Central University of Himachal Pradesh

Department of Environmental Science

School of Earth and Environmental Sciences

Education Tour Report

Dehradun

Date – 26 May 2025 To 31 May 2025

DATE	VISITED PLACES	TIME
27-05-2025	Wadia Institute	10:00 AM
	Forest Research Institute (Fri)	03:00 PM
28-05-2025	Indian Institute of Soil & Water Conservation (ICAR)	10:00 AM
	Wildlife Institute of India	11:30 AM
29-05-2025	Mussoorie	09:00 AM
30-05-2025	Indian Institute of Remote Sensing	09:00 AM
	Haridwar	11:00 AM

TOUR INCHARGE AND STUDENT NAME

Tour In charge - Prof. A.K. Mahajan and Dr. Ritambhara K. Upadhyay

Tour team Leader: - Pratibha Kashyap and Raghav Rana

SL.No.	NAME	ROLL NO.	GENDER	SEMESTER
1	RAGHAV RANA	CHUP24ENV20	MALE	2ND SEM
2	ABHAY	CHUP24ENV01	MALE	2ND SEM
3	AKSHITA MOUDGIL	CUHP24ENV04	FEMALE	2ND SEM
4	RITIKA	CHUP24ENV21	FEMALE	2ND SEM
5	SHRUTIKA	CHUP24ENV27	FEMALE	2ND SEM
6	SANJANA	CHUP24ENV23	FEMALE	2ND SEM
7	ANSHIKA	CHUP24ENV07	FEMALE	2ND SEM
8	SARGUN SHARMA	CHUP24ENV24	FEMALE	2ND SEM
9	TANVI	CHUP24ENV32	FEMALE	2ND SEM
10	TANVI SHARMA	CHUP24ENV33	FEMALE	2ND SEM
11	DAMINI	CHUP24ENV08	FEMALE	2ND SEM
12	PAYAL	CHUP24ENV19	FEMALE	2ND SEM
13	ISHITA	CHUP24ENV11	FEMALE	2ND SEM
14	SAKSHI	CHUP24ENV25	FEMALE	2ND SEM
15	NEHA	CHUP24ENV17	FEMALE	2ND SEM
16	PATEL NANCY	CHUP24ENV18	FEMALE	2ND SEM
17	PRATIBHA KASHYAP	CHUP23ENV18	FEMALE	4TH SEM
18	MUSKAN	CHUP23ENV31	FEMALE	4TH SEM
19	ANSIKA JENA	CHUP23ENV05	FEMALE	4TH SEM
20	YAKSH	CHUP23ENV33	MALE	4TH SEM
21	UDESH DHIMAN	CHUP23ENV26	MALE	4TH SEM
22	VISHAL	CHUP23ENV29	MALE	4TH SEM
23	DIVYANSH	CHUP23ENV06	MALE	4TH SEM
24	ANSHUL	CHUP23ENV04	MALE	4TH SEM

SPECIAL THANKS

We would like to extend our heartfelt gratitude to **Prof. AK. Mahajan Sir** and **Dr. Ritambhara K. Upadhyay Ma'am** for organizing such an amazing and insightful educational tour. Your meticulous planning, dedication, and constant support made this tour not only educational but also truly memorable. we were able to visit significant institutions and sites that contributed meaningfully to our academic journey. The exposure we gained during this tour has broadened our perspective, strengthened our subject knowledge, and left us with lifelong memories.

We are truly grateful for the opportunity and extend our heartfelt thanks, for their tireless efforts, unwavering support, and inspiring mentorship. This tour will remain a highlight of our academic experience, and it would not have been possible without their exceptional guidance and leadership.

Throughout the tour, **Prof. AK. Mahajan Sir** was not only a guide and mentor but also a constant source of motivation and support. Their enthusiasm, depth of knowledge, and willingness to engage with students at every step made the experience far more impactful than we could have imagined. The professor's ability to connect academic theory with practical application during site visits helped deepen our understanding and made learning truly come alive.

What made this tour truly stand out was the personal effort and care that **Prof. AK. Mahajan Sir** put into ensuring that each student felt included, valued, and encouraged to explore, ask questions, and learn through experience. Their leadership created an environment of curiosity, collaboration, and mutual respect, which greatly enhanced the overall educational value of the trip.

From the outset, it was evident that the tour was the result of meticulous planning, thoughtful coordination, and a strong commitment to providing students with real-world exposure beyond the classroom. **Prof. AK. Mahajan Sir** and **Dr. Ritambhara K. Upadhyay Ma'am** ensured that every detail—whether it was transportation, accommodation, scheduling, site visits, or educational sessions—was carefully arranged for our comfort, safety, and learning benefit.

Thank you once again for your efforts in making this tour a grand success. It was truly a remarkable experience that we will cherish for years to come.

Report on Visit to Wadia Institute of Himalayan Geology, Dehradun

Date: 27th May 2025

Day: Tuesday

Time: 10:00 AM

Venue: Wadia Institute of Himalayan Geology (WIHG), Dehradun

Introduction

A visit to the **Wadia Institute of Himalayan Geology (WIHG)**, an autonomous research organization under the Department of Science and Technology, Government of India, was conducted on **27th May 2025**. The purpose of the visit was to gain insight into the geological features of the Himalayan region and to understand the ongoing research activities related to tectonics, glaciology, geohazards, and climate change.

Established in 1968, WIHG is one of India's premier institutions dedicated to geological studies of the Himalayas. The institute is named after the renowned geologist **Prof. D.N. Wadia**. Located in Dehradun, Uttarakhand, it serves as a center for advanced research in Earth Sciences and hosts a variety of laboratories, research departments, and a museum dedicated to Himalayan geology.

About the Geological Museum

The Geological Museum at WIHG serves as a public and academic repository of geological samples and knowledge. It features an impressive collection of:

- Rocks (metamorphic, sedimentary, igneous)
- Fossils
- Minerals
- Geomorphological models
- Information panels explaining Earth's geological processes

The museum plays an important role in educating visitors about Earth's dynamic history, especially the geology of the Himalayan region. The visit to the museum was guided by **Dr. Mutum R. Singh** and **Dr. R Perumal** respectively who briefly explained the fossils and the types of rocks briefly.

The **Continental Drift Theory** was first proposed by **Alfred Wegener** in 1912. According to the theory:

- Continents were once part of a single large landmass called **Pangaea**.
- Over millions of years, this supercontinent began to **break apart and drift**, forming the present-day continents.

- The movement is caused by forces within the Earth, later explained more fully by **Plate Tectonics Theory**.

MUSEUM HIGHLIGHTS ON CONTINENTAL DRIFT:

Interactive Models and Maps:

The museum featured animated models showing the gradual breakup of Pangaea and the drift of landmasses to their current positions.

Tectonic Plate Display:

A large map explained the Earth's lithospheric plates and how their movements influence continental drift.

Formation of the Himalayas:

A detailed model demonstrated how the **Indian Plate** drifted northward and collided with the

Eurasian Plate, leading to the **uplift of the Himalayan Mountain range**.

This ongoing tectonic collision continues to cause earthquakes and geological activity in the region.

- **Fossil Evidence:**

  Panels showed fossils of the same species found on different continents, supporting

  Wegener's theory (e.g., *Glossopteris* flora in India, South America, and Africa).

- **Rock Correlation:**

  The museum exhibited similar rock formations found in geographically separated continents, further validating the idea of ancient landmass connectivity.

Educational Importance:

The museum's presentation of the Continental Drift Theory connects directly with:

- Understanding Himalayan geology
- Earthquake prediction and monitoring
- Global climate and ocean circulation changes over geologic time

It helped students visualize complex geodynamic processes and appreciate the ongoing evolution of Earth's surface.

Major Rock Types Displayed

1. Metamorphic Rocks

Metamorphic rocks are those that have undergone transformation due to intense heat and pressure. The museum features:

- **Schist** – displaying distinct foliation and shiny mica content
- **Gneiss** – showing banding patterns formed under high-grade metamorphism
- **Marble** – a metamorphosed form of limestone, appreciated for its texture and use in architecture
- **Quartzite** – a hard, non-foliated rock originally formed from sandstone

These rocks help in understanding the intense geological forces acting within the Himalayan crust.

2. Sedimentary Rocks:

These are formed through the deposition and compaction of sediments. Important specimens included:

- **Sandstone** – formed from compacted sand grains, often used to study ancient river environments
- **Limestone** – composed mostly of calcium carbonate, commonly formed in marine environments
- **Shale** – made of fine-grained sediments, important for fossil preservation

Conglomerate – coarse rock with rounded clasts, indicating strong water current environments. The museum explained the role of sedimentary processes in shaping the Himalayan foothills and basins.

3. Igneous Rocks:

Formed from the cooling and solidification of magma or lava, the museum exhibits:

- **Granite** – a coarse-grained intrusive igneous rock, rich in quartz and feldspar
- **Basalt** – a dark, fine-grained rock formed from lava flows, commonly found in the Deccan Traps
- **Diorite** and **Gabbro** – examples of intermediate and mafic intrusive rocks

These rocks illustrated the deep crustal and volcanic activities that contributed to the Himalayan orogeny.

