CURRICULUM VITAE

NAME	:	**Dr. Suman Ray**
PRESENT POSITION	:	*State Aided College Teacher* - I, Dept. of Physics, Gobardanga Hindu College. And, *Honorary Scientist*, Indian Centre for Space Physics, Kolkata, West Bengal, India.
DATE OF BIRTH	:	16-05-1984
SEX	:	Male
MARITAL STATUS	:	Married
NATIONALITY	:	Indian
RELEGION	:	Hindu
PERMANENT & PRESENT ADDRESS	:	VILL.- North Habra (Backside of Primary School), POST- Habra, DIST.- North 24 Parganas, STATE- West Bengal, PIN-743263.
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EDUCATIONAL QUALIFICATION **:** **Ph.D.**, Physics, 2014,
University of Calcutta, Kolkata, India.

(Passed Ph.D-Course work from S. N. Bose National Centre for Basic Science, with 87% marks)

Title of the Thesis –'Study of the Very Low Frequency (VLF) Radio Wave Propagation in Earth-Ionosphere Wave-guide and its Application for Possible Correlation of VLF Signal Anomalies with Seismicity'.

Thesis Supervisor : Prof. Sandip Kumar Chakrabarti,
Senior Professor, S. N. Bose National Centre for basic Sciences,
& Academic in-Charge, Indian Centre for Space Physics, Kolkata.

M.Sc., Physics, 2008, 1st Class,
University of Calcutta, Kolkata, India.

B.Sc., Physics (Hons.), 2005, 2nd Class,
University of Calcutta, Kolkata, India.

Higher Secondary, 2002, 1st Division,
West Bengal Council of Higher Secondary Education.

Secondary, 2000, 1st Division,
West Bengal Board of Secondary Education.

ACADEMIC PROJECT UNDERTAKEN :

SUBJECT OF THE PROJECT	NAME OF THE PROJECT WORK	DURATION OF THE PROJECT WORK	FUNDING AGENCY
VLF Radio Astronomy	Study on the correlation of solar and terrestrial events with the earth-ionosphere by analyzing Very Low Frequency (VLF) signals.	Two Year [21/12/2021 to 20/12/2023]	Gobardanga Hindu College [Research Grant (Seed Money) for Young Researcher Scheme]

RESEARCH INTEREST **:**

1) VLF Radio Astronomy
2) The upper atmosphere.
3) Seismic events.
4) Solar flare.
5) Solar eclipse.

TEACHING EXPERIENCES **:** 16 years teaching experience.
[August, 2009 to till date]

1) Working as a Faculty-member at Gobardanga Hindu College since August, 2009 to till date and taught several courses at Undergraduate level.

3) Worked as a Guest Teacher at West Bengal State University, Barasat, for four different semesters (August, 2022 to January, 2023; August, 2023 to January, 2024; February, 2024 to July, 2024; August, 2024 to January, 2025) and taught Astrophysics and Nuclear-Physics at Postgraduate level.

SEMINARS / CONFERENCES ATTENDED :

1) Attended **"Exploring the Universe: Near Earth Space Science to Extra-Galactic Astronomy"** from 14th to 17th November, 2018, at S. N. Bose National Centre for Basic Sciences, Kolkata, India, organized by 'S. N. Bose National Centre for Basic Sciences', Kolkata, India.

2) Attended **"Atmospheric Electricity Phenomena and Natural Hazards"** jointly organized by Department of Atmospheric Sciences, University of Calcutta, Kolkata, & Indian Centre for Space Physics, Kolkata, on 5th May, 2017.

3) Attended **"Natural Disaster Phenomena: Contemporary Developments"** organized by Department of Atmospheric Sciences, University of Calcutta, Kolkata, on 26th Feb, 2016

4) Attended **"40th COSPAR Scientific Assembly"** during 2nd to 10th August, 2014, at Moscow State University, Moscow, Russia.

5) Attended **"ISRO Respond Review Meeting"** during 20th to 21st February, 2014 at Physical Research Laboratory (PRL), Ahmedabad, India.

6) Attended **"ISRO Respond Review Meeting"** during 8th to 9th February, 2013 at PRL, Ahmedabad, India.

7) Attended **"39th COSPAR Scientific Assembly"** during July 14-22, 2012, at Narayana Murthy Centre of Excellence, Mysore, India, Local organizer-ISRO.

8) Attended **"Indo-Us workshop on Advancing VLF Science through the Gobal AWESOME network"** during 28th Nov to 1st Dec, 2011 in Goa, India, organized by Indian Institute of Geomagnetism.

