

Rasayanika

THE CHEMICAL SOCIETY MAGAZINE 2019-2020
MIRANDA HOUSE
UNIVERSITY OF DELHI



R
A
S
A
Y
A
N
I
K
A



RASAYANI Volume 17-19
Covering academic sessions 2017-18, 2018-19, 2019-20

EDITORIAL BOARD

Student Editor	Siri Mereddy
Assistant Editors	Divya Singh Pooja Yadav
Staff Adviser	Dr Bani Roy

FRONT COVER

Collage of Chemistry students' activities in 2019-20

CONTENTS

From the Editors' Desk	3	Sleep	38
Class Photographs 2019-20	4	Role of Chemistry in Agriculture	39
<i>Rasayanika</i> Annual Reports and President's Messages 2017-2019	10	Chemistry is Everywhere	41
Nobel Prizes in Chemistry 2017-19	22	My Journey in Miranda House	41
Unravelling the Universe	29	My Miranda	42
In the Lap of Nature	31	Miranda House: When a Dream Came True	43
Vegan Fashion	32	Experiences in Miranda House	44
The Colours of Love	32	The Pandemic	45
Exploring Beyond Boundaries	33	A Leap of Faith	46
Chemical Wedding	34	Department of Chemistry 2017-18	48
Lessons Learnt from COVID-19	35	Fun with Chemistry	51
She...	37	Excursion to Udaipur	52
Once Again MH Stands at NIRF 1	37		

FROM THE EDITORS' DESK 2019-20

RASAYANI Volume 2017-20 – The magazine brought out by the Miranda House Chemical Society *Rasayanika*, is an amalgamation of many people's creative input and effort. It has been an immense pleasure to bring out this latest edition covering past three years. This gave us an opportunity to know about our seniors and their contributions. We have striven to incorporate all the stories from the astonishing walls of Miranda House and Department of Chemistry which up-skilled us in all walks of life.

We would like to thank Dr Bani Roy, for her inputs, zeal and support throughout the process of compilation and publication of this magazine.

The past year has been bittersweet. We started the year with many fruitful and successful events but due to the unprecedented circumstances of the global pandemic, we had to return to our respective hometowns to prevent community transmission. It is heart-breaking for us to give a virtual farewell to our seniors. The contents of this magazine, including articles, photographs, collages, poems etc might cheer you up a little and bring back memories in these odd times. Here's to celebrating all the strong women who are graduating this year.

We would like to thank all the people who have contributed to this magazine. We extend our sincere love and gratitude.

To all the readers – hope you enjoy and learn from this magazine as much we did while writing, editing and compiling it.

