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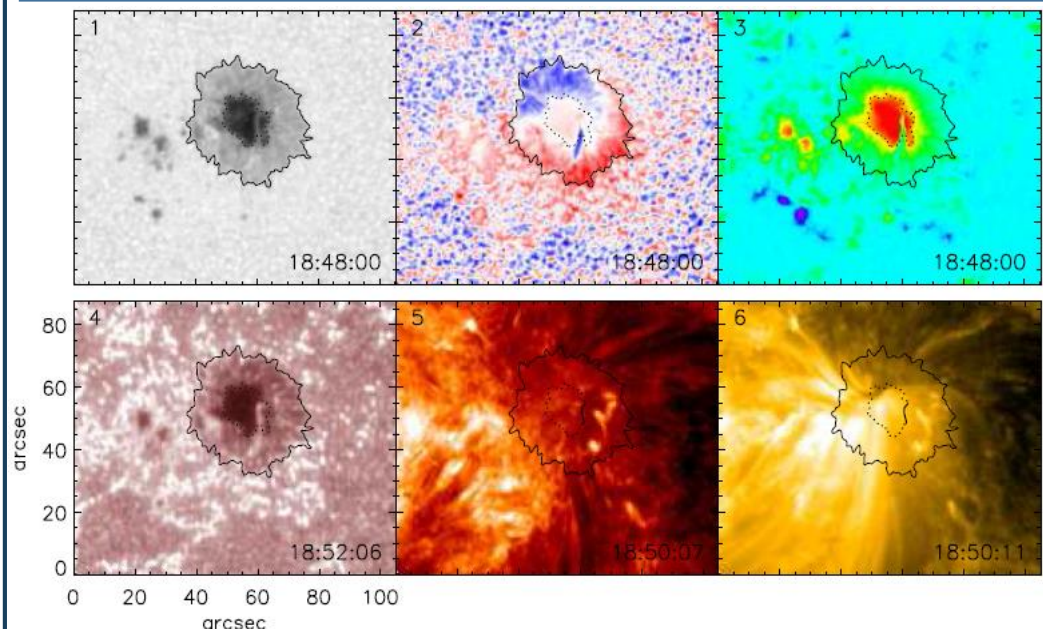
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The Formation of an Atypical Sunspot Light Bridge as a Result of Large-scale Flux Emergence

(Rohan E. Louis, Christian Beck, and Debi P. Choudhary)