Educational Value:

- Each rock type was labeled with its name, origin, composition, and formation process.
- Visual aids and diagrams helped in understanding rock cycles and the role of tectonics.
- The museum provided hands-on exposure to real specimens, enhancing textbook learning.

After viewing various types of rocks type, we were shown and explained various fossil exhibits. The museum

at the Wadia Institute displays a remarkable collection of fossils that provide insights into the prehistoric life forms that once roamed or existed in this region.

Students had the opportunity to view:

- **Plant and wood fossils**, including ancient tree trunks and leaf impressions, highlighting the types of vegetation that existed millions of years ago.

- **Animal fossils**, such as bones and skulls of extinct species. Notable fossils included remains of:
  - **Elephants**,**Giraffes**
  - **Hippopotamuses** and **Horses Ancient apes**, which intrigued students particularly for their anthropological significance.

- Also, the fossil of dinosaur egg was also preserved and shown there.

Marine fossils:- Which indicated the presence of ancient seas and marine ecosystems in what are now terrestrial Himalayan regions.

These exhibits vividly illustrated how the landscape and life on Earth have transformed over geological time scales.

Another highlight of the museum was the **Geological Clock** displayed in the corridor. This fascinating visual representation outlines the major events in Earth's geological history—from the formation of the planet approximately 4.6 billion years ago to the emergence of life forms and the rise of humans. The Geological Clock helped students grasp the enormity of geological time and the relatively recent emergence of human beings in Earth's history.

As part of our educational field visit to the **Wadia Institute of Himalayan Geology**, Dehradun, we were privileged to attend a thought-provoking lecture on **seismology and earthquake mitigation**, delivered by **Dr. Dilip**, a distinguished seismologist at the institute. The lecture was organized after our guided tour of the institute's Geological Museum, which showcased various fossils and geological artifacts.

Dr. Dilip began the session by introducing the fundamentals of **earthquakes**, their causes, and how seismic waves are generated due to the release of energy along faults. He elaborated on the role of **plate tectonics**, especially the Indian plate's interaction with the Eurasian plate, in generating seismic activity in the Himalayan region.

A significant part of the lecture focused on **major earthquakes that have impacted the Indian subcontinent**, including:

- The **1905 Kangra earthquake**
- The **1934 Bihar-Nepal earthquake**
- The **2001 Bhuj earthquake**
- The **2015 Gorkha earthquake in Nepal**

For each event, Dr. Dilip discussed the **epicenter, magnitude, casualties**, and the lessons learned in terms of preparedness and scientific understanding.

- **Seismic Zones in India**

  Dr. Dilip described how India is divided into **seismic zones**, ranging from Zone II (low risk) to Zone V (very high risk), with the Himalayan belt falling under Zones IV and V due to intense tectonic activity. He emphasized the need for **regional hazard mapping** and continuous monitoring.

- **Earthquake Mitigation Strategies**

  The lecture covered various **earthquake mitigation and preparedness strategies**, including:

- **Earthquake-resistant building design**
- **Public awareness and community preparedness programs**
- **Early warning systems**
- **Retrofitting of vulnerable structures**

  The role of **government agencies and scientific institutes** in disaster risk reduction

- **Contribution of Wadia Institute**

  Dr. Dilip, along with inputs from **Dr. Naresh and Dr. Haider,** highlighted the ongoing **research efforts at Wadia Institute** in the fields of **seismology, tectonics, and hazard assessment**.

  They explained how the institute works closely with national and international organizations to monitor seismic activity and reduce the impact of natural disasters.

LABORATORIES AT WADIA INSTITUTE OF HIMALAYAN GEOLOGY, DEHRADUN

The Wadia Institute of Himalayan Geology (WIHG) in Dehradun houses several specialized laboratories equipped with advanced instruments for geoscientific research.

1. X-Ray Fluorescence (XRF) Laboratory

Instrument: XRF Spectrometer

Principle: XRF detects secondary X-rays emitted from a sample when it's excited by a primary X-ray source, allowing for elemental composition analysis. For this the sample rock is firstly converted into a fine size of 200mm particles and are locked using a hydraulic press.

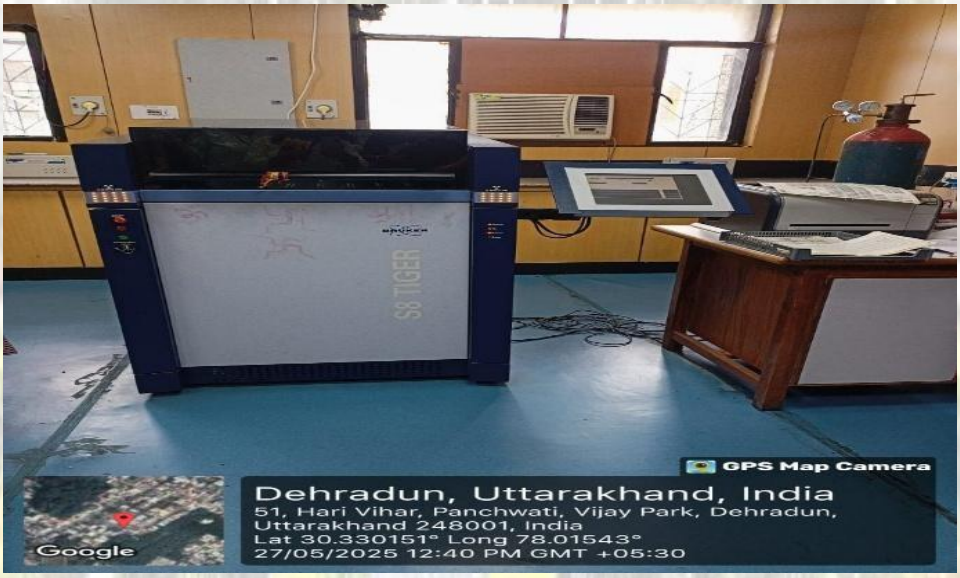
Random sampling is done

Applications: Major and trace element analysis in rocks and sediments.

This spectrometer has the several advantageous features like high speed, accommodating 60 samples at a time, more precise elemental analysis with enhanced sensitivity and flexibility in terms of adopting several analytical modes including a special analytical program for analysis of rock/mineral samples.

- The extended analytical range includes some of the very useful elements that can be analyzed along with the usually analyzed major and trace elements in geological samples. Special features include a High-power X-ray tube of 4kW capacity providing more powerful excitation of elements, eight number of analyzing crystals and two x-ray detectors (Gas flow proportional and scintillation) with three optimized coarse and fine collimators.

X-Ray Diffraction (XRD) Laboratory



Principle: XRD identifies crystalline phases by measuring the diffraction patterns of X- rays interacting with the crystal lattice. Diffraction can occur whenever the Bragg law, **$n\lambda = 2d\sin\theta$** is satisfied. This equation puts very stringent condition on **λ** and **θ** for any crystal with crystal in a beam of X- ray will not in general produce any diffracted beam. The crystallite size is the average size of a coherent scattering domain (perfect arrangement of unit cells or perfect crystal).

The crystallite size may affect dissolution, material strength, catalytic activity or product aging. Note that crystallite size and grain size are not necessarily the same, since a grain may be composed of multiple crystallites. Crystallite size is reported in nm for each individual crystalline phase.

Determination of crystallite size by XRD is ideal when crystallites are too small ($<5000^0$A) for optical methods, and XRD provides a means for determination of average crystallite size for bulk material sampling.

- **This is done for both rare earth and trace elements**

Applications: Mineral identification, crystallographic studies, phase analysis.

Seismological lab

Central seismic laboratory of WIHG is at Dehradun where real time seismic data is collected from the remote seismic stations of NW Himalaya. The laboratory is well equipped with the computational facilities to achieve, process and interpret the seismic data in real time mode. Currently there are 75 active seismic station.

Presently three seismic networks are in operation in NW Himalaya

Garhwal seismic network

Kangra- chamba seismic network

Kinnaur seismic network

- **Trillium 120QA Broadband Seismometers**

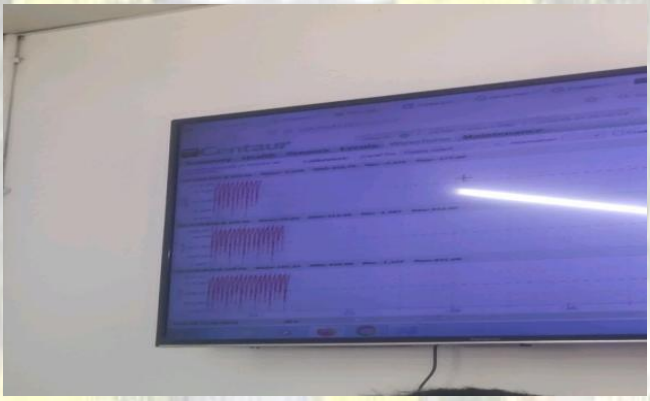
  Principle: These seismometers detect ground motions over a wide frequency range, capturing both low and high-frequency seismic waves. They operate based on the principle of electromagnetic induction, where ground movements cause a mass- spring system to move, inducing a voltage proportional to the motion.

