MHAS-Observer

Newsletter of the McMath-Hulbert Astronomical Society, Lake Angelus, Michigan

Contents

President's Message

Greetings all.

I hope everyone has been enjoying this past June's nice weather. The Sun has had a few spots on it to keep us hopeful of more to come. We do seem to be past solar minimum and are starting to see sunspots from the new solar cycle 25. For us in the society that means we need to prepare our telescopes for increased viewing of the Sun. Solar filters to be checked for pin holes or as in the case of my own filter, it has deteriorated to the point of needing replacement. The Society has purchased a roll of Mylar solar filter material to make several filters for the club's portable telescopes.

The observatory's permanent scopes are only partially usable due to overgrown trees on the property. We can use the spectrohelioscope in Tower 2 for a few hours per day in the summertime. We do strive to keep the equipment in working order though with the hope to one day clear the trees and continue advancing the organization's growth and someday purchase the property.

An article in the Astronomical League's newsletter *Reflector* about a restored visual spectrohelioscope that's now functional at the Stellafane site in Vermont has caught the attention of our treasurer Tom Hagen. The observatory happens to have one or two spectrohelioscopes and most of the parts seem to still be here. Tom has contacted two of the authors of the article, Dave Groski and Matt Considine, who are members of the Springfield Telescope Makers (STM) club in Vermont for advice on how to get ours in working order. I'm hoping we can also make our own to be used for outreach events. These are great projects for our members to work on so you might consider joining our organization to be included in projects of this nature. We will keep everyone updated on this project and others.

Another idea that was recently suggested by Dave Groski of STM is a way of inexpensively using silver to coat some of our mirrors. The cost of coating all of our mirrors with aluminum is beyond our financial abilities at present so a more affordable coating, though temporary, will help us test our optical systems.

As State of Michigan Covid-19 restrictions are slowly being lifted, we plan on starting tours again starting on the first Saturday of July at 11:00 AM until about 3:00 PM. This happens to be the 4th but several members will available that day. Please bring a mask, of course.

Marty Kunz

Corona Virus Update

With the relaxation of social distancing restrictions, we can now allow our members and members of the public back in to MHO. We can have up to ten people present at events. And don't forget to wear a mask and maintain 6-foot social distancing. See you on the 4th of July at 11 AM! Please let us know if you want to attend by RSVP at info@mcmathhulbert.org.

MHO Circa 1946

History Corner—Jim Shedlowsky

An Oakland County Historical notable memory… recognized late!

I was born in Oakland County, Michigan in 1937, and have lived here my whole life. I have many memories of growing up in the Pontiac and Oakland area. I grew up down Baldwin Avenue from the Fisher Body Plant where they built Antiaircraft Guns in WW2 and remember when school buses were built at the GM Truck & Bus plant on South avenue. I went to football games at the old Wisner Stadium and visited the Cranbrook Institute of Art,……when it was new!
But one Oakland County landmark that I visited as a child, was to have a profound impact on my life. It has almost been over looked in the history of this region,…..even though for decades it had a major impact on the world of science. I was a thirteen year old Boy Scout in 1950, when Art Hodges, our old scoutmaster took a small group of us to visit a strange complex of structures in a hilly region just off of Lake Angelus.

There were three towers with domes on top, which looked like photos that I'd seen of astronomical observatories,….several on stilts. We were taken to a conference room in the large building and shown a movie by one of the resident astronomers, of gigantic storms raging on the surface of the Sun. The astronomer demonstrated the relative size of the Earth with a silver dollar held in his hand in front of the movie screen, pointing out that these solar storms were many times the size of the earth. We were impressed,…..and I was amazed to learn that those movies were obtained, at ***that*** observatory, by **local** citizen scientists, who had developed the processes and designed and built the Telescopes and other instruments, and astounded the scientific world with their pioneering efforts,….just a few years prior.

This encounter, more than 70 years ago, had a significant influence in awakening my interest in science, my educational path, my career….and to a significant degree on my life. My choice of the University of Michigan for an Engineering/Physics degree was influenced by that visit with those U of M astronomers.
The McMath-Hulbert Solar Observatory was founded in 1930 by three amateur astronomers, who with cleverness, ingenuity, intelligence, enterprise ….and passion, made a significant mark on the scientific world. The Observatory operated from 1930 until 1979 and during its heyday, it was at the forefront….worldwide…. in the field of Solar Research. It was operated by the University of Michigan under the directorship of Robert McMath, who would go on to be instrumental in the establishment of the first U.S. National Observatory at Kitt Peak, AZ, with its McMath-Pierce Solar Observatory.