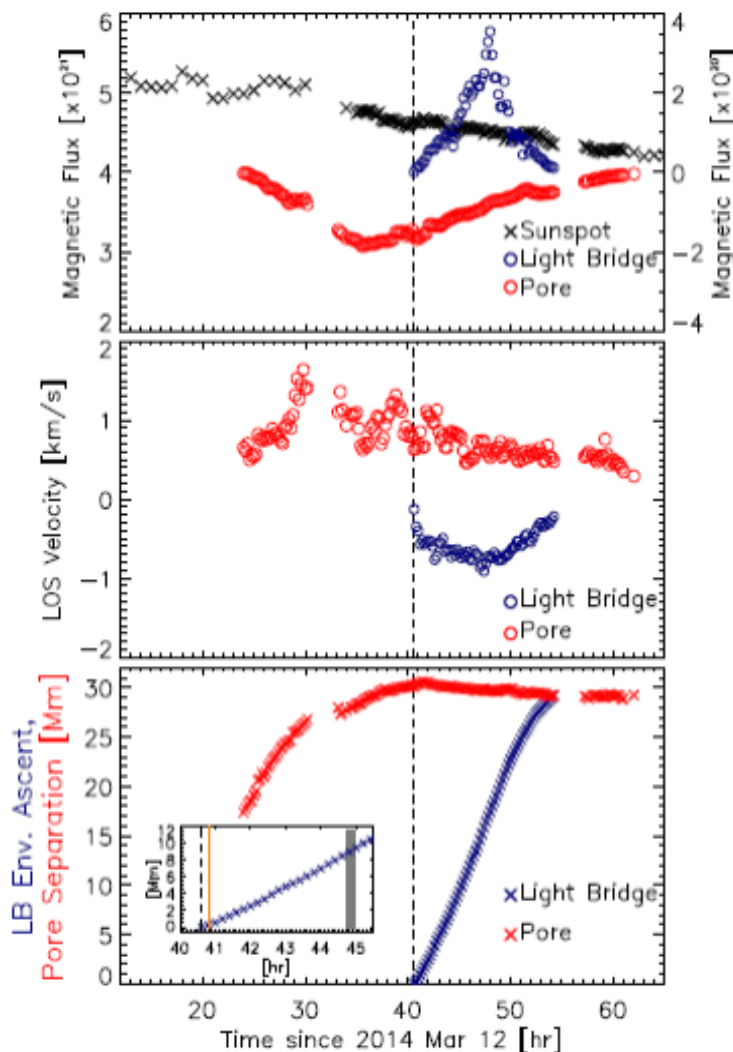


Rohan E. Louis



Caption: Leading sunspot in NOAA AR 12002 on 2014 March 13. Top row, from left to right SDO/HMI continuum intensity, LOS velocity and the vertical component of the magnetic field. The strong blue-shifts in the LB correspond to the horizontal emergent structure. The pore ($x, y: 22'', 25''$) represents the outer footpoint of the large-scale emergent structure. Bottom row, from left to right: SDO/AIA 1700Å, 304 Å, and 171 Å channels.

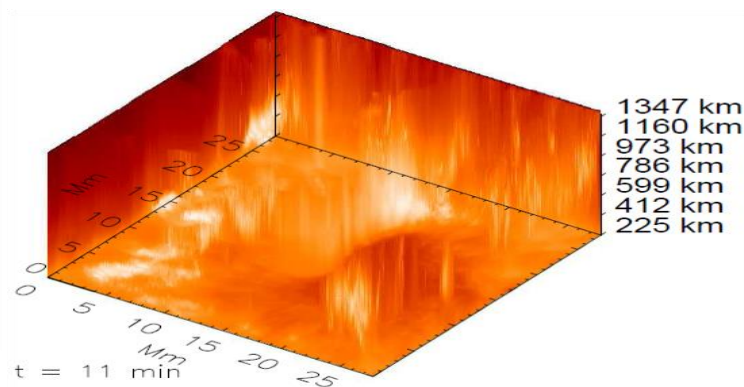
Light Bridges (LBs) are bright, extended structures within the umbrae of sunspots/pores. LBs are often seen during the early stages of sunspot formation or during the late phase of sunspot decay and are located along lanes where individual spots coalesce or fragment. Their formation is generally regarded to stem from vigorous overturning convection within a sunspot. We explore the above premise in this investigation by analysing the formation, structure, and evolution of an atypical LB in a regular sunspot, using a combination of full-disk data from NASA's Solar Dynamics Observatory (SDO) and high-resolution data from the 76 cm Dunn Solar Telescope of the National Solar Observatory in New Mexico, USA. The LB results from the emergence of magnetic flux with one footpoint rooted in a pore outside the parent sunspot that appears about 17 hr before the LB.



Caption: Evolution of magnetic flux (top), and LOS velocities (middle) in the pore and LB. Bottom: The colored crosses show the height to which the envelope of the LB rises in the solar atmosphere and the distance of the pore's separation from the sunspot. The inset in the lower left corner shows a smaller time window of the ascent with the orange vertical line signifying the appearance of the surges in the AIA images and the gray shaded region represent the DST observing window.

The pore has a polarity opposite to that of the sunspot and recedes from it at a speed of about 0.4 km/s. This is accompanied by the development of an elongated magnetic channel in the outer penumbra that triggers the formation of the LB when it reaches the inner penumbral boundary. The LB is a nearly horizontal structure with a field strength of about 1.2 kG that exhibits long-lived photospheric blueshifts of about 0.85 km/s along its entire length.

The thermal inversion of chromospheric spectra from the DST reveal the LB to be about 600–800 K hotter than the umbra. Our results indicate that the LB formation is part of a flux emergence event with the LB envelope reaching a height of about 29 Mm before dissolving after about 13 hr. We conclude that the existence of persistent, large-scale photospheric blueshifts in LBs is the most likely criterion for distinguishing between flux emergence events and overturning convection in field-free umbral intrusions.



Caption: Thermal structure of the LB shows different sections of the LB are elevated to heights between 400 and 700 km.

