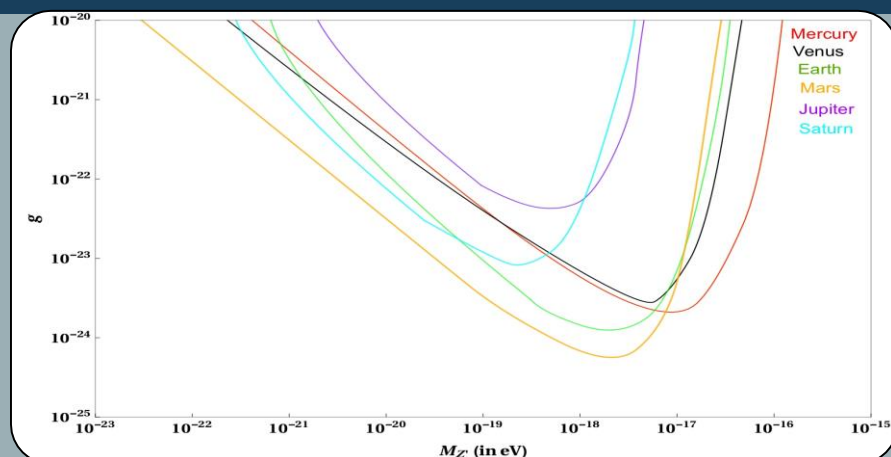




# PRL News - *The Spectrum*



MONTHLY NEWSLETTER OF THE PHYSICAL RESEARCH LABORATORY



# Constraints on long range force from perihelion precession of planets in a gauged $L_e - L_{\mu,\tau}$ scenario

Tanmay Kumar Poddar, Subhendra Mohanty, and Soumya Jana

The observation of the perihelion precession of Mercury planet strongly confirms that the Einstein's general theory of relativity (GR) is a correct theory of gravity. The deviation from  $1/r^2$  type of Newtonian force results the perihelion precession which was successfully encountered in Einstein's GR theory. However, there is an uncertainty in the measurement of the perihelion precession of Mercury from Einstein's GR value which is  $10^{-3}$  arc-second/century. To solve this uncertainty, we consider a long range Yukawa type of force ( $1/r e^{-M_{Z'} r}$ ) which mediates between the Sun and the planets in the solar system due to the presence of electrons inside those celestial bodies.

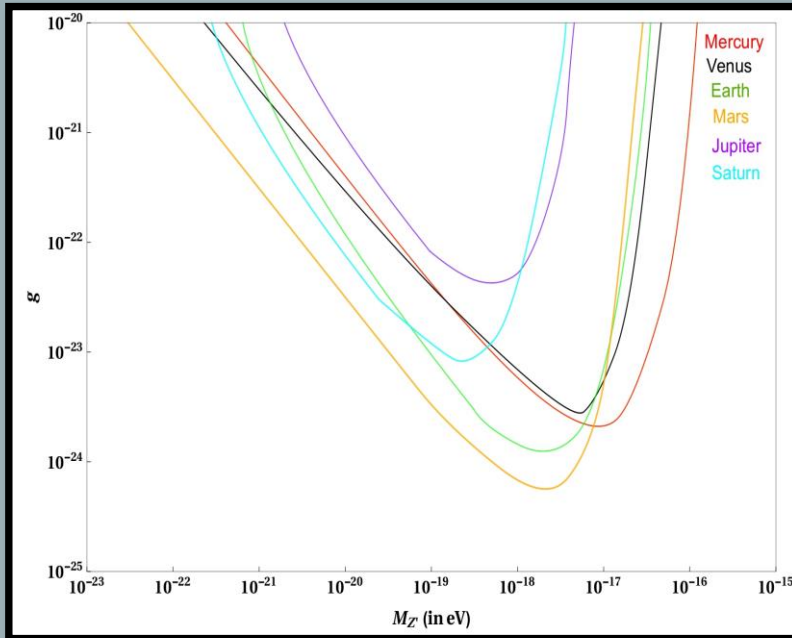


Figure: Plot of the coupling constant vs. the mass of the gauge boson. The planet Mars gives the stronger bound.