9) Attended **"XXX URSI General Assembly and Scientific Symposium of International Union of Radio Science"** during 13-20 August, 2011, at Istanbul Lutfi Kirdar Convention & Exhibition Centre, Istanbul, Turkey.

10) Attended **"International Workshop on Seismo-Electromagnetics and Atmospheric Science (IWSE-AS 2010)"** during 16-18 November 2010, organized by 'Department of Physics, Faculty of Engineering & Technology, RBS College, Bichpuri, Agra, India.

11) Attended 1st international conference on **"Very Low Frequency (VLF) Radio Waves : Theory & Observations"** from 14th March, 2010 to 18th March, 2010, at S. N. Bose National Centre for Basic Sciences, Kolkata, India, organized by 'S. N. Bose National Centre for Basic Sciences', Kolkata, India.

12) Attended **"Physics 2005 and beyond – A few Glimpses"** on 7th February, 2005 at the Department of Physics, Jadavpur University, Kolkata, India, organized by 'Nuclear and Particle Physics Research Centre, Department of Physics, Jadavpur University, Kolkata, India.

ORAL PRESENTATION :

1) Presented **"Possibility of earthquake prediction by using VLF signals"** on 14th November at "Exploring the Universe: Near Earth Space Science to Extra-Galactic Astronomy", S. N. Bose National Centre for Basic Sciences, Kolkata, India.

2) Presented **"Response of the VLF signals due to Solar energetic phenomena and the pre-seismic effects"** on 5th May, 2017 at "Atmospheric Electricity Phenomena and Natural Hazards", Department of Atmospheric Sciences, University of Calcutta, Kolkata.

3) Presented **"Correlation between seismic events and anomalous 'VLF day-length' for west-east and east-west propagation paths"** on 8th August, 2014, at '40th COSPAR Scientific Assembly' (Scientific Event C0.4), Moscow, Russia.

4) Presented **"Correlation between night time VLF amplitude fluctuations and seismic events in Indian sub-continent"** on 6th August, 2014, at '40th COSPAR Scientific Assembly' (Scientific Event A3.1), Moscow, Russia.

5) Presented **"Study of ionospheric behaviour during total and annular solar eclipse using the Characteristic of Very Low Frequency (VLF) signals"** on 20th Feb, 2014 at 'ISRO Respond Review Meeting', PRL, Ahmedabad, India

6) Presented **"Study of ionospheric behaviour during total solar eclipse of July 2009 using the Characteristic of Very Low Frequency (VLF) signals"** on 8th Feb, 2013 at 'ISRO Respond Review Meeting', PRL, Ahmedabad, India.

7) Presented **"Unusual Fluctuation of the Night time VLF Signal Amplitude before Seismic Events"** on 15th July, 2012 at '39th COSPAR Scientific Assembly' (Scientific Event C0.4), Mysore, India.

8) Presented **"Unusual Shifts in Terminator Times of the VLF Signals before the Pakistan Earthquake (M=7.4), Occurred on 19th Jan., 2011"** on 21st July, 2012, at '39th COSPAR Scientific Assembly' (Scientific Event A3.1), Mysore, India.

9) Presented **"Study of the anomalous behaviors of the ionosphere during earthquake for VTX-Malda and VTX-Kolkata baseline"** on 17th November, 2010 at 'International Workshop on Seismo-Electromagnetics and Atmospheric Science (IWSE-AS 2010)', RBS College, Bichpuri, Agra.

10) Presented **"Study of the anomalous behaviors of the ionosphere during earthquake for VTX-Malda Baseline"** on 15th March, 2010 at 1st international conference on 'Very Low Frequency (VLF) Radio Waves : Theory & Observations', S. N. Bose National Centre for Basic Sciences, Kolkata, India.

POSTER PRESENTATION :

1) On 'Correlation between seismic events and anomalous VLF day-length for west-east and east-west propagation paths' by **S. Ray**, S. K. Chakrabarti and S. Sasmal, at XXXI URSI General Assembly and Scientific Symposium of International Union of Radio Science', Beijing, China, during 16-23 August, 2014.

2) On 'Unusual shifts in terminator times of the VLF signals before the Pakistan earthquake (M=7.4), occurred on 18th Jan., 2011' by **S. Ray** and S. K. Chakrabarti, at XXXI URSI General Assembly and Scientific Symposium of International Union of Radio Science', Beijing, China, during 16-23 August, 2014.

3) On 'Studies of precursors of earthquakes using anomalies in very low frequency signal' by S. Sasmal, S. K. Chakrabarti and **S. Ray,** at XXXI URSI General Assembly and Scientific Symposium of International Union of Radio Science', Beijing, China, during 16-23 August, 2014.