So…..It was with some amazement, a few years ago, that I discovered that this, largely unknown facility,… still exists, largely intact, although somewhat overgrown with trees. I also discovered some of its fascinating and fabled history,… of its association with observatories and research institutions around the world and of its impact on our understanding of the sun,…and the development of technologies for measuring the solar parameters. The scientific world knew where the Mcmath-Hulbert Observatory was located,…and what its capabilities were, but to a large extent,…… Oakland County was never aware of one of its most significant historical treasures.

Intro to Radio Astronomy

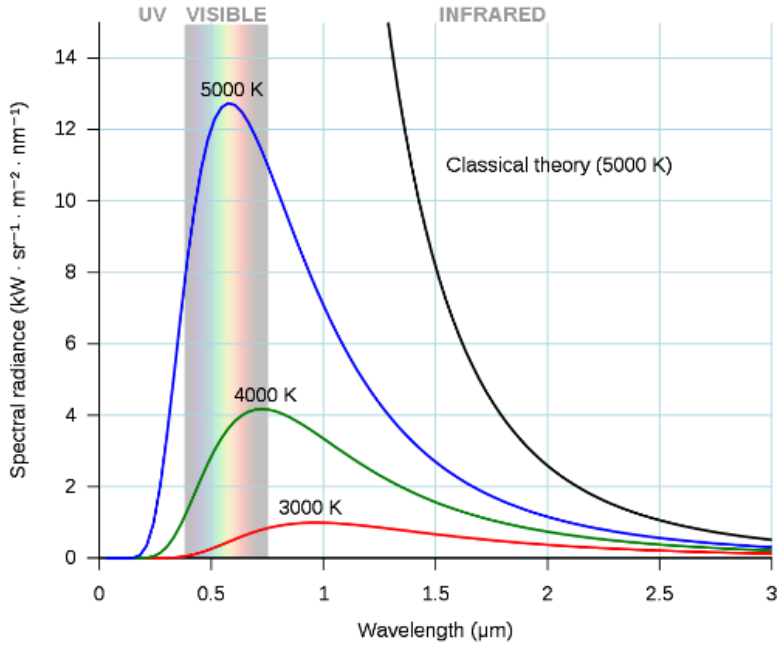
The most common mechanism of electromagnetic radiation is called black body radiation. Blackbody radiation or thermal radiation is the radiation that is emitted by a solid, liquid, or a gas under high pressure that has a temperature above absolute zero.

Recall that absolute zero or 0 Kelvin is the temperature at which there is no energy available that can cause atomic and molecular motion or vibration, all the electrons in atoms are at their lowest possible energy states. 0 K corresponds to about -273°C, or -460°F.

When matter has a temperature above 0 K, energy can be emitted by means of electromagnetic radiation at any of a number of possible wavelengths. This emission is caused by thermal accelerations of the electrical charges of the electrons and protons of the matter in the blackbody. This emission is continuous over a wide span of wavelengths and is different than the single line emission like that of HI discussed last month or of the emission line such as the light from a neon light bulb. Single line emissions are due to quantum effects that allow energy to be emitted in only certain allowed packets of energy (quanta).

Your body, for example, is an approximate black body. By definition, a blackbody is in thermal equilibrium. This means that the blackbody is at a constant temperature and that by definition it must radiate exactly as much energy at it absorbs. The human body temperature at 98.6°F corresponds to about 310 K.

The black body radiation curve has a distinctive shape that has a peak amplitude at a wavelength that depends on the temperature of the blackbody.



Family of Blackbody Curves at 3 Different Temperatures (Sun temperature =5000 K)[1]

Notice that the radiation from a blackbody is continuous over a wavelength range, but has a peak radiance in a certain range based on its temperature. The Sun at around 5000 K has a brightness peak in the visible spectrum and cooler bodies have peaks in longer wavelengths or lower frequencies.

The human body has a temperature of 310 K and has peak brightness in the infrared range at around 10 μm, or 1/100th of a millimeter. The characteristic shape of these curves is a property of quantum physics. The fact that energies can only occur at specific fixed levels was proposed by Max Planck around 1900 to explain the peculiar shape of the blackbody curve.