  Application: Recording a broad spectrum of seismic events, including local and teleseismic earthquakes.

- **Titan Strong Motion Accelerometers (TACCL-N1)**

Principle: These devices measure strong ground accelerations during seismic events. They utilize force-balance accelerometer technology, where a mass is kept stationary relative to the device housing, and any acceleration causes a force that is measured to determining ground motionusing this instrument the live recording of seismic waves from the Chamba seismic centre were shown to us by our professors and the scientists from the Wadia insititue of Himalayan geology itself.

Application: Capturing high-amplitude ground motions near earthquake epicentres, essential for engineering and structural analyses.



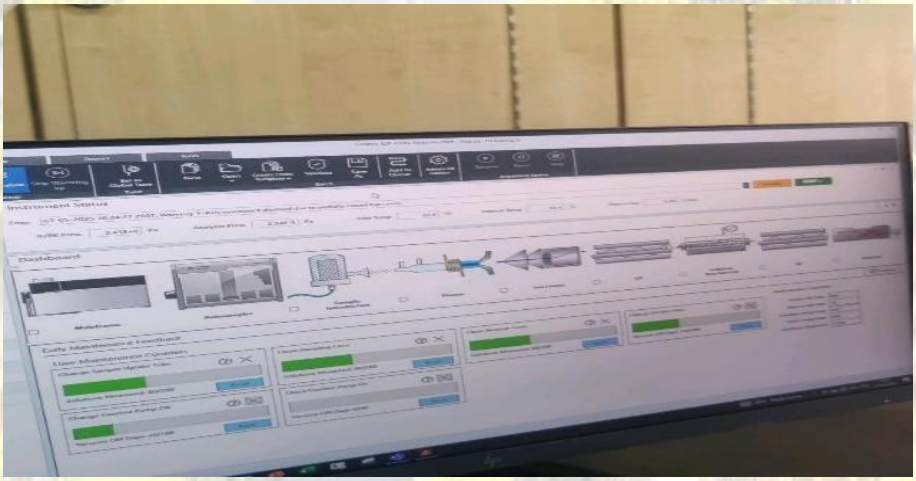
- **ICP-MS (Inductively Coupled Plasma Mass Spectrometer)**

The **TQ-ICP MS Lab** ensures a high level of precision and care to maintain the integrity of geochemical analyses. The combination of **Savillex PFA vials** and the **microwave digestion system** technique a robust approach for handling complex geological materials. Geological samples are prepared in air-controlled fume hoods to minimize contamination.

Savillex PFA vials are utilized for the decomposition of geological samples, offering enhanced analytical accuracy and ultra-low procedural blanks. The **Microwave Digestion protocol** is optimized for the complete digestion of ultramafic rocks, refractory mineral-bearing sediments, and whole rocks.

The lab employs **Triple Quadrupole Inductively Coupled Plasma Mass Spectrometry (TQ-ICP MS)** with **Collision and Reaction Cell (CRC) technology** to achieve unparalleled sensitivity and precision. The CRC technology effectively eliminates spectral interferences, enabling accurate measurement of challenging elements in complex matrices.

Additionally, the lab utilizes **de-ionized water (18.2 MΩ)** and **analytical-grade (AR) acids**— including HF, HNO_3, HCl, and $HClO_4$—for sample decomposition and preparation, ensuring the highest standards in geochemical analysis.



- **Anton Paar Multiwave Microwave Digestion Systems**

Anton Paar's **Multiwave series** represents a range of advanced microwave digestion systems designed for efficient and safe sample preparation across various industries, including environmental analysis, food testing, pharmaceuticals, and materials science.

Key Features:

High Throughput: The Multiwave 5001 system can process up to 64 samples simultaneously, enhancing laboratory efficiency

Broad Application Range: Suitable for digesting a wide variety of samples, from food and environmental matrices to polymers and pharmaceuticals.

Advanced Temperature and Pressure Control: Capable of reaching temperatures up to 300 °C and pressures up to 199 bar, ensuring complete digestion of challenging samples.

User-Friendly Interface: Features a high-resolution touchscreen and intuitive software with over 600 pre-installed methods, facilitating ease of use

Safety and Compliance: Equipped with multiple safety features and certifications, including ETL and GS marks, to ensure safe operation and compliance with industry standards.

Report on Visit to Forest Research Institute (FRI), Dehradun

Date: 27th May 2025 **Day:** Tuesday **Time:** 3:00 PM

Venue: Forest Research Institute (FRI), Dehradun

Overview

The educational visit to the Forest Research Institute (FRI), Dehradun, a premier institution under the Indian Council of Forestry Research and Education (ICFRE), provided a comprehensive exposure to India's forestry research, biodiversity conservation, and ecological knowledge systems. The session featured expert-guided museum tours, a walkthrough of the national herbarium, and interactive experiences in the botanical garden. The following report summarizes the academic and technical insights gained during the visit.

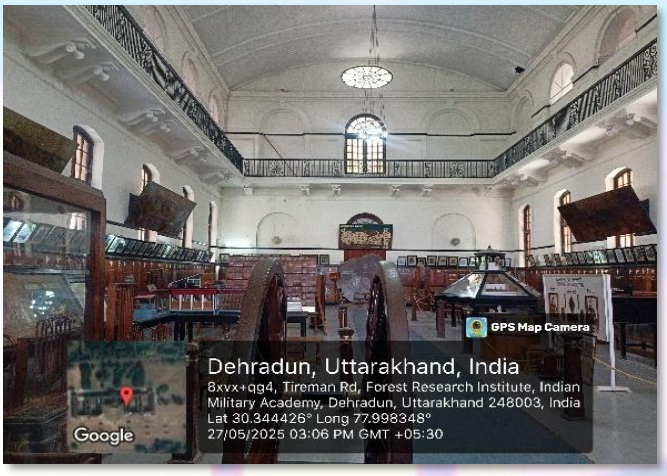
The Greco-Roman and Colonial architectural styles of the FRI building define its external appearance. In 1929, the main building was finished. Reflecting classical architectural forms, the structure has a large façade and a symmetrical layout. Lime-sand mortar and brick masonry structures were the materials utilised in the building. In addition to improving the building's visual appeal, the choice of sustainable materials highlights the institution's dedication to environmental responsibility. The surrounding landscape has also been carefully planned, with pathways and green areas that promote community engagement and interaction.Overall, FRI's exterior design harmoniously combines beauty and functionality, making it a beacon in its surroundings. Because of its historical and architectural significance, it is currently recognised as a National Heritage monument.

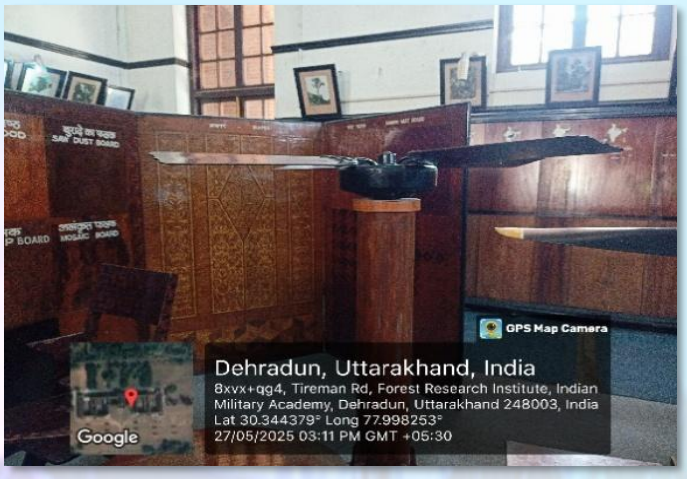
Museum Exploration and Forestry Science Exhibits

The visit began with a detailed tour of FRI's six specialized museums, guided by

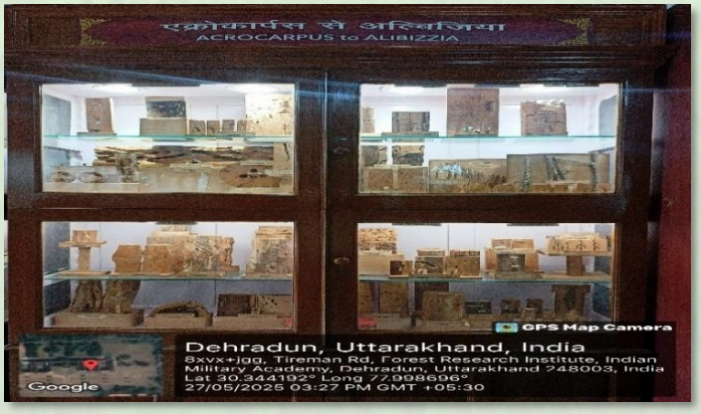
Mr. Niranjan Kumar (MTS PLO office ICFRE FRI Dehradun museums), with additional academic input from the **Scientist, ICFRE Dr Vishwajit Kumar**. Each museum highlighted a unique aspect of forest science:

1) **Timber Museum** – Showcased over 100 Indian timber species, including their anatomical properties, durability classifications, and commercial applications.