Source/Reference of the Work:
<https://doi.org/10.1029/2020GL090362>



What does the Good employee do differently? The USP

(CVRG Deekshitulu)

In PRL the USP - Unique Selling Proposition is the perceived benefit of a good which makes it unique from the rest of the competing research institutes in India. That's the responsive administrative setup and freedom in absolute terms for doing the research.

I joined the PRL in 2003 before I inquired about the PRL with my previous colleagues and a few seniority faculty working in IIMA. I was given a thumbs up and advised to join. The working environment transformed my working style and perceptions on many an issue on hand. The philosophy is 'the mindset called 'internal locus of control' a belief that power resides inside us. It is expected that everybody knows his/her responsibility towards the institution and do all that he/she can do in elevating its stature in the eyes of peers and the general public.

The traits I observed afterwards and some of it I found in PRL. The personnel in PRL feels and claims of ownership of things. At times even it is not their fault one owns it and take it as their responsibility. The mindset called 'internal locus of control' a belief that power resides inside us which can be co-related to our health, incomes and the career success.

Ingenuity to come up with a solution when encountered with the difficulties is termed as the resourcefulness which is amplified and shown in a large extent, be it in scientific endeavours and/or dealing an administrative matter on hand. The committee way of administration leads to nurturing the future leaders, who understand the systems and compliances, ala mentorship.

By giving and sharing the knowledge and expertise acquired by over a period and pass it on to the next, without an agenda or quid pro quo, leads to mentorship. This builds a bond with their colleagues/peers and inculcate a habit of going out of their way to extend help to the fresher and newcomers. 'One views his own colleague/peer as a customer' I understood the power of the proposition. Does it sound surreal?

Move quickly: The movement of papers and work with a purpose, speed and determination. The knowledge and experience one acquires in the course of their performance is manifested in being an 'Expert' or a domain specialist. This is nurtured with the free exchange of ideas and extensive interaction with the international peers and observation of advancement in the chosen fields.

How this is possible and/or acquired?

To constantly pursue continuing education in their domain or sphere of knowledge and insights into the environment in which one functions. Understand the trends and emerging technologies or tools. To become innovative and do some out of box thinking in a more competitive environment. To know and understand that the services create value for their working and keep in realm and forefront.

What the newcomers do to position themselves into the whole?

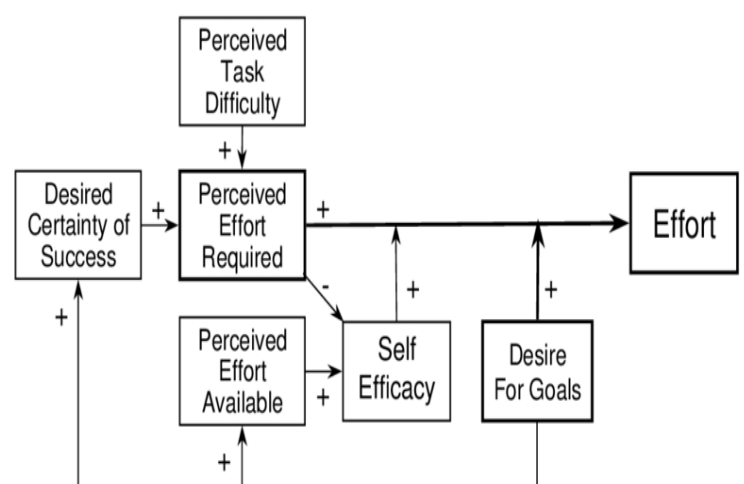
Upskill and to remain relevant. Do the homework and attend to the meetings? Keep the tradition of punctuality. Data analytics and learn to see from the different paradigm of the problem on hand: an important change that happens when the usual way of thinking about or doing something is replaced by a new and different way. This discovery will bring about an understanding of evolution. Define the ironclad outcomes. It is unlikely that the guaranteed outcome may result in shortfall and/or not entirely delivered. But, it would definitely act as a springboard to target and lead to the next level of the outcome.

Pose questions to better understand the requirements that aim to provide customized solutions. Politely refuse if there is an iota of doubt that a promised outcome is difficult and beyond one's realm or cannot be delivered rather than bogging down taking something on hands and fail to deliver. Always keep the interests of the institution ahead of one's own. Be an ambassador and protect the image of the institution, not to be part of rumour-monger, not to monetize or think in monetary terms of each transaction. Win the confidence and trust, and inspire confidence and hope.