Student Editor
Siri Mereddy

Assistant Editors
Pooja Yadav
Divya Singh



Siri Mereddy

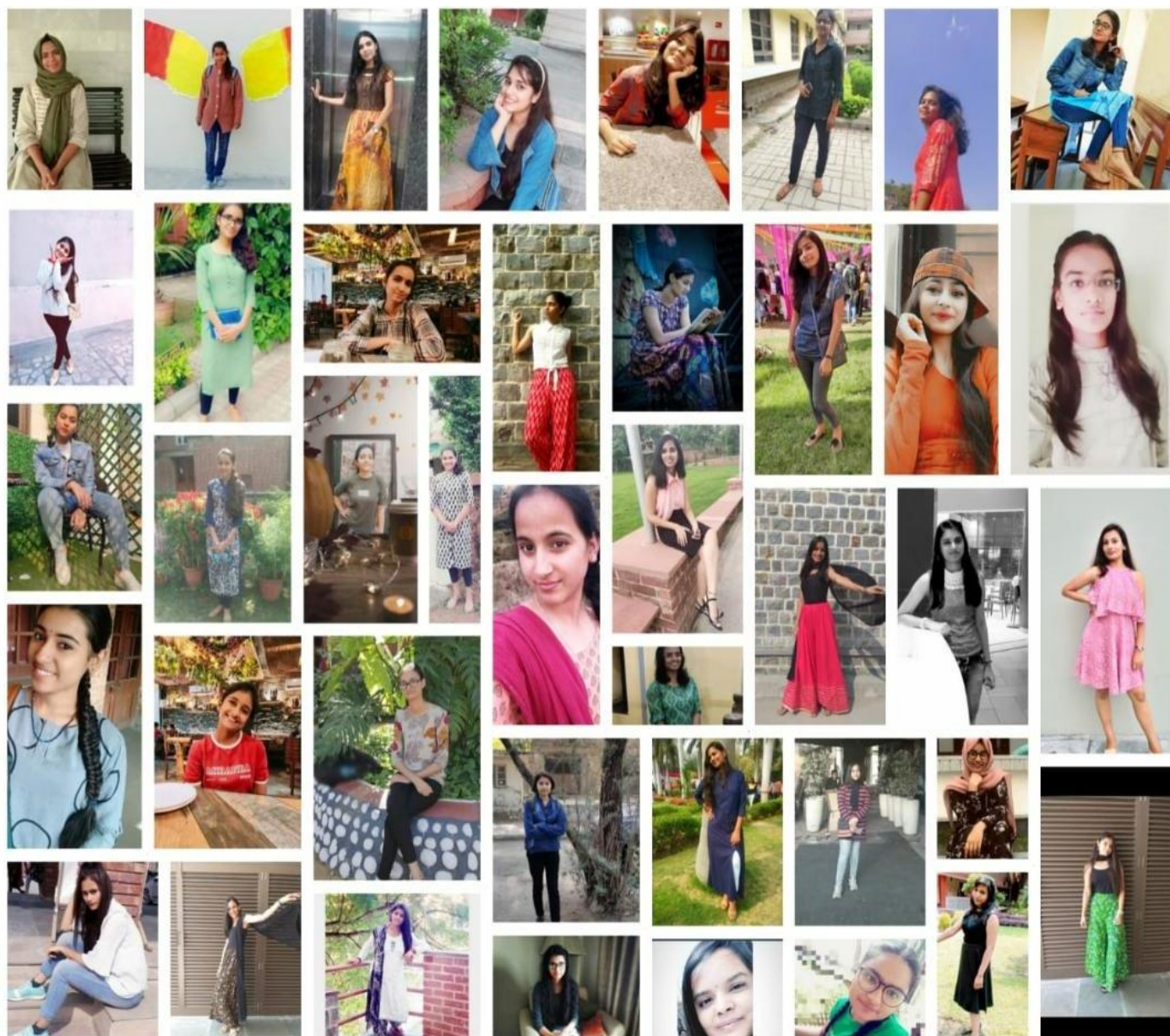


Pooja Yadav



Divya Singh

I Year Chemistry (H) Section 1- 2019-20



From top row L to R

Row 1: Anjel Fathima KK, Kriti Shakya, Komal, Kanika Deshwal, Khushi, Jyoti, Manisha Kerketta, Manisha