2) **Forest Pathology Museum** – Displayed wood-decaying fungi, diseased samples, and biocontrol mechanisms used in managing forest health.



Wood decaying fungi

3) **Entomology Museum** – Featured forest insects including pests and beneficial species, with detailed models and specimen displays.

Different types of Butteriflies

An Environment artificial model for insects

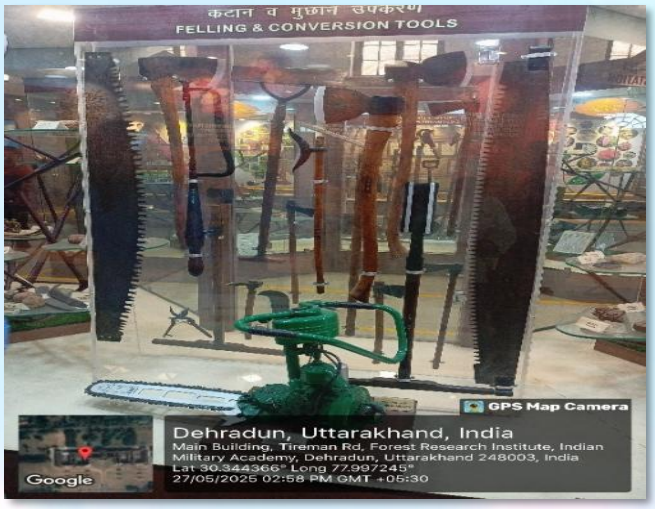
4) **Silviculture Museum** – Focused on forest regeneration systems, sustainable logging practices, and silvicultural tools.

A tour to the silviculture museum

Silviculture world

Different Threats to the forest

Different types of tools that were used for forest purpose **(Felling Equipment)**



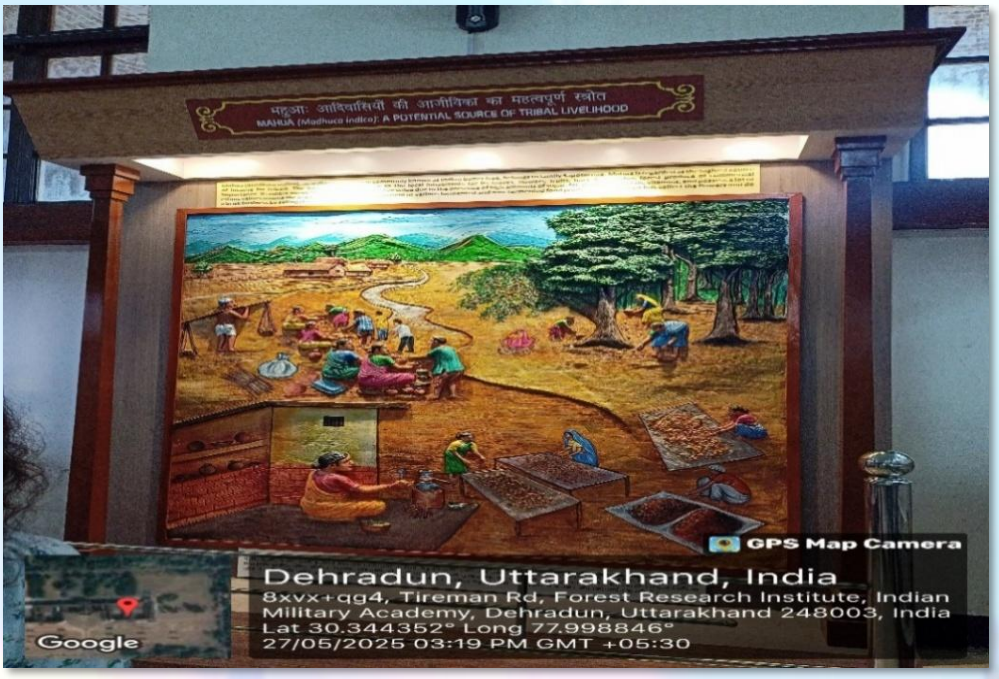
Models of different Forest management activities

Forest working & Management

Forest Fire Surveillance System

This Glass window demonstrating how ecosystem services might be offered

5) **Social Forestry Museum –** Emphasized participatory forest management, community involvement, and rural development through forestry.



A sculpture painting showing Rural people doing their works as well as managing the forest

6) **NWFP (Non wood Forest Products) Museum** – This museum provides an overview of the products used as a substitute to wood goods. Examples include resins, gums, oils, medicines, and many bamboo items.

The above picture showing Ayurveda system

Traditional Handmade pictures showing the growth of the different plants

This painting depicts several images of the prominent trees and flowers of different Indian state

Different Gums from forest

Different Essential oils from forest

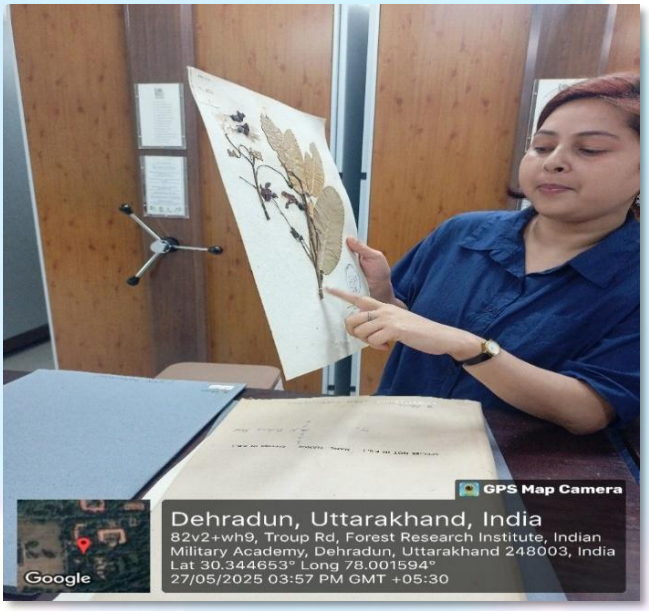
- The museum sessions were highly informative, with detailed explanations provided for each exhibit, linking practical forestry challenges with research-based solutions.

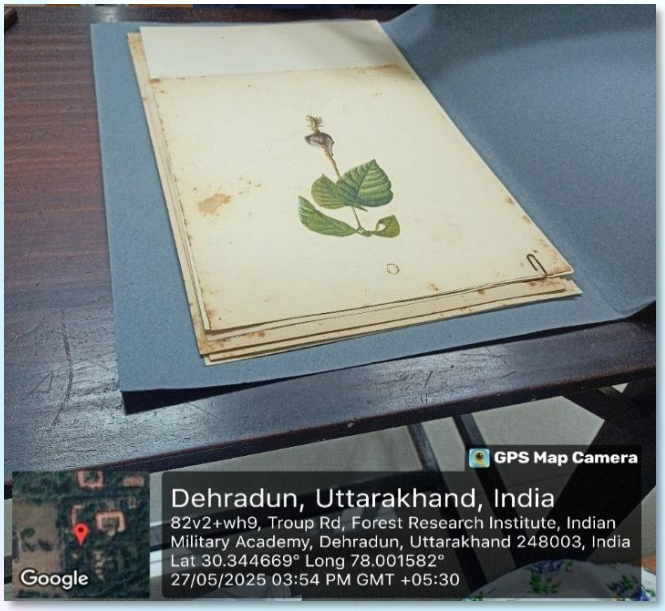
Herbarium Visit and Botanical Documentation

Following the museum tour, the group visited the Central National Herbarium Section of FRI. This herbarium plays a crucial role in plant taxonomy, ecological research, and conservation biology.

Key observations included:

- The systematic method of plant specimen collection, pressing, and preservation.
- The taxonomic classification of forest flora including rare and endemic species.
- The utility of herbarium records in monitoring ecological change and plant distribution overtime.





Preservation of plant species and their Part Hand-made diagram of the a plant

- Students observed a wide variety of preserved specimens and learned about the role of herbariums in academic research and biodiversity inventory programs

Botanical Garden and Outdoor Learning

The final part of the visit took place in the FRI Botanical Garden, an expansive landscape serving as a living repository of India's forest flora which was guided by **Mr. Manoj Kumar**. The garden offered interactive learning across multiple thematic zones:

- **Medicinal Plant Section** – Displayed ethnobotanically significant plants such as Ocimum sanctum, Rauwolfia serpentina, and Tinosp cordifolia, along with their medicinal applications.
- **Arboretum and Palm Grove** – Featured a wide range of indigenous and exotic tree species, each labeled with scientific names and ecological information.
- **Bamboo Plot** – Demonstrated fast-growing species important for sustainable forest product development.
- **Seasonal and Ornamental Flora** – Highlighted the role of horticulture in urban forestry and landscape restoration.

A notable feature within the garden was the "Green Conference Room", an open-air space with seating arranged beneath a large, mature tree. Designed as an eco-classroom, this area exemplified FRI's philosophy of integrating environmental education with natural surroundings.