But our bodies don't radiate only in infrared, we radiate at radio wavelengths too! Using the McMath-Hulbert 21 cm horn antenna, the radiation from people can be detected when the horn is pointed at somebody. The horn also detects anything else at ambient temperature like trees and

cars. The Sun also generates a lot of noise at 21 cm too.

We also use an upcycled satellite dish that makes up the "Itty Bitty Telescope" that detects radiation from humans at a frequency of 12 GHz or a wavelength of about 1 inch in length.

The biggest blackbody radiator of all is the cosmic microwave background radiation (CMB) that is the result of the Big Bang event that represents the start of our universe. We'll talk about the CMB and the Big Bang in next month's article.

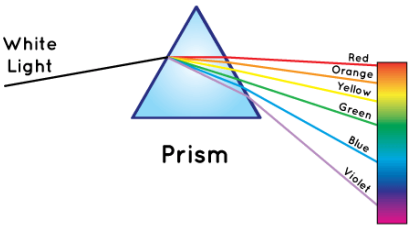
[1]By Darth Kule - Own work, Public Domain, https://commons.wikimedia.org/w/index.php?curid=10555337

Why Is the Sky Blue? NASA "Space Place" Article

The Short Answer:
Sunlight reaches Earth's atmosphere and is scattered in all directions by all the gases and particles in the air. Blue light is scattered more than the other colors because it travels as shorter, smaller waves. This is why we see a blue sky most of the time.

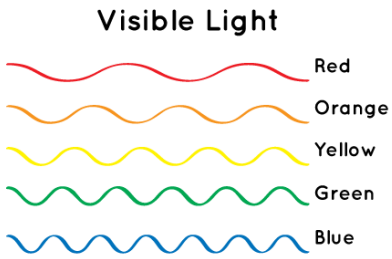
A lot of other smart people have, too. And it took a long time to figure it out!

The light from the Sun looks white. But it is really made up of all the colors of the rainbow.



When white light shines through a prism, the light is separated into all its colors. A prism is a specially shaped crystal.

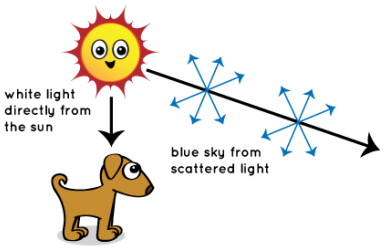
If you visited **The Land of the Magic Windows**, you learned that the light you see is just one tiny bit of all the kinds of light energy beaming around the universe--and around you! Like energy passing through the ocean, light energy travels in waves, too. Some light travels in short, "choppy" waves. Other light travels in long, lazy waves. Blue light waves are shorter than red light waves.



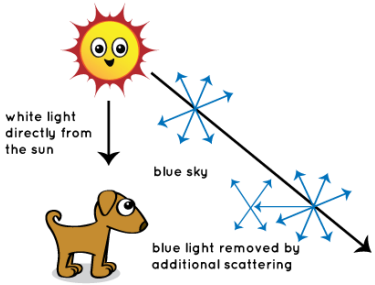
All light travels in a straight line unless something gets in the way and does one of these things:—

- reflects it (like a mirror)
- bends it (like a prism)
- or scatters it (like *molecules* of the gases in the atmosphere)

Sunlight reaches Earth's atmosphere and is **scattered** in all directions by all the gases and particles in the air. Blue light is scattered in all directions by the tiny molecules of air in Earth's atmosphere. Blue is scattered more than other colors because it travels as shorter, smaller waves. This is why we see a blue sky most of the time.



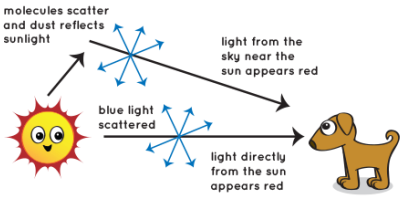
Closer to the horizon, the sky fades to a lighter blue or white. The sunlight reaching us from low in the sky has passed through even more air than the sunlight reaching us from overhead. As the sunlight has passed through all this air, the air molecules have **scattered** and ***rescattered*** the blue light *many times* in *many directions*.



Also, the surface of Earth has **reflected** and **scattered** the light. All this scattering mixes the colors together again so we see more white and less blue.

What makes a red sunset?

As the Sun gets lower in the sky, its light is passing through more of the atmosphere to reach you. Even more of the blue light is scattered, allowing the reds and yellows to pass straight through to your eyes.