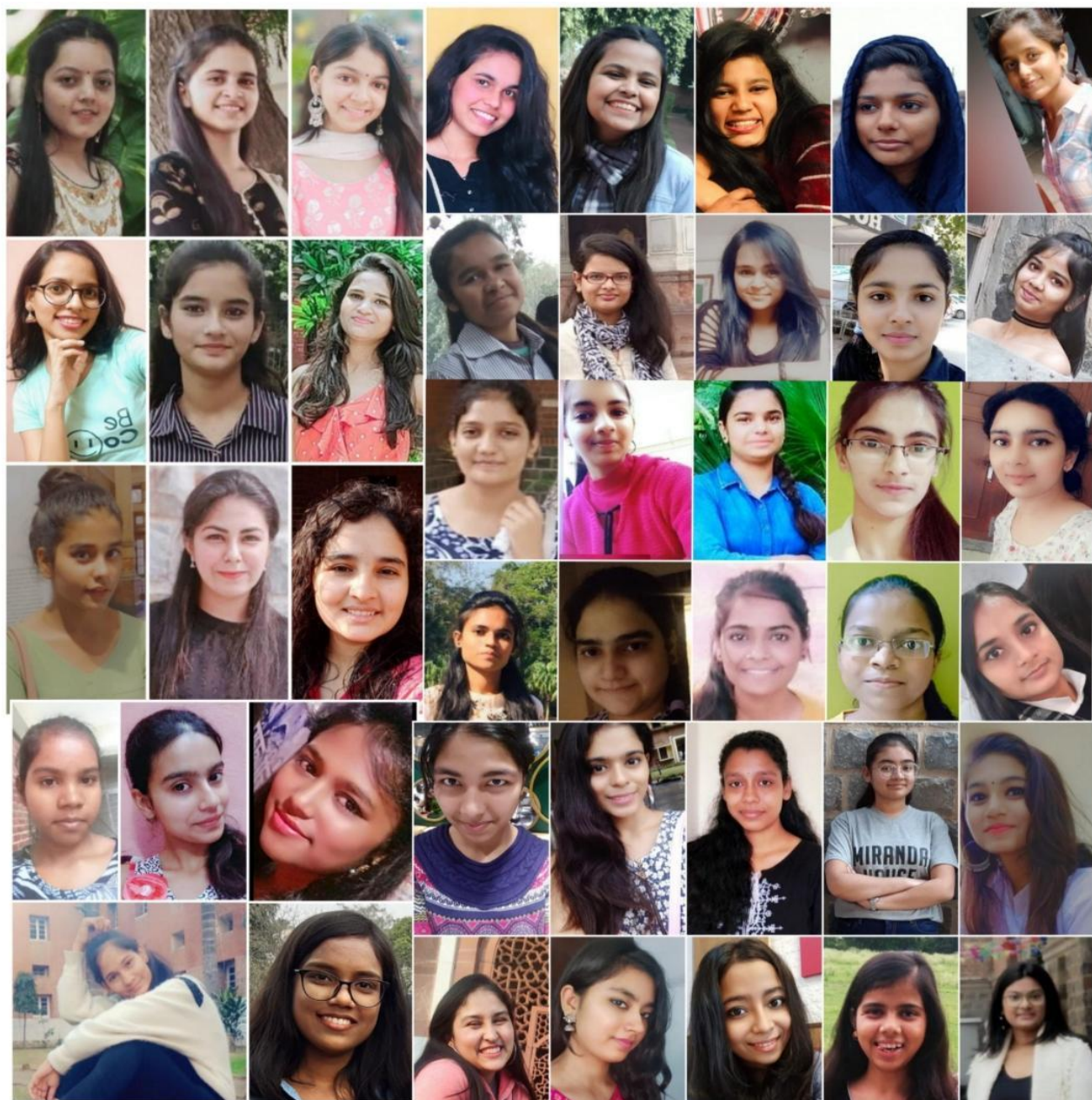
Row 2: Chhavi Prajapati, Aarti, Muskan Singh, Keerthi E, Akshaya Mohan, Divya, Kaikasha Malik, Dharna Yadav

Row 3: Kritika, Chhavi Sharma, Mitali Rajput, Anjana R Chandran, Ekta, Aditi Sharma, Anamika Sharma, Aarushi Gupta, Divya Singh

Row 4: Anjali V A, Faguni Agrawal, Astha Yadav, Meghna Manoharan, Kirti, Kanika Goyal, Ipshita Das, Hana Fathima Keloth, Muskaan Joshi

Row 5: Kajal, Kalpana Mahala, Harsha, Anushka Dahiya, Megha Jangir, Ekta, Ishika Bansal

I Year Chemistry (H) Section 2- 2019-20



From top row L to R

Row 1: Sakshi, Navpreet Kaur, Prakriti Thakur, Vini, Pallavi, Nisha Patwal, Nisha Nazia Parangodath, Riya Kumari

Row 2: Shagun Paliwal, Sania ,Priyanka Meena, Sadhna, Neha, Prachi, Namita, Srishti