4) On 'Studies of VLF signal anomalies due to earthquake' by S.K. Chakrabarti, S. Sasmal, **S. Ray** and Bakul Das, at XXXI URSI General Assembly and Scientific Symposium of International Union of Radio Science', Beijing, China, during 16-23 August, 2014.

5) On 'A study of the behavior of the terminator time shifts using multiple VLF propagation paths during the Pakistan earthquake (M = 7.2) of 18 January 2011', at '40th COSPAR Scientific Assembly' (Scientific Event C0.4), Moscow, Russia, during 2-10 August, 2014.

6) On 'Calibration of the VLF Signals for VTX-Malda Propagation Path: Correlation between Ionospheric Anomaly and Seismic Activities' by **S. Ray,** S. K. Chakrabarti, S. Sasmal & A. K. Choudhury at '39th COSPAR Scientific Assembly' (Scientific Event C0.4), Mysore, India, during 14-22 July, 2012.

7) On 'Ionospheric Anomaly During Seismic Activities Observed from NWC-Sitapur Baseline' by S. Sasmal, S. K. Chakrabarti, S. K. Mondal and **S. Ray**, at '39th COSPAR Scientific Assembly' (Scientific Event C0.4), Mysore, India, during 14-22 July, 2012.

8) On 'Anomalous fluctuations of the night time VLF amplitude before earthquakes' by **S. Ray** and S. K. Chakrabarti at 'International Workshop on Seismo-Electromagnetics and Atmospheric Science (IWSE-AS 2010)', Goa, India, during 16-18 November, 2011.

9) On **'**Precursor of earthquake using night time VLF amplitude' by **S. Ray** and S. K. Chakrabarti at 'XXX URSI General Assembly and Scientific Symposium of International Union of Radio Science', Turkey, Istanbul, during 13-20 August, 2011.

10) On 'Anomalous behaviors of the VLF Signals before earthquake for VTX-Malda propagation path' by **S. Ray**, S. K. Chakrabarti and A. K. Choudhury at 'XXX URSI General Assembly and Scientific Symposium of International Union of Radio Science', Turkey, Istanbul, during 13-20 August, 2011.

11) On 'Result of VLF Campaigns in Summer and Winter in Indian sub-continent' by S. K. Chakrabarti, S. Pal, S. Sasmal, S. K. Mondal, **S. Ray** and T. Basak, at 'XXX URSI General Assembly and Scientific Symposium of International Union of Radio Science', Turkey, Istanbul, during 13-20 August, 2011.

12) On 'VLF observation results of total eclipse of 22nd July, 2009 by ICSP team' by by S. K. Chakrabarti, S. Pal, S. Sasmal, S. K. Mondal, **S. Ray**, T. Basak and S. Maji, at 'XXX URSI General Assembly and Scientific Symposium of International Union of Radio Science', Turkey, Istanbul, during 13-20 August, 2011.

13) On 'Precursory effects of earthquakes in VLF signals' by **S. Ray**, S. Sasmal and S. K. Chakrabarti, at 18th State Science and Technology Congress, Kolkata, during 28th February, 2011 to 1st March, 2011.

ORGANIZATION OF CONFERENCE:

1) Member of the **L**ocal **O**rganizing **C**ommittee (**LOC**) of 1st international conference on *"Very Low Frequency (VLF) Radio Waves : Theory & Observations"* during 14th March to 18th March, 2010, at S. N. Bose National Centre for Basic Sciences, Kolkata, India.

2) Joint Program Co-ordinator of "Science Camp & Awareness Program for School Students", Sponsored by the Department of Higher Education, Science & Technology and Biotechnology and jointly organized by Department of Physics & Chemistry, Gobardanga Hindu College, held at Gobardanga Hindu College, during 19-21 September, 2019.

OTHER PARTICIPATION & ADDITIONAL ACTIVITES :

1) Participated in ICSP's dignity(1 to 7, 10, 11) series **Balloon Flight Experiment**.
2) Participated **Multi Station VLF Campaign** 17th to 25th July, 2009 during the 'Total Solar Eclipse' on 22nd July, 2009.
3) Installed one ICSP made VLF antenna/ receiver system in Bhagalpur, Bihar, India.
4) Participated in **18th Science and Technology Congress** during 18th February, 2011 to 1st March, 2011.
5) Installed one ICSP made VLF antenna/ receiver system in Shillong, Meghalaya, India.