Bamboos and its benefits

An Eco-classroom

Academic Interactions and Institutional Contributions

Throughout the visit, faculty and research staff provided insights into the institutional objectives of FRI:

- Conducting applied research in forest genetics, silviculture, climate change, and ecology.
- Providing training and academic programs through FRI Deemed University.
- Supporting government policy with scientific data on forest resources and biodiversity.
- Collaborating with international organizations in areas like REDD+, ecosystem restoration, and sustainable forest management.

❖ Students also interacted with researchers and postgraduates, gaining an understanding of current projects in forest monitoring, urban green planning, and conservation technologies.

Conclusion

The visit to the Forest Research Institute (FRI), Dehradun, offered a holistic and academically enriching experience. From guided tours of forestry museums and herbarium collections to hands-on learning in the botanical garden, the program fostered a deep understanding of forestry science, biodiversity, and ecological stewardship. The expert-led sessions, institutional briefings, and field-based demonstrations significantly enhanced our awareness of sustainable resource management and the critical role of research in addressing environmental challenges.

Report on Visit to ICAR-Indian Institute of Soil & Water Conservation, Dehradun

Date: 28th May 2025 **Day:** Wednesday **Time:** 10:00 AM

Venue: ICAR-Indian Institute of Soil & Water Conservation, Dehradun

Overview:

The Indian Council of Agricultural Research (ICAR) established the Indian Institute of Soil and Water Conservation on April 1, 1974. There are eight institutes located in India, specifically in Agra, Bellary, Chandigarh, Datia, Koraput, Kota, Ooty, and Vasad, with its headquarters situated in Dehradun. The primary objective of these institutes is to conserve and manage the country's soil and water resources. These institutes offer both research facilities and training in soil and water resource management and conservation.

A tour of Museum:

We visited the headquarters in Dehradun, where we were also accommodated. On the morning of May 28, we visited the museum that showcased various projects. At the museum, we received a warm welcome from **Dr. Charan Singh**, the Head of **HRD & SS**, **Dr. Rajesh Kaushal**, a **Principal Scientist**, and **Dr. Matber Singh Rana**, a **Senior Scientist** from the Forestry Division.

Key Highlights:

Dr. Matber Singh Rana provided us with a comprehensive tour of the museum and explained about the problems related to soil and water as well as provided explanations regarding various types of soil erosion and methods for its conservation.

Additionally, he shared brief information about the technical and mechanical approaches of different projects.

Discussions also included watershed development and management, highlighting projects such as the 'Sukhomajri' project in Haryana, the 'Nada' project in Chandigarh, and the 'Fakot' project in Tehri-Garhwal, Uttarakhand.

He addressed various sustainable erosion reduction Bio-engineering methods, including 'Bori Bund', 'vegetative barriers' such as Ber, Aloe Vera, and Sambuta, as well as bamboo plantation.

Furthermore, he discussed different village linkage programs, which enable them to educate farmers about agricultural practices.

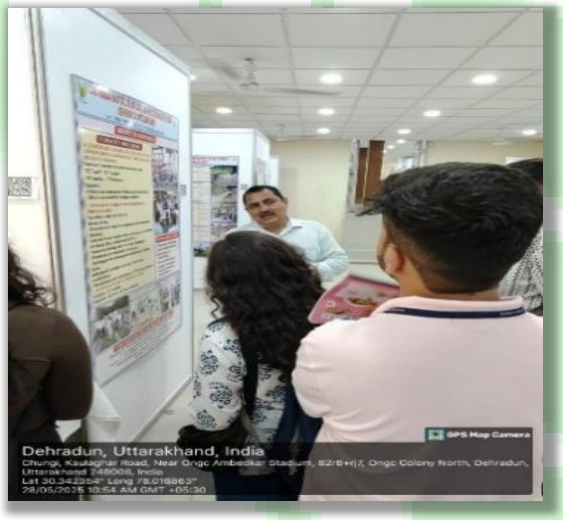
Training Schedules:

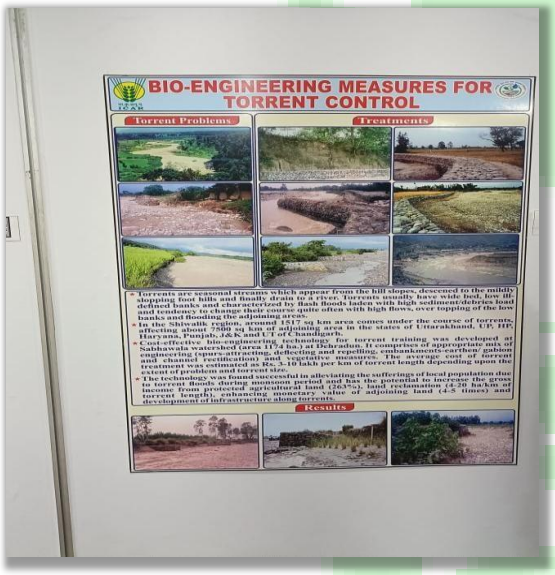
- A certified course in soil and water conservation as well as watershed management is available; it is a regular course lasting four months. Two batches are conducted each year, approximately from 'April to August' and 'October to February'.

- Criteria for eligibility: officers and assistants of both state and central Government, along with officers sponsored by foreign nations.
- Various training programs were also sponsored, lasting from 3 days to 3 weeks.
- primarily designed for MTech and BTech students, as the focus is mainly on technical work.

Conclusion: The visit proved to be remarkably insightful. Through firsthand experience, we learned a variety of conservation practices and the associated terminology, while also gaining valuable perspectives on a range of ongoing project initiatives. The knowledge and insights gained will undoubtedly contribute to our understanding and future efforts in conservation.

Dr. Matber Singh outlining the various initiatives





Bio-Engineering Project

TDET-MoRD Project

Report on Visit to Wildlife Institute of India Dehradun

Date: 28th May 2025

Day: Wednesday **Time:** 11:30 AM

Venue: Wildlife Institute of India, Dehradun

Introduction

On the third day of our educational visit, we had the privilege of visiting the prestigious Wildlife Institute of India (WII) on May 28, 2025. This visit was organized to provide students with a deeper understanding of wildlife conservation, scientific research, and the practical application of forensic science in protecting India's biodiversity.

This institute was established in the 1982. It actively researches biodiversity-related issues and conduct monitoring of sort of wildlife species such as endangered, vulnerable, critically endangered, and so forth. It has helped the nation and the region meet its pressing capacity-building needs for scientific planning, management, and research in the area of Wildlife conservation over the years.

1. Description of the Visit

Upon arrival at the institute, we were warmly welcomed by **Dr. Amarjeet,** who served as our guide and lecturer for the day. The session began with an overview of the institute itself.

A. Lecture on the Wildlife Institute of India

Dr. Amarjeet explained the history of the Wildlife Institute of India, including its establishment, mission, and objectives. She highlighted the institute's role as a premier research and training organization dedicated to the conservation and management of wildlife and its habitats in India.

Research Activities

We learned about the various research projects undertaken by the institute, ranging from ecological studies and wildlife monitoring to habitat restoration and policy formulation. **Dr. Amarjeet** emphasized the importance of scientific research in informing conservation strategies and protecting endangered species.

B. Fauna of India

A brief but insightful overview of India's rich biodiversity was provided. **Dr. Amarjeet** discussed the wide variety of animal species found in different regions of the country, their habitats, and the threats they face due to human activities and environmental changes.

1. Lecture on Wildlife Forensics

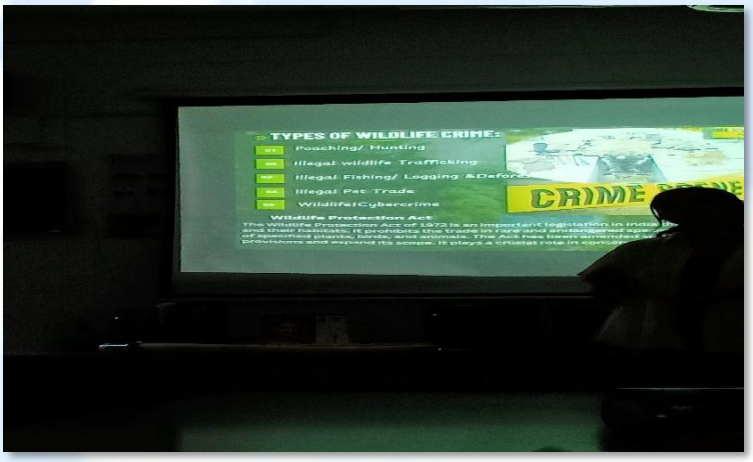
A significant part of the visit was dedicated to understanding the role of forensic science in wildlife conservation.

A. Wildlife Forensics Overview

Dr.Amarjeet introduced us to the concept of wildlife forensics, explaining how it is used to investigate crimes against wildlife, particularly poaching and illegal wildlife trade.

B. Poaching and Illegal Activities

We were informed about the scale and impact of poaching in India. The lecture covered how poachers target endangered species for their body parts and trophies, which are often sold illegally in domestic and international markets.