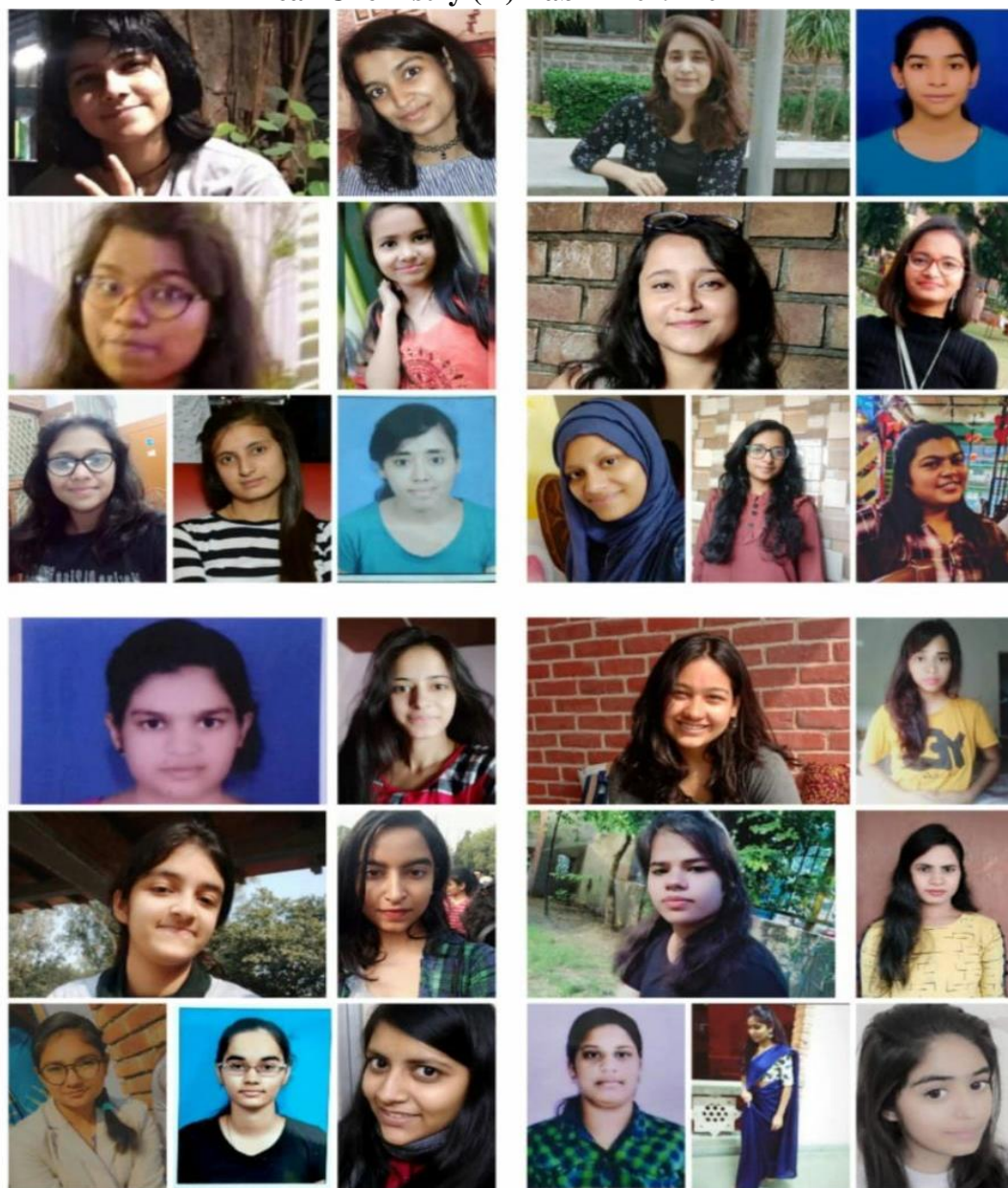
Row 3: Priya Kumari, Sakshi, Rakhi, Raveena Kumari, Sonam

Row 4: Ritu Singh, Reetika, Salochna, Vandana Kumari, Sanna, Priyanshi, Shivani Verma, Nidhi Jain

Row 5: Savita Prajapati, Shilpi, Snehal, Payal Yadav, Shweta, R Bhuvaneshwari, Zainab Fatima, Neha Sharma

Row 6: Preeti, Priyanka, Yashasvi, Samya Raj, Shruti, Vaishali, Shivani Dohare

II Year Chemistry (H) Lab 1- 2019-20



From top row L to R

Row 1: Sarika, Pooja, Neeharika, Fiza Madar

Row 2: Riya, Preeti, Urvashi Abrol, Pooja Yadav

Row 3: Rubal, Vidhi, Sonali, Sahiba Khan, Shruti Sharma, Shubhangi

Row 4: Sushma Meena , Vandana Devi , Ojaswita Pant , Sonam

Row 5: Saumya Tyagi , Reenu , Sakshi Maan , Suman Kumari Dhangar

Row 6: Sneh , Pooja Meena , Richa Singh, Ritu , Narsagalla Sheela , Savina

II Year Chemistry (H) Lab 2 - 2019-20



From top row, L to R

Row 1: Lakshita Hasija, Monika Yadav, Arju, Daya, Akanksha, Jyoti

Row 2: Monika, Kusum, Mansi Sharma, Aadya

Row 3: Himanshi, Hitakshi, Ashmita Bodh, Aprajita Sood, Changni, Anushka

Row 4: Muskan, Ankita Meena, Anshul, Archana Kumari, Bhumika, Hemlata

Row 5: Kavita, Anamika, Garima, Kunja Anitha

Row 6: Gariyashi Deka, Himani Kashyap, Amisha, Khushboo Goel, Siri Mereddy, Chailsi

