You can see this effect with a VLF receiver. Look up NSPIRE receiver for more information.

Cheers, Linda

Hypothetically speaking what is the escape velocity from the sun? As in if there were a space craft roughly positioned near the surface of the sun, how much energy/velocity would that craft need to escape the suns gravity?

ehzstreet

If you start at the surface of the sun, you need over 600 km/sec to break away from the sun. But if you start at the orbit of the Earth, you only need about 42 km/sec. The two Voyager spacecraft are fast enough to leave the solar system (as are Pioneer 10 and 11, but we can no longer communicate with them). -- Dr. Eric Christian

Do any of you consider yourselves to be similar to the skywatchers of old? How we look back on them and think it was savage of them to cut out hearts to appease a sun god, what do you think future sky watchers(scientists) will look back on to your works and think it to be archaic/savage?

Fruhmann

No.

Cheers, Linda :-D

This question may already have been asked, or maybe you're already done answering, but:

Is there any safe way to look directly at the total solar eclipse? I live in Kentucky, very near the location where totality will be visible. I've always wanted to see a total eclipse -- the impressions I've seen are beautiful, with the corona visible around the black disc of the moon, but I don't want to seriously damage my eyes trying to view it the wrong way. Like, is there any way to do that without risking permanent eye-damage?

eternalquiet

See our webpages at https://eclipse2017.nasa.gov. --Mitzi

Hi and thank you for doing this AMA. I have a 5 year old son and he has been telling my wife and I that he wants to be an astronaut for the last year and a half. Every chance he gets he will remind us. What advice would you give us so that we can guide him in the right direction for this career? What sort of after school activities do you think he should experience and learn from?

Thank you again!

StressEatingMachine

He'll need to work hard, both academically and in a sport or two (the astronauts are all in good physical shape). Most of the astronauts are either military pilots or PhD scientists, although the specific science varies. Even the scientists tend to have private pilot licenses. My advice is that he finds something that he enjoys and he's good at. Most astronauts are successful in their non-astronaut career when they apply to the program. -- Dr. Eric Christian

If you are still answering questions, I have a serious one. I have heard a lot about gravity waves and did a project on them a couple years back before we found "proof" they exist. Now that we have some proof I was wondering, what can we even do with this knowledge(as in a link to how to create a small wormhole)?

Bloxer136

Gravity waves give us another way to do astronomy. We can "view" distant parts of the universe to observe and understand what is happening there. Using gravity waves is a very, very different story, and there currently is no way to create a small wormhole. -- Dr. Eric Christian

Why full solar eclipses are so rare in South America, specially in South East Brazil? I've never seen one when I lived there, neither my parents had. The only report I had is from my grandparents when they were kids. Is it just unluck, am I just missing them or am I biased in thinking like this?

ThiagoMacgyver

They are actually not all that rare; I saw one in the Atacama desert in Chile in 1994, but remember, Earth is a large planetary body with a lot of water, while the Moon is a small body with a small shadow. The probability of the shadow falling on the ocean rather than land is much higher. --Mitzi

Hey quick question, are you working on any other research or technology with other space agencies? (i.e. ISRO, SpaceX, CSA). If so, How do you communicate and share any research findings and/or do you collectively meet up through the web or physically meetup?

Thanks!

thunderman175

Personally, no. But colleagues in my group are working with the Japanese Space Agency. Their communications are generally through telecons (at odd times of day) and face-to-face meetings. To test equipment, sometimes our scientists go there, sometimes their scientists come here. We all get together for at least one yearly meeting, either the Solar Physics Division meeting of the American Astronomical Society or the American Geophysical Union. --Mitzi

I'm on the east coast of the USA and want to see the solar eclipse in totality. I'm planning to take the day off work so I can travel for it. Is there a particularly good spot to experience the eclipse from?

CrisisOfConsonant

Good luck. We hope the weather cooperates with us all.

This page shows the map of the eclipse for the USA.
https://eclipse.gsfc.nasa.gov/SEmono/TSE2017/TSE2017.html

North and South Carolina, Georgia and Tennessee should have the best viewing. Check for some science centers and universities in those areas, along the path of totality.

Good luck and happy viewing.

Thanks, CB

Off topic here but I'm coming to Cocoa Beach and I was just wondering if the space x launch is still a go on April 9th. An what time do I need to be on the beach, an which pad should I look at? Thanks

TRIGRhap

Thanks for joining us and being interested in watching a launch. It's a great opportunity everyone should do.

This website provides our NASA launch schedule. https://www.nasa.gov/launchschedule/

Keep in mind, other companies or the government may launch payloads that aren't NASA related and wouldn't be on our schedule.

As someone who worked at KSC for years, ANY place on Cocoa or the Cape beach works for a launch. You may not see the initial liftoff (the first few seconds) until it clears the trees and buildings, but it's GREAT after that.

For initial liftoff, you typically would park on US1 / 528, along the Banana River as you head into Cape Canaveral. Or, the 401, heading to (But not in) the Cape Canaveral AFS Guard Gate has roadside parking, bleachers, etc.

Plenty of people also go to Jetty Park.

There are plenty of places people may suggest, but the beach is always a great view. No issues, as long as weather cooperates.

Happy viewing.

Thanks, CB

Late to the party; Do you have any recommendations for solar or narrow band filters (material/type/manufacturer) for viewing/imaging?

(I'm running an amateur-grade newt-reflector if it matters)

mc_kitfox

I suggest that you look at the equipment list for the Citizen CATE project. For more information, check out the National Solar Observatory's page here: http://eo.nso.edu/citizencate. --Mitzi

When I see movies of the sun rotating the axis is always up and down as if I were standing on the North Pole. Do you turn the camera 90* to give us a "better" but misleading view?

splagen

At local noon, the axis of the sun is up and down, you don't have to be at the north pole. But the movies are all this way for standardization, just as maps are standardized to have north at the top. -- Dr. Eric Christian

What is the current prognosis for something like the Carrington Event to repeat? Are there any plans or

protocols in case such an event is observed and going to hit earth?

Acceleratio

The Carrington Event probably will happen again and there are groups that are studying how we can protect our electrical grid. President Obama signed an Executive Order last year that set out plans for space weather events. --Mitzi

If I wanted to bring my dog to an eclipse viewing party, will regular sunglasses work? Or should I build some puppy goggles? I want him to enjoy the eclipse with us.

aasteveo

Regular sunglasses are not safe to look at the Sun for anyone. I am sure your dog will enjoy the eclipse just by being with you. But you could observe his behavior during the eclipse. --Mitzi