C. Forensic Techniques

Dr. Kajal detailed the forensic techniques employed by the institute to identify animal parts and trophies. These techniques help distinguish between real and fake animal products, enabling law enforcement agencies to take appropriate legal action against offenders. She explained how DNA analysis, morphological examination, and other scientific methods are used to support conservation efforts.

D. Identification of fake and real ones

We were given a detailed and interactive session by the institute's experts on wildlife protection and illegal wildlife trade. One of the most insightful parts of the visit was the display and explanation of wildlife artifacts, which included:

- Animal skins (such as snow leopard, python)
- Elephant tusks and ivory products
- Bones, claws, horns (rhino), and skulls

The experts explained how wildlife artifacts are often used in illegal trade for decoration, traditional medicine, or fashion. We were shown real and fake versions of these items side by side.

E. Role of the Institute

The session concluded with a discussion on the institute's collaboration with government agencies and law enforcement to combat wildlife crime**. Dr. Amarjeet** shared real-life examples of cases where forensic evidence played a crucial role in bringing poachers to justice.

2. Learning Outcomes

- Enhanced Knowledge: We gained a deeper understanding of the importance of wildlife conservation and the scientific methods used to protect endangered species.
- Awareness of Challenges: The visit highlighted the challenges posed by poaching and illegal wildlife trade.
- Inspiration: The session inspired many of us to consider careers in wildlife conservation and forensic science.
- Practical Insights: We learned how scientific research and forensic techniques are applied in real-world conservation effort.

Conclusion

The trip to the Wildlife Institute of India was instructive and motivating. It highlighted the critical role that forensic science and scientific research play in preserving India's biodiversity and provided deep insights into wildlife conservation. We sincerely thank the institute, Dr. Amarjeet, and Dr. Kajal for their hospitality and for sharing their priceless knowledge. This experience has deepened our comprehension and reaffirmed the importance of conservation initiatives nationwide.

Report on Visit to Mussoorie, Dehradun

Date: 29th May 2025

Day: Thursday **Time:**

9:00 AM

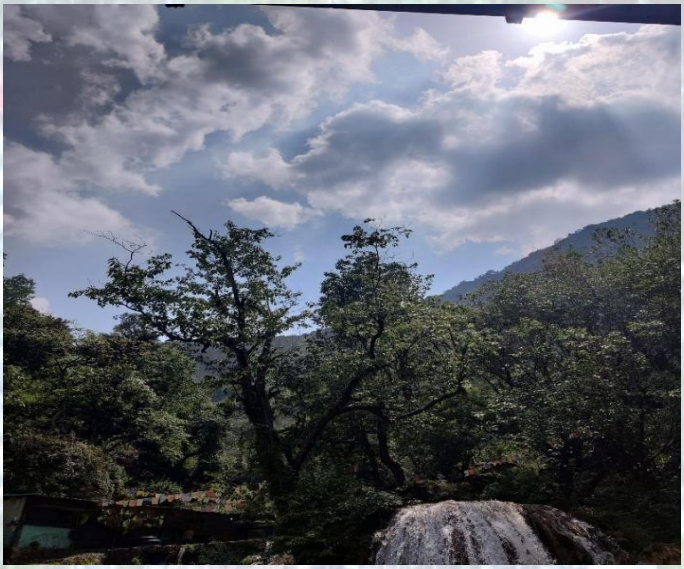
Venue: Mussoorie, Dehradun

Mussoorie is a hill station and a municipal board, in Dehradun city in the Dehradun district of the Indian state of Uttarakhand. It is about 35 kilometres (22 mi) from the state capital of Dehradun. The hill station is in the foothills of the Garhwal Himalayan range.

Mussoorie is at an average altitude of 2,005 metres (6,578 ft). To the northeast are the Himalayan snow ranges, and to the south, the Doon Valley and Shivalik ranges. Mussoorie is popularly known as The Queen of the Hills.

Mussoorie has a fairly typical subtropical highland climate for the mid-altitude Himalaya. Summers are warm and very wet, with July and August averaging approximately 660 millimetres (26 in) of rain per month due to orographic lift of the extremely moist monsoonal air. In winter, rainfall is a little more frequent than in the pre-and post-monsoon seasons, and the general weather is cool and partly cloudy.

Prof. AK. Mahajan explain geology of kempty water fall and their present rocks, minerals etc., Kempty Falls is a waterfall in Ram Gaon and at the south of Kempty, in the Tehri Garhwal District of Uttarakhand, India. It is 13 kilometres (8 mi) from Mussoorie on the Chakrata Road, and 45 kilometres (28 mi) from Dehradun. It is nearly 1364 meters above sea level, at 78°-02’ East longitude and 30° -29’ North latitude. The Kempty Falls, and the area around is surrounded by high mountain ranges at an altitude of 4500 feet. The thick patches of forests around Kempty falls are home to many birds and animals.



The forests under Mussoorie Forest Division have mainly four distinct plant communities namely Oak, Pine, Shisham, miscellaneous plant communities and open barren land in the area. Quercus leucotrichophora (Oak); Pinus roxburghii (Pine); Dalbergia sissoo (Shisham); miscellaneous forests (Bauhinia variegata, Acacia catechu, Cassia fistula, Lannea coromandelica, Terminalia belerica, etc.) as the dominant species.

This region is covered by highly fractured Krol limestone with a slope more than 60 degrees.

The area around Kempty Falls is characterized by varied rock types, including quartzite, dolomite, and slate, all part of a complex geological formation.

The area is also known for its high altitude and surrounding mountain ranges, contributing to the diverse geological makeup.

Limestone is the parent material which supports all the plant communities. Quartzite is the second most common parent material, Dolomite and Slate are the only parent material which occurred only in higher altitudes that supports Oak and Pine communities.The plants supported by porous rocks charged with nutrient gradually break up the parent rocks and organic matter soon accumulates. Due to high rate of erosion and solubility of carbonates, the softer rocks get eroded at high rates ultimately making the watercourse steeper resulting in the formation of waterfall.

Prof. AK. Mahajan explains, Mussoorie's geology is characterized by the Mussoorie Syncline, a structural basin containing rocks from the Proterozoic to Cambrian periods. The area is dominated by rocks of the Krol belt, including quartzites, slates, shales, and limestones. The geology is also influenced by the Main Boundary Thrust, where the Krol belt rocks are thrust over Neogene sedimentary rocks.

Mussoorie Syncline: This synclinal structure is a significant feature in the Lesser Himalayas, hosting the Tal Group of rocks, which are important for understanding Early Cambrian paleobiology.

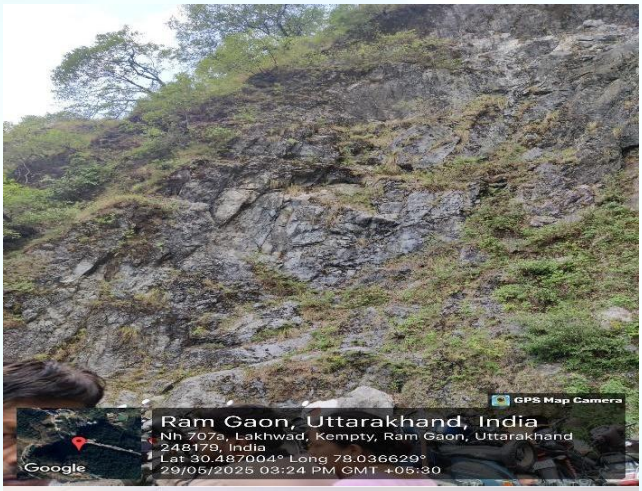
Krol Belt: The area is primarily composed of rocks belonging to the Krol belt, which are of Proterozoic-Cambrian age.

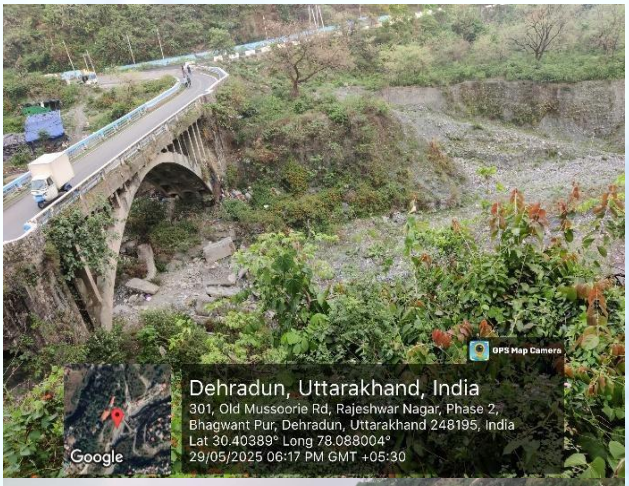
Main Boundary Thrust: This major tectonic boundary separates the Krol belt rocks from the Siwalik Group (Neogene sedimentary rocks).