Tanmay Kumar Poddar

The particle or the gauge boson which mediates this long range Yukawa type of force is gauged  $L_e - L_{\mu,\tau}$  type and we extend the standard model gauge theory by  $U(1)_{L_e - L_{\mu,\tau}}$  in an anomaly free way. The mass of the gauge bosons is constrained by the distance between Sun and planets which demands  $M_{Z'} < 10^{-19}$  eV. The gauge coupling is very small for the mediation of these ultralight gauge bosons and the planet Mars gives stronger bound on the gauge coupling. These ultralight gauge bosons can be a possible candidate of fuzzy dark matter which can therefore be observed in the precession measurements of planetary orbit.

Reference: <https://doi.org/10.1140/epjc/s10052-021-09078-9>

## ***Report on First Dr. Bibha Chowdhuri Memorial Lecture***

***By- Dr. Srubabati Goswami***



***Dr. Srubabati  
Goswami***

Dr. Bibha Chowdhuri (1913-1991) was the first women high-energy physicist of India. With Prof. D. M. Bose, she did pioneering research (1939-44) on identifying new particles in cosmic rays and published four papers in Nature. Their works were referred to by Prof. C.F. Powel, the Nobel Prize winner for discovery of mesons. Subsequently she did her Ph.D from the University of Manchester with Prof. P. M. S. Blackett on “Penetrating particles in Extensive Air Showers in cosmic rays” . She has the distinction of being the first women scientist to join TIFR (1949-1953) and PRL (1966-1976). Between 1954-59 she was in Ecole Polytechnique, Paris and the University of Michigan working on detectors like multiple cloud chambers and pulse ionization chambers. During the period 1959-1966, she worked at the Kodaikanal Observatory of PRL. She was involved in research on detecting high energy muons associated with extensive air showers at the Kolar Gold Field. She left PRL in 1976, after her plans to set up a new experiment at Mount Abu on radio frequency emissions associated with Extensive Air Showers did not materialize, due to the untimely demise of Dr. Sarabhai. She continued her research work in Kolkata with scientists of SINP, IACS and University of Calcutta, publishing her last research paper in 1990. Despite her breakthrough research in leading International and Indian organizations, her name remained obscure to the next generation until recently when a book entitled “A jewel unearthed: Bibha Chowdhuri” by Rajinder Singh and Suprakash Roy got published (2018) and she began to receive recognition. TIFR has recently brought out the Indian edition of this book. Recently IAU has named a white yellow dwarf star as “Bibha” (meaning ray of light in Bengali) in honour of Dr. Bibha Chowdhuri. In a recent endeavour, the Women and Child Development Ministry declared that it will establish 11 chairs named after women scientists, in institutes across the country, to honour their contribution in the field. A chair in the name of Dr. Bibha Chowdhuri to be instituted in TIFR or PRL has been proposed under this scheme. The Dr. Bibha Chowdhuri Memorial Lecture has been instituted by PRL in 2021 to commemorate the life and work of this pioneering physicist and also to celebrate women in science in general. This Lecture will be organized every year during the months of February/March on the occasions of the International day for women and girls in science (8<sup>th</sup> February)/International women’s day (8<sup>th</sup> March) and would involve a lecture by an eminent women researcher in the field of Science, Technology or Social Science.



# COVID-19 Vaccination Camp

As per national directives for COVID19 vaccination for frontline workers, Physical Research Laboratory in association with Ahmedabad Municipal Corporation (AMC) had organised COVID19 vaccination Camp to facilitate the Covid19 immunization for their employees, Scholars, PDFs and Contractual Workers under AMC - COVID19 mass immunization drive. Though majority of PRL numbers have already taken COVID19 vaccination under the Frontline worker category at various vaccination sites of AMC, still substantial numbers had been left out without vaccination. After extensive and exhaustive coordination by PRL team with AMC, it became possible to arrange this camp at PRL for our members within short time.