Sometimes the whole western sky seems to glow. The sky appears red because small particles of dust, pollution, or other aerosols also scatter blue light, leaving more purely red and yellow light to go through the atmosphere.

Is the sky blue on other planets, too?

It all depends on what's in the atmosphere! For example, Mars has a very thin atmosphere made mostly of carbon dioxide and filled with fine dust particles. These fine particles scatter light differently than the gases and particles in Earth's atmosphere.

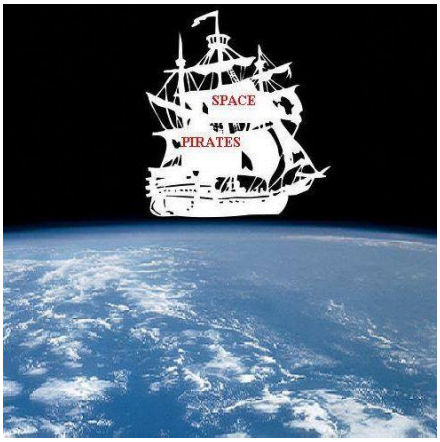
Photos from NASA's rovers and landers on Mars have shown us that at sunset there is actually the opposite of what you'd experience on Earth. During the daytime, the Martian sky takes on an orange or reddish color. But as the Sun sets, the sky around the Sun begins to take on a blue-gray tone.

The top image shows the orange-colored Martian sky during the daytime and the bottom image shows the blue-tinted sky at sunset. Both images were captured by NASA's Mars Pathfinder Lander. Credit: NASA/JPL

Did You Know? MHAS President Has His Own Internet Radio Show!

Marty Kunz, MHAS President, hosts an astronomy radio show that airs every week on Wednesdays at 9 PM EDT. Listen for it at: www.astronomy.fm

Marty's program is called "Space Pirate Radio" and features current information about space travel developments, astronomy news, and a "what's-in-the-sky today" report. Set you alarm for Wednesdays at 9 PM!



MHAS Contact Information:

MHAS Website

http://www.mcmathhulbert.org/solar/

MHAS Facebook Page

Click on the button below to get to the MHAS Facebook Page.

Address:

McMath-Hulbert Astronomical Society
895 N. Lake Angelus Rd.
Lake Angelus MI 48326

Email: info@mcmathhulbert.org

Phone: 248-494-8256 (Google Voice, leave message if nobody picks up)

MHAS Officers

President
Marty Kunz

Vice-President
Jim Shedlowsky

Secretary
Ken Redcap

Treasurer
Tom Hagen

Appointed Positions

Dir-Membership
Ken Redcap

Dir-Communications & Website
Tom Hagen

Dir-Educational Activities
Tom Hagen

Dir-Finance
TBD

Dir-MHO Preservation
TBD

Dir-Buildings Security
TBD

Dir-Social Activities
Marty Kunz

Dir-History
Jim Shedlowsky

Scheduled Meetings

All MHAS members are welcome to join us at Open Houses and Board of Directors Meetings. We are open to the public at the Open House Meetings.

MHAS Open House Meetings:
We schedule MHO Open House Days on the first Saturday of the month starting at 11AM. The July 4, 2020 open house will be held with social distancing in effect. Please wear a mask and maintain 6 foot distancing.

MHAS Board Monthly Meetings / Teleconferences:
1st Sunday of Each Month @ 1 PM
The next board meeting is scheduled for July 5, 2020 and will be via teleconference. MHAS paid members are invited to participate in this meeting.

MHAS Standing Committee Meetings:
These are internal meetings and are announced on Groups.io Calendar

Join MHAS!!

Membership in MHAS is $25/year. Join with us on our mission to preserve and promote the McMath-Hulbert Solar Observatory. Just drop us a line at info@mcmathhulbert.org and we'll get you signed up! Or use the application form on the next page, print it out, and return it to us via email or USPS.

McMath-Hulbert Astronomical Society

Membership Form

Name_____

Address_____

Email_____

Phone_____

Date_____

Dues_____Donation_____

Annual membership is $25. Checks should made out to “MHAS” or “McMath-Hulbert Astronomical Society”. You can also pay using PayPal on our website.

Bring to meeting or mail to:
MHAS
McMath-Hulbert Solar Observatory
895 N. Lake Angelus Rd.
Lake Angelus, Mi. 48326