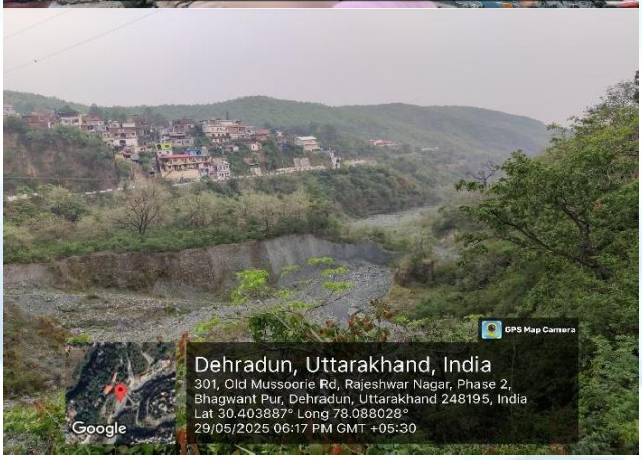
Phosphorite Deposits: Phosphorite deposits are found in the Mussoorie Syncline, particularly associated with carbonaceous shale, chert, and limestone in the Lower Tal Group.

Landslides: The area is susceptible to landslides, influenced by factors like lithology, slope, and proximity to active faults.

Seismic Activity: Mussoorie is located in a seismically active zone, potentially experiencing earthquakes with a maximum intensity of VIII.


GPS Map Camera
Ram Gaon, Uttarakhand, India
Nh 707a, Lakhwad, Kempty, Ram Gaon, Uttarakhand 248179, India
Lat 30.467004° Long 78.036629°
29/05/2025 03:24 PM GMT +05:30
Google


GPS Map Camera
Dehradun, Uttarakhand, India
301, Old Mussoorie Rd, Rajeshwar Nagar, Phase 2, Bhagwant Pur, Dehradun, Uttarakhand 248195, India
Lat 30.40389° Long 78.088004°
29/05/2025 06:17 PM GMT +05:30
Google


GPS Map Camera
Dehradun, Uttarakhand, India
301, Old Mussoorie Rd, Rajeshwar Nagar, Phase 2, Bhagwant Pur, Dehradun, Uttarakhand 248195, India
Lat 30.403887° Long 78.088028°
29/05/2025 06:17 PM GMT +05:30
Google


GPS Map Camera
Dehradun, Uttarakhand, India
301, Old Mussoorie Rd, Rajeshwar Nagar, Phase 2, Bhagwant Pur, Dehradun, Uttarakhand 248195, India
Lat 30.403883° Long 78.088029°
29/05/2025 06:17 PM GMT +05:30
Google


GPS Map Camera
Dehradun, Uttarakhand, India
301, Old Mussoorie Rd, Rajeshwar Nagar, Phase 2, Bhagwant Pur, Dehradun, Uttarakhand 248195, India
Lat 30.403955° Long 78.088046°
29/05/2025 06:20 PM GMT +05:30
Google

Report on Visit to Indian Institute of Remote Sensing (IIRS), Dehradun

Date: 30th May 2025

Day: Friday

Time: 9:00 AM

Venue: Indian Institute of Remote Sensing (IIRS), Dehradun

Overview

India's space program and remote sensing capabilities were thoroughly introduced during the educational tour to the Indian Institute of Remote Sensing (IIRS), Dehradun, a prestigious institution under the Indian Space Research Organisation (ISRO). **Dr. Ashutosh Bhardwaj (Research Project Monitoring Department and Scientist/Engineer-SG), Dr. Rajat Subhra Chatterjee (Head Scientist, Group Director, Geosciences & Disaster Management Group (GDMG)),** and **Mr. Javed** were the experts who gave us a tour of IIRS during the expert-led discussions. thorough explanations of important Indian space missions and technology, as well as engagement with operational models. The report that follows summarises the technical knowledge that was acquired during the visit.

Introduction to ISRO and Space Infrastructure

Mr. Javed, one of the session leaders, provided a comprehensive overview of ISRO's space program. Key institutions like the Vikram Sarabhai Space Centre (VSSC) and various launch facilities were discussed. ISRO currently operates two active launch sites:

- **Satish Dhawan Space Centre (SDSC), Srihari Kota (SHAR)** – the primary and oldest launch site.
- **Thumba Equatorial Rocket Launching Station (TERLS)** – used for sounding rocket launches and early atmospheric research.

A proposed **third launch pad** is under consideration in **Kulasekarapattinam, Tamil Nadu**, aimed at handling increased launch frequencies and enabling dedicated small satellite launches.

Satellite Launch Vehicles and Missions

Participants were introduced to the major satellite launch vehicles developed by ISRO:

- **PSLV (Polar Satellite Launch Vehicle)** – known for its reliability and used for launching satellites into polar and sun-synchronous orbits.
- **GSLV (Geosynchronous Satellite Launch Vehicle)** – used for placing heavier payloads into geostationary orbits.
- **SSLV (Small Satellite Launch Vehicle)** – a recent addition optimized for quick and cost-effective deployment of small satellites.

The **SLV-3 (Satellite Launch Vehicle-3)** and **ASLV (Augmented Satellite Launch Vehicle)** were also discussed, representing ISRO's early launch systems. The **RLV-TD (Reusable Launch Vehicle - Technology Demonstrator)** showcased India's foray into spaceplane and reusability technology.

Satellite Systems

Multiple generations of Indian satellites were discussed:

- **INSAT (Indian National Satellite System)**: Primarily communication and meteorology satellites operating in geostationary orbit (~36,000 km). These satellites match Earth's angular velocity to remain fixed relative to a point on Earth—facilitating uninterrupted communication and broadcast services.
- **GSAT (Geo-Stationary Satellite)**: Continuation and enhancement of the INSAT series, providing services in telecommunications, television broadcasting, VSAT networks, and satellite-based internet.

- **IRS (Indian Remote Sensing satellites)**: Operate in **Low Earth Orbit (LEO)**, typically between **400 to 1,000 km altitude**, providing high-resolution imagery and data for agricultural monitoring, urban planning, and resource mapping.

Models and Technological Demonstrations

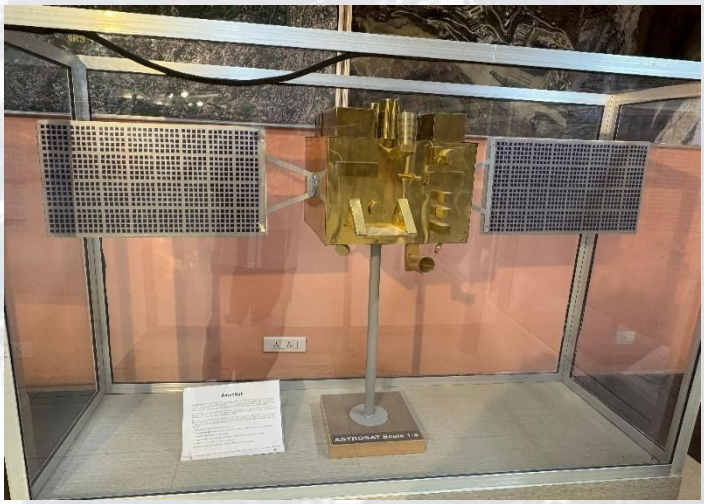
Dr. Ashutosh Bhardwaj demonstrated a range of spacecraft and satellite models at scale and provided a description of the diversity and capabilities of India's space assets. These included:

A variety of spacecraft and satellite models were displayed at scale, demonstrating the diversity and capability of India's space assets. These included:

- **SLV-3, ASLV, RLV-TD** – launch vehicle evolution.
- **Aryabhata, Rohini** (scale 1:2) – India's first experimental and operational satellites.
- **Resource Sat, GSAT-31, Ocean Sat, RISAT, Astro Sat, IRNSS, Chandrayaan-1, MOM (Mars Orbiter Mission)** – all displayed at **1:5 scale**, representing various scientific, navigational, and interplanetary missions.
- **Heat Shield** (scale 1:10) – a crucial component protecting payloads during atmospheric re-entry.
- **Deep Space Network Antenna** (scale 1:75) – essential for communicating with deep-space missions like MOM and Chandrayan.

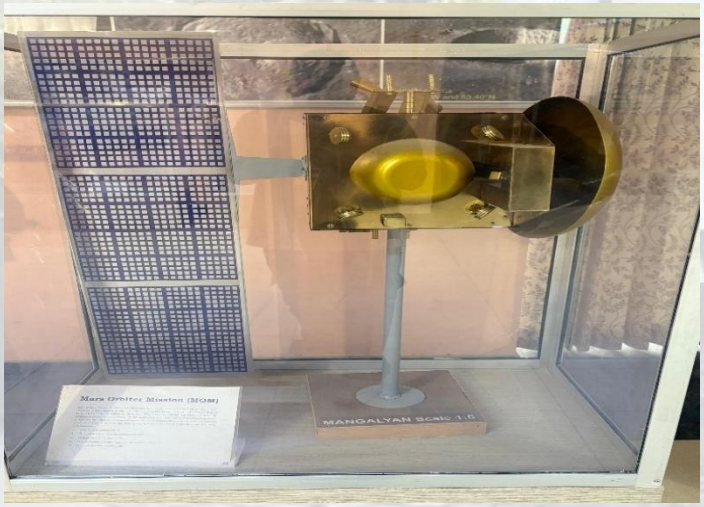
Each model was accompanied by technical specifications, mission objectives, and achievements, allowing a detailed understanding of system-level architecture and operational principles.