Work for the Goal congruence. It is a situation in which people in multiple levels of an area/division share the same goal. A well-thought-out design causes goal congruence and results in an area/division being able to work together to accomplish a strategy.

Build a long-lasting relationship with the peers and colleagues, invest in training, motivate and imbibe excellent work ethics. This leads to reward and recognition, positive behavioural traits, show empathy, and be an inspiration. The trust one wins and relationship built would be lost long and reciprocity and likeability enhanced considerably.

I know what's on the mind – should I take the risk and follow this advice? in this day and age? Do you have a choice!



Graphics: courtesy ResearchGate ©

Season's greetings and best wishes! Happy & healthy 2021.

Discovery of boulder fall activity in the Jezero crater, Mars

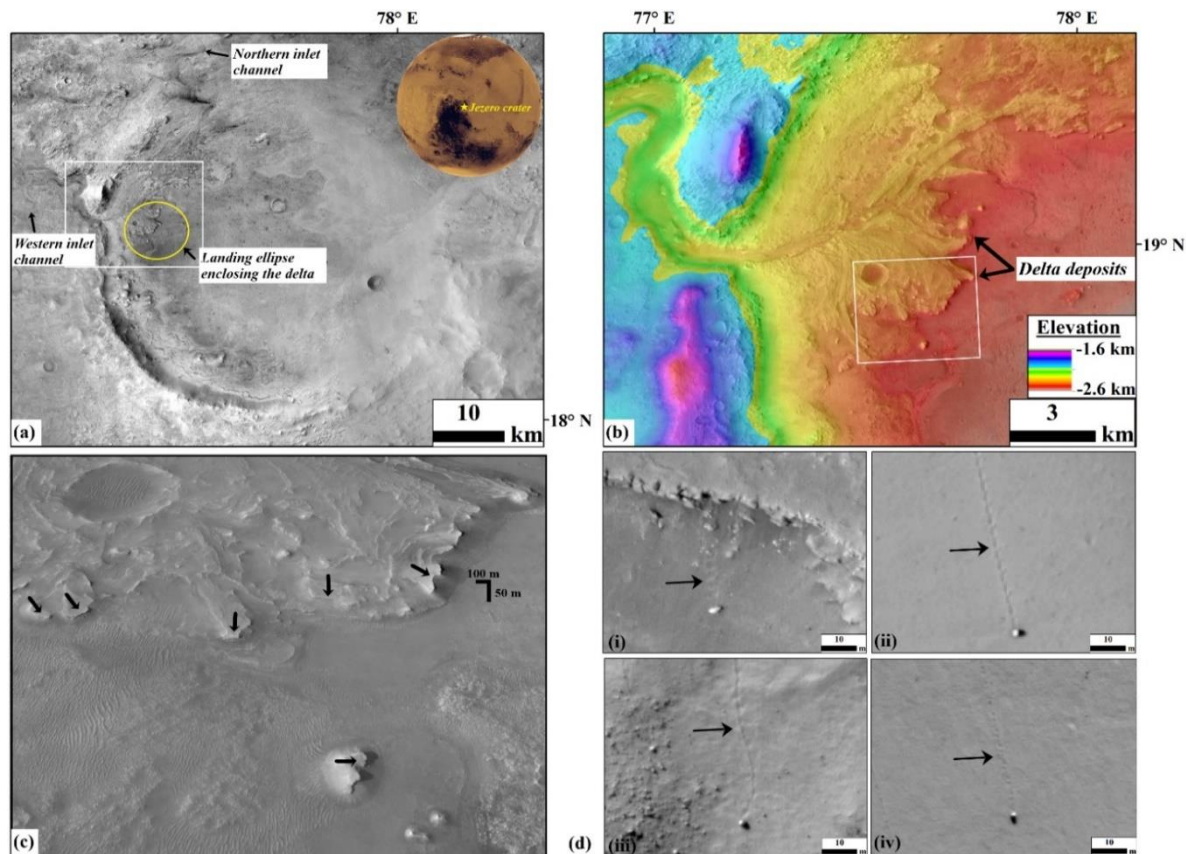
(Rishitosh K. Sinha, Alka Rani, Susan J. Conway, Vijayan Sivaprahasam, Amit Basu Sarbadhikari, Marion Massé, Nicolas Mnagold, Anil Bhardwaj)