The camp was held at K. R. Ramanathan Auditorium on 31.03.2021 (Wednesday). Utmost care had been taken to follow COVID19 protocols while managing the beneficiaries at the camp site. The common foyer outside the hall had been designated as waiting hall, where people came and took their token numbers for vaccination. The vaccination was arranged on the dais of the hall. The hall seats were reserved as an observation room, where those who undergone vaccine took their seat for 30 minutes to remain under observation. Afterwards they were allowed to leave the hall from opposite door of the hall.

Total number of the beneficiaries covered under vaccination is 164. Those who have undergone 1<sup>st</sup> dose of the Covishield vaccine are gently reminded not to forget taking second dose within 28 to 56 days of 1<sup>st</sup> dose.



# NATIONAL FIRE SERVICE WEEK IN PRL

As a part of National Fire Service Week (14 - 20 April 2021), PRL in coordination with Fire wing of CISF conducted a lecture on first aid firefighting and demonstration on handling of various types of fire extinguishers in Thaltej Campus on 16 April 2021. Assistant Commandant, Fire Wing of CISF delivered a detailed lecture on the following:

- (a) Types of fire
- (b) Causes of various types of fire
- (c) How to escape from the fire
- (d) What type of fire extinguisher to be used for different types of fire
- (e) How to operate the fire extinguisher
- (f) Immediate actions to be taken on notice of fire etc.

Also had demonstration on operation of various types of fire extinguishers on different type of fires. Some PRL members were also had an experience of operating the same.



## Colloquia @ PRL

- Prof. Bimla Buti (Director, Centre for Science and Society, Buti Foundation, New Delhi) delivered a talk entitled "Coherence, Chaos and Turbulence in Plasmas" on 03 March 2021
- Prof. Tanusri Saha-Dasgupta (Professor, Department of Condensed Matter Physics and Materials Science S. N. Bose National Centre for Basic Sciences, Kolkata) delivered a colloquium entitled "Electrons in Complex Materials: from Theory to Practice" on 17 March 2021
- Prof. Devesh K. Sinha (Professor, Department of Geology, Centre of Advanced Study, Delhi University) delivered a talk on 'Paleobiogeographic and biostratigraphic evidences for role of Ocean gateways in changing ocean circulation and global climate during Cenozoic' on 24 March 2021.
- Dr. Archana Sharma (Principal Staff Scientist, CERN Laboratory Geneva, Switzerland) delivered 1<sup>st</sup> Dr. Bibha Chowdhuri Memorial Lecture entitled "Unlocking secrets of the Universe at CERN" on 31 March 2021.



## Obituaries

### *Goodbye Dear Friend.....*

You never said I'm leaving  
You never said goodbye.  
You were gone before we knew  
And only God knows why.

In Life you were close to us  
In death you are closer still.  
In our hearts we hold a place  
That only you can fill.

It broke our hearts to lose you

But you didn't go alone.  
A part of us went with you  
The day God took you home.



Mukesh Saradava  
1981 - 2021



<b>Late Shri Punambhai S. Panchal Senior Technician-C</b>	
<b>Date of Birth</b>	<b>21.05.1940</b>
<b>Date of retirement</b>	<b>31.05.2000</b>
<b>Date of Death</b>	<b>18.04.2021</b>



<b>Late Shri K.C. Patel Technical Assistant-D</b>	
<b>Date of Birth</b>	<b>22.07.1935</b>
<b>Date of retirement</b>	<b>31.07.1995</b>
<b>Date of Death</b>	<b>19.04.2021</b>



<b>Late Shri K.J. SHAH Computer Scientist-SE</b>	
<b>Date of Birth</b>	<b>26.05.1952</b>
<b>Date of retirement</b>	<b>31.05.2012</b>
<b>Date of Death</b>	<b>15.04.2021</b>



# HEARTY WELCOME TO NEW MEMBER

Name : MAHESH CHAND SAINI

Designation : TECHNICAL ASSISTANT

Date of Joining : 09.04.2021

Division/Area : ASTRONOMY & ASTROPHYSICS DIVISION



## The Editorial Team



Garima Arora



Pragya Pandey



Prashant Jangid



A. Shivam



Rohan Louis



Partha Konar



Bijaya Sahoo



Som Sharma

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