INSAT-3D Scale 1:5


ASTROSAT Scale 1:5


IRNSS Scale 1:5


GSAT-31
G SAT-31 Scale 1:5


Mars Orbiter Mission (MOM)
MANGALYAN Scale 1:5

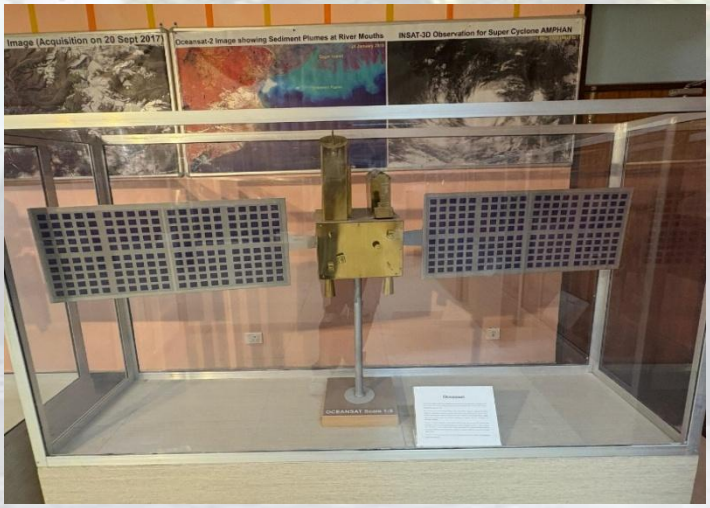


Image (Acquisition on 20 Sept 2017)
Oceansat-2 Image showing Sediment Plumes at River Mouths
INSAT-3D Observation for Super Cyclone AMPHAN
OCEANSAT Scale 1:5


Date of Acquisition: December 24, 2020
RISAT-1
RI SAT Scale 1:5


GSAT-31
G SAT-31 Scale 1:5

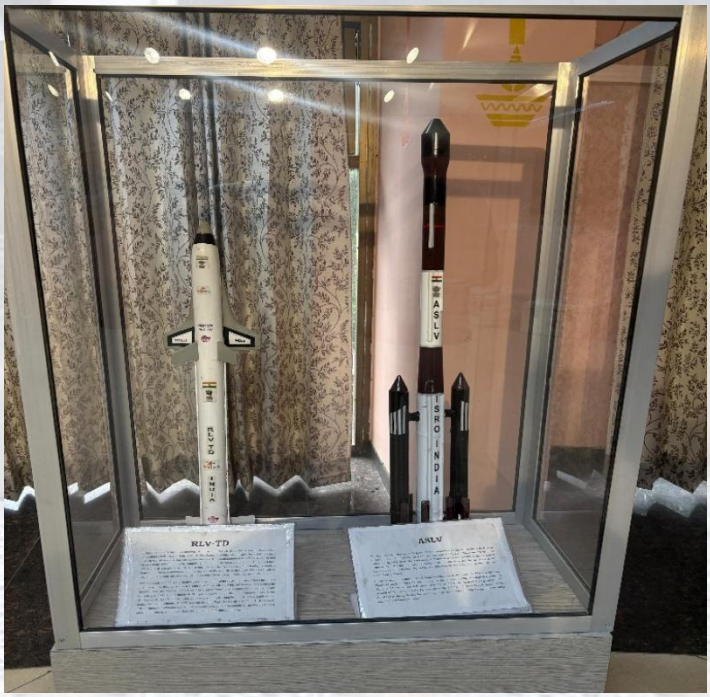

DEEP SPACE ANTENA
Scale 1:75


VIKAS ENGINE
SCALE 1:5


HEAT SHIELD Scale 1:10


FNC NOZZLE Scale 1:5


CRYO ENGINE
Scale 1:5
CRYO C25 STAGE Scale 1:10


HASLV
ISRO INDIA
RLV-TD
ASLV

Gaganyaan Mission: Human Spaceflight Program

The visit also included an overview of ISRO's ambitious **Gaganyaan** program. Key objectives include:

- Sending Indian astronauts (Vyomnauts) into Low Earth Orbit (LEO).
- Development of life-support systems, crew modules, and abort mechanisms.
- Testing critical subsystems through uncrewed missions before a manned flight.

This represents a major technological leap for ISRO into human-rated spacecraft and long-duration orbital missions.

Lecture Sessions and Institutional Roles

In the lecture hall, subject matter experts including **Dr. Chatterjee** and others elaborated on the strategic roles of:

- **IIRS (Indian Institute of Remote Sensing), Dehradun** – Specializing in training and education in remote sensing, GIS, and GPS technologies.
- **NRSC (National Remote Sensing Centre)** – Responsible for ground station operations and satellite data processing.
- **IGS (Indian Geodetic System) Station & Court Station GPS** – Permanent GNSS reference stations used for high-precision geodetic measurements and tectonic monitoring.

Discussions also covered the **CCTEAP (Centre for Space Science and Technology Education in Asia and the Pacific)** initiatives and **international academic collaborations**, including training programs in the **Netherlands**, which align with ISRO-IIRS's global outreach and capacity-building mission.

The use of high-resolution satellite data at **1:5,000 scale for Uttarkashi** was demonstrated, highlighting practical applications in terrain mapping and disaster management.

Conclusion

The visit to IIRS provided a holistic view of India's space capabilities, integrating remote sensing, satellite technology, and launch vehicle systems. The exposure to working models, expert-led lectures, and real-world applications significantly enriched our technical understanding of ISRO's missions and their contributions to national development and global science.

Report on Visit to Haridwar, Uttarakhand

Date: 30th May 2025

Day: Friday

Time: 12:00 PM

Venue: Haridwar, Uttarakhand

Study of Haridwar Geology

Geographical and Geological Setting

Location: Haridwar is located in the southwestern part of Uttarakhand, at the interface of the Siwalik Hills (Outer Himalayas) and the Indo-Gangetic Plains.

It lies at an average elevation of 314 meters above sea level.

Geographically, it marks the transition zone from the Himalayas to the plains—a tectonically active foreland basin.

1. Tectonic Framework

Haridwar lies near a critical tectonic boundary called the:

- **Himalayan Frontal Thrust (HFT):**

✓ A major thrust fault marking the boundary between the Siwalik sediments (younger fold belt) and the Indo-Gangetic alluvial basin.

✓ Haridwar lies in Seismic Zone IV, meaning it is prone to moderate to high earthquake risk.

2. Stratigraphy and Lithology

A. Indo-Gangetic Alluvium (Quaternary Age)

- ✓ High groundwater potential, but also a risk of contamination due to:
- ✓ Improper sewage disposal
- ✓ Urban expansion
- ✓ Religious tourism-related waste
- ✓ Seasonal variation in groundwater level is observed.

3. Geohazards

A. Seismic Hazard

- ✓ Due to proximity to active faults (HFT), earthquakes up to magnitude 6–7 are possible.
- ✓ Important for seismic hazard zoning and infrastructure planning.

B. Flooding

- ✓ The Ganga and its tributaries flood the plains during monsoon, especially July– September.
- ✓ Floodplains are inhabited and agriculturally used, increasing flood vulnerability.

C. Landslides

While less common in the city, landslides are a risk in nearby hilly terrains of the Siwaliks, especially along roadways and during rains.

4. Geological Importance of Haridwar

- ✓ Transition zone between tectonically active Himalayas and stable plains.
- ✓ Important for Himalayan tectonics research.
- ✓ Key location for fluvial geomorphology, alluvial stratigraphy, and seismic risk assessment.
- ✓ Helps understand the evolution of foreland basins and Quaternary climate and sedimentation patterns.

5. Relevant Research & Institutions

- ✓ Research by the Wadia Institute of Himalayan Geology, Dehradun.
- ✓ Seismic and neotectonics studies by the Geological Survey of India (GSI).
- ✓ Hydrological studies by the Central Ground Water Board (CGWB).

Conclusion

A combination of tectonic activity, river dynamics, and sedimentation processes shapes Haridwar's geology. It serves as a key region for understanding Himalayan uplift, seismic risk, and river-based landform development. Its complex geological setting requires sustainable planning to manage water resources, infrastructure, and natural hazard risks. A large gathering of devotees participating in traditional rituals and taking holy dips in the river, believed to purify thesouland washaway sins.

The ghat is bustling with activity, reflecting the deep- rooted religious and cultural heritage of India. The presence of ancient temples, the sound of devotional chants, and the overall sanctity of the place make Haridwar a prominent spiritual destination. This trip was not just a getaway, it was an inward journey, leaving us with unforgettable memories and a heart full of calm and gratitude.

GLIMPSES OF THE TOUR

Wadia Institute

FRI (Forest Research Institute)

ICAR(Indian Council Of Agriculture Research)

Wildlife Institute

Mussoorie

IIRS (Indian Institute of Remote and Sensing)

At Haridwar