6) Participated **Multi Station VLF Campaign** 23rd to 29th December, 2019 during the 'Total Solar Eclipse' on 26th December, 2019.
7) Installed one ICSP made VLF antenna/ receiver system in Chandipur, Odisha, India.

ACADEMIC VISITS ABROAD:

1) Visited **'Moscow State University', Moscow, Russia** to attend the "40th COSPAR Scientific Assembly" during 2-10 August, 2014.

2) Visited **Istanbul, Turkey** to attend the "XXX URSI General Assembly and Scientific Symposium of International Union of Radio Science" during 13-20 August, 2011at Istanbul Lutfi Kirdar Convention & Exhibition Centre.

LIST OF PUBLICATIONS :

IN JOURNALS :

1) "Ionospheric anomaly due to seismic activities-III: correlation between night time VLF amplitude fluctuations and effective magnitudes of earthquakes in Indian sub-continent" by **S. Ray**, S. K. Chakrabarti, S. K. Mondal, S. Sasmal, *Nat. Hazards Earth Syst. Sci.*, 11, 2699-2704, 2011.

2) "Precursory effects in the nighttime VLF signal amplitude for the 18th January, 2011 Pakistan earthquake" by **S. Ray,** S. K. Chakrabarti and S. Sasmal, *Ind. J. Physics*, 86(2), 85-88, 2012.

3) "VLF signals in summer and winter in the Indian sub-continent using multi-station campaigns" by Sandip K. Chakrabarti, S. K. Mondal, S. Sasmal, S. Pal, T. Basak, S. Chakrabarti, D. Bhoumik, **S. Ray**, S. Maji, A. Nandi, V. K. Yadav, T. B. Kotoch, B. Khadka, K. Giri, S. K. Garain, A. K. Choudhury, N. N. Patra, N. Iqbal, *Ind. J. Physics*, 86(5), 323-334, 2012.

4) "VLF campaign during the total eclipse of July 22nd, 2009: Observational results and interpretations" by S. K. Chakrabarti, S. Pal, S. Sasmal, S. K. Mondal, **S. Ray,** T. Basak, S. K. Maji, B. Khadka, D. Bhowmick, A. K. Chowdhury, *Journal of Atmospheric and Solar Terrestrial Physics*, 86, 65–70, 2012.

5) "A Study on the behaviors of the terminator shifts of the VLF signals using the multiple VLF propagation paths during the Pakistan earthquake, occurred on 19th Jan., 2011" by **S. Ray** and S. K. Chakrabarti, *Nat. Hazards Earth Syst. Sci.*, 13, 1501-1506, 2013.

6) "Unusual behavior of Very Low Frequency signal during the earthquake at Honshu/ Japan on 11 March, 2011" by S. Sasmal, S. K. Chakrabarti and **S. Ray**, *Ind. J. Physics*, 88(10), 1013-1019, 2014.

7) "Modeling of the lower ionospheric response and VLF signal modulation during a total solar eclipse using ionospheric chemistry and LWPC", by Suman Chakraborty, Sourav Palit, **Suman Ray**, Sandip K. Chakrabarti1, *Astrophys Space Sci*, 361 (2), 1-15, 2016.

8) “Inverse Problem in Ionospheric Science: Prediction of Solar Soft-X-ray Spectrum from Very Low Frequency Radiosonde Results” by Sourav Palit, **Suman Ray**, and Sandip K. Chakrabarti, *Astrophys Space Sci*, 361 (5), 1-11, 2016.

9) “Numerical modeling of possible lower ionospheric anomalies associated with Nepal earthquake in May, 2015” by Suman Chakraborty, Sudipta Sasmal, Tamal Basak, Soujan Ghosh, Sourav Palit, Sandip K. Chakrabarti and **Suman Ray**, *Advances in Space Research*, 60, 1787-1796, 2017.

10**) “**Observations and modeling of D-region ionospheric response of Annular Solar Eclipse on December 26, 2019, using VLF signal amplitude and phase variation”, by S. Ghosh, S. Chowdhury, S. Kundu, S. Biswas, A. Dawn, **S. Ray**, A. K. Choudhury, Md.W. Bari, D. Bhowmick, S. Manna, S. K. Mondal, S. Chakrabarti, R. Maiti, R. C. Das, T. Basak, S. K. Chakrabarti, *Astrophysics and Space Science*, 368:19, 2023 (https://doi.org/10.1007/s10509-023-04179-1).

IN PROCEEDINGS :

1) ‘Correlation between seismic events and anomalous VLF day-length for west-east and east-west propagation paths’ by **S. Ray**, S. K. Chakrabarti and S. Sasmal, *General Assembly and Scientific Symposium (URSI GASS), 2014 XXXIth URSI, IEEE,* DOI: 10.1109/URSIGASS.2014.6929823.