Rishitosh K. Sinha

NASA's Mars 2020 Perseverance rover is scheduled to arrive in Jezero crater (centered at 18.42°N, 77.67°E) in early 2021. We report on the discovery of 63 boulder fall tracks on the slopes of the delta deposits that the Perseverance rover will explore, on the wall of Jezero crater and on the wall of a small crater (2 km diameter) on the floor of Jezero crater. Hazardous boulders bigger than the size of the rover (>2.7 m) have recently fallen down moderately steep gradients, and moved up to a few tens of meters to nearly a kilometer. We found that the boulder position has not changed over the past ~12 years, although our morphological observation of both fresh and faded boulder fall tracks suggests that the boulder falls are recent and ongoing. We suggest that this newly found hazard related to the rover operations should be taken into consideration by the mission team. We propose that the surfaces of these recently fallen boulders may be less exposed to radiation, thus they could be ideal targets for collecting samples that could be examined for the signs of Mars' ancient life. We suggest possible processes (e.g. thermal contraction, eolian erosion and seismic shaking) that could have been responsible for the fall of boulders in and around Jezero crater. These processes can be tested by the instruments on board the rover.

Source/Reference of the Work: <https://doi.org/10.1029/2020GL090362>



Caption: (a) Mars Reconnaissance Orbiter (MRO) Context Camera (CTX) image based mosaic of the landing site (Jezero crater) of the Mars 2020 Perseverance Rover. The landing ellipse is shown in yellow. The landing ellipse encloses fan-shaped delta deposits believed to have formed as a result of past fluvial activity in the regions in and around the crater. Note the inlet channels around the north and west. White box shows the location of Figure b. (b) MRO High Resolution Imaging Experiment (HiRISE) based digital elevation model (DEM) of the delta deposits. Note the peculiar topography of the delta deposits. White box shows the location of Figure c. (c) A three dimensional view of the delta deposits using HiRISE DEM and HiRISE images. The cliffs of delta deposits host large number of boulders at the top, bottom and on the flanks. We have identified fresh and faded boulder fall tracks on the flanks of the cliffs marked by arrows. (d) (i-iv) HiRISE image based zoomed views of the boulder fall tracks (marked by arrows). The difference in morphology of the tracks helped us to characterize boulder tracks as fresh and faded.

Zeroing In – The Science Podcast

(Prachi Prajapati)



An initiative by the IIST Alumni Association (IISTAA), **Zeroing In – The Science Podcast**, is a non-profit community podcast venture aimed at curating and sharing the discussions with active Indian community of scientific researchers primarily working in science and technology.

Our fundamental purpose is to generate awareness about scientific research, details of life in science, and carry out science outreach within the student community in India ranging from that of schools, colleges, and up to research institutes. In long term, we aim to bridge the pronounced gap between the school students, academia, and Indian researchers, and even industry, by opening up avenues of information, collaboration, and prospects for the students by proffering them knowledge and exposure about the life, and ideas of eminent researchers.

If you or your friends/family would like to discover our curated conversations with some of the pioneering researchers in various scientific fields, please visit anchor.fm/zeroingin, to hear our podcasts. These podcasts are also available on Instagram & various other streaming platforms such as Spotify, Apple, Google, Breaker, Overcast, RadioPublic, Pocket Cast, and Anchor.

You may contact or write to us at zeroinginpodcast@gmail.com / zeroingin@outlook.in or follow us on Instagram @[zeroinginpodcast](https://www.instagram.com/zeroinginpodcast).