2) ‘Unusual shifts in terminator times of the VLF signals before the Pakistan earthquake (M=7.4), occurred on 18th Jan., 2011’ by **S. Ray** and S. K. Chakrabarti, *General Assembly and Scientific Symposium (URSI GASS), 2014 XXXIth URSI, IEEE,* DOI: 10.1109/URSIGASS.2014.6929819.

3) ‘Studies of precursors of earthquakes using anomalies in very low frequency signal’ by S. Sasmal, S. K. Chakrabarti and **S. Ray,** *General Assembly and Scientific Symposium (URSI GASS), 2014 XXXIth URSI, IEEE,* DOI: 10.1109/URSIGASS.2014.6929820.

4) ‘Studies of VLF signal anomalies due to earthquake’ by S. K. Chakrabarti, S. Sasmal, **S. Ray** and Bakul Das, *General Assembly and Scientific Symposium (URSI GASS), 2014 XXXIth URSI, IEEE,* DOI: 10.1109/URSIGASS.2014.6929580.

5) ‘Study of the anomalous behaviors of the ionosphere during earthquake for VTX-Malda Baseline’ by **S. Ray**, S. K. Chakrabarti, S. Sasmal and A. Choudhury, *AIP Conference Proceedings*, 1286, 298-308, 2010, ISBN: 978-0-7354-0841-8.

6) ‘Precursor of earthquake using night time VLF amplitude’ by **S. Ray** and S. K. Chakrabarti, *General Assembly and Scientific Symposium, 2011 XXXth URSI, IEEE,* DOI: 10.1109/URSIGASS.2011.6051045, ISBN: 978-1-4244-5117-3.

7) ‘Anomalous behaviors of the VLF Signals before earthquakes for VTX-Malda propagation path’ by **S. Ray** and S. K. Chakrabarti, *General Assembly and Scientific Symposium, 2011 XXXth URSI, IEEE,* DOI: 10.1109/URSIGASS.2011.6051047, ISBN: 978-1-4244-5117-3.

8) ‘Result of VLF Campaigns in Summer and Winter in Indian sub-continent’ by S. K. Chakrabarti, S. Pal, S. Sasmal, S. K. Mondal, **S. Ray** and T. Basak, *General Assembly and Scientific Symposium, 2011 XXXth URSI, IEEE,* DOI: 10.1109/URSIGASS.2011.6051007, ISBN: 978-1-4244-5117-3.

9) ‘VLF observation results of total eclipse of 22nd July, 2009 by ICSP team’ by by S. K. Chakrabarti, S. Pal, S. Sasmal, S. K. Mondal, **S. Ray**, T. Basak and S. Maji, *General Assembly and Scientific Symposium, 2011 XXXth URSI, IEEE,* DOI: 10.1109/URSIGASS.2011.6051005, ISBN: 978-1-4244-5117-3.

IN BOOKS :

1) ‘Short Term Earthquake Prediction Using VLF observation : An ICSP Initiative in Indian Sub-continent’ by S. K. Chakrabarti, S. Sasmal and **S. Ray**, in ‘The Frontier of Earthquake Prediction Studies’, Ed. By M. Hayakawa, *Nihon-Senmontosho-Shuppan*, 678-687, 2012, ISBN: 978-4-931507-16-6.

2) ‘ICSP Detections of Anomalous VLF Radio Wave Signals Prior to Major Earthquakes’ by S. K. Chakrabarti, S. Sasmal and **S. Ray**, in “Earthquake prediction Studies – Seismo Electromagnetics”, Ed. By M. Hayakawa, *Nihon-Senmontosho-Shuppan,* (TERRAPUB: Tokyo), 2013, 49-55, ISBN: 978-4-88704-163-9.

3) ‘Study of Seismo-Ionospheric Coupling Using Perturbation in Very Low Frequency Radio Signal’ by **Suman Ray**, in “Exploring the Universe: From Near Space to Extra-Galactic”, Ed. By B. Mukhopadhyay and S. Sasmal, *Astrophysics and Space Science Proceedings 53,* (Springer International Publishing AG), 2018, 597-609, ISBN: 978-3-319-94606-1.

4) ‘Possible Precursory Effects of Seismic Events in VLF Radio Signals’ by **Suman Ray**, in “Advances in Modern and Applied Sciences”, Ed. By S. Pal & T. K. Biswas, *Scientific Research Publishing*, 2022, 171-178, ISBN: 978-1-64997-437-2