EPISODE 01 In conversation with Dr. Anand Narayanan Associate Professor, IIST on Astronomy and Astrophysics. "The scientific world-view can be as refreshing, entertaining, and liberating, as art, music, or any other great thing that the humankind has done."	EPISODE 02 In conversation with Prof. B.S. Manoj Associate Professor, IIST on Networking and Communications. "Late 90's, the industry was rapidly progressing, particularly in the software sector. At that time, I was actually resigning my software industry job to do a PhD."	EPISODE 03 In conversation with Dr. R. V. Ramanan Adjunct Professor, IIST on Spaceflight Mechanics and Astrodynamics. "...when we start anything, that fear of unknown will be there. It may look simple, but that is something I used to say in classes also— nothing is simple, nothing is obvious, nothing is trivial... Now we have sent 104 satellites in a launch, but in '98 we started with two!"
EPISODE 04 In conversation with Dr. Jinesh K.B. Associate Professor, IIST on Semiconductor & Device Physics, and Nanotechnology. "...you see noise is not always bad. Carefully analysing the noise, we observed that something very different was happening in our experiment. There was ice formation at room temperature and that... that was a revolutionary discovery!"	EPISODE 05 In conversation with Dr. Sreejalekshmi K.G. Associate Professor, IIST on Chemical Sciences. "...the problem with drug discovery is that it's a very long process. It takes atleast 10-12 years to bring a drug into the market. The efficiency of getting an end result was very frustrating. So everyone thought about how to get more results at the end of funnel—combinatorial chemistry was the answer."	EPISODE 06 In conversation with Dr. Govindan Kutty M. Associate Professor, IIST on Atmospheric Sciences. "If God appears before you and gives you a weather model which is perfect in all sense, you will still not be able to give an accurate forecast! This is because of the fundamentally chaotic nature of the atmosphere—that we cannot change!"

EPISODE 07 : IN CONVERSATION WITH DR. B.N. SURESH

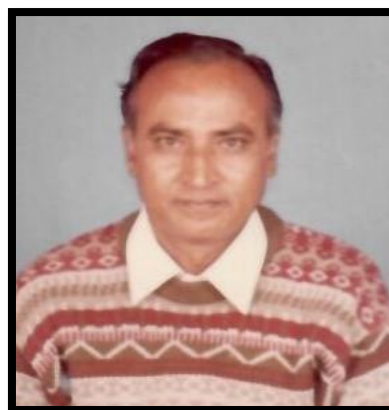
Stream Zeroing In now on: @zeroinginpodcast

Obituaries



Late Shri B.L. Panchal
Chief Construction Engineer

Date of Birth	02.10.1938
Date of retirement	31.10.1998
Date of Death	15.12.2020



Late Shri G.A. Macwan
Sr. Draughtsman-B

Date of Birth	26.06.1940
Date of retirement	30.06.2000
Date of Death	21.12.2020



Late Shri M.G. Dhamecha
Tradesman-G

Date of Birth	07.01.1943
Date of retirement	31.01.2003
Date of Death	18.11.2020



Late Shri Philip C.S.
Personal Assistant-C

Date of Birth	18.04.1948
Date of retirement	30.04.2008
Date of Death	20.11.2020

Awards and Honors

- ✚ **Prof. Srubabati Goswami**, Senior Professor, Theoretical Physics Division of PRL has been elected as a Fellow of The World Academy of Sciences (TWAS) for the advancement of science in developing countries, effective from 1 January 2021.
- ✚ **Prof. Bimla Buti**, Senior Professor (Retd.) of PRL has been awarded the R. D. Birla Memorial Award in Physics for the year 2020 by the Indian Physics Association. This award recognizes Professor Buti's outstanding contributions in the areas of research and mentoring.

Superannuation



Shri S.N. Mathur, Technical Officer-F superannuated from PRL on 31.12.2020 after serving the institute for nearly 32 years. PRL family thanks him for his contributions towards the betterment of the institute and wishes him a Happy and Healthy superannuated life.

Colloquia @ PRL

- **Prof. Pankaj Joshi** (Vice-Chancellor (Provost) & Founding Director, International Center for Cosmology (ICC), CHARUSAT University, Anand) delivered a colloquium entitled “*Beyond Penrose -Blackholes and Spacetime Singularities*” on 09 December 2020.
- **Prof. Dipankar Banerjee** (Director, Aryabhata Research Institute of Observational Sciences (ARIES), Nainital, Uttarakhand) delivered a colloquium entitled “*Long term study of the Sun using the Kodaikanal Digitised archive*” on 16 December 2020.
- **Prof. Subramanian Gurubaran** (Professor, Indian Institute of Geomagnetism, Navi Mumbai) delivered a colloquium entitled “*Internal Bores in the Mesosphere: A manifestation of Atmospheric Gravity Waves*” on 23 December 2020
- **Prof. Alexander Tielens** (Professor, Astronomy Department, Leiden University and University of Maryland) delivered a special colloquium entitled “*The Molecular Universe*” on 02 December 2020

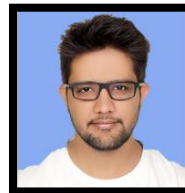
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