III Year Chemistry (H) Lab 2 - 2019-20



From top row L to R

Row 1: Kusum, Avika, Eknoor, Geeta, Geetika, Jyoti, Mohini

Row 2: Divya, Aarti, Aman, Ankita, Meenakshi, Deepanshi, Deepti

Row 3: Manju, Jyoti, Aayushi, Mamta, Hairen, Jasleen, Aprajita

Row 4: Jyoti, Muskan, Astha, Abiyamol, Himani, Kranti, Kajal

Row 5: Bhavika, Anuja, Bhawna, Chetna, Tanya, Mamta, Kanika

Row 6: Maria, Monica, Komal, Bandita, Raveena, Ankita Duggal, Menka

III Year Chemistry (H) Lab 3 - 2019-20



From top row L to R

Row 1: Riya, Utsa, Shivani Meena, Sheetal, Pankhuri, Priya Yadav, Tarishma

Row 2: Saumya, Priya Yadav, Neha, Shivangi, Urvica, Ritika, Shweta

Row 3: Renu, Sneha, Sneha Singh, Sugandha, Pulkit, Pallavi, Nikita

Row 4: Sakshi, Priyanka, Saranya, Parveen, Nitisha, Ruchi, Tanya Sehgal

Row 5: Sudikshya, Tisha, Nandini, Surbhi, Prachi, Ruby, Shallu

Row 6: Sheetal, Shivanshi, Pooja, Shivani Tomar, Varnika, Sheetal, Shambhatee

ANNUAL REPORTS
Department of Chemistry and *Rasayanika*, the Chemical Society

Team *Rasayanika* 2019-20

President	Nikita Grover
Vice President	Maria Amin
General Secretary	Garima
Joint Secretary	Ojaswita

Report 2019-20

The activities of the Department of Chemistry began even before the onset of the current academic session. A number of Chemistry students carried out Summer Research Projects from May to July 2019 under the DS Kothari Central Interdisciplinary Research Facility (DSKC), Miranda House under the supervision of faculty members.

As per the practice in past years, a Bridge Course on *Lab Safety and Handling of Equipment* was organised on 1 August 2019 for all First Year Chemistry Honours students. The Bridge Course was very well-attended since in this academic session, there are two sections in First Year Chemistry Honours due to the increase in the sanctioned strength of the Department. For the first time since its inception, the Bridge Course was also conducted for First Year students of B.Sc. Life Sciences on 7 August 2019. The course attempted to bridge the gap between laboratory practices in school and college. It was much appreciated by the freshers, for many of whom it was the very first exposure to advanced labs and lab equipment. The Lab Safety Quiz held at the end of the course generated enthusiastic participation from both Honours and Life Sciences students.

Teachers' Day was celebrated on 5 September by Chemistry students, who brought a cake which was cut jointly by students and faculty. The students also gave each teacher a small token of appreciation. The joint Inaugural Talk of *Rasayanika*, the Chemical Society and the Add-on certificate Course in *Nanochemistry* was delivered on 6 September 2019 by Institute Chair Professor Ashok Kumar Ganguli, Department of Chemistry, IIT Delhi. The talk, titled *The World in A Grain of Sand*, highlighted for the faculty and students various amazing aspects of Nanoscience and Nanotechnology, helping them to imbibe the spirit of the nano world. At the end of the session, many students were able to envisage a great career option in the field. On the same day, the Department also organized the *Dmitri Mendeleev Memorial Lecture*. The invited speaker was Mr R. Parthasarathy, former IAS officer, who gave a talk titled *Periodic Table: Past, Present and Future*. The talk enhanced the students' knowledge about the development of the current periodic table. Mr Harjas Singh, a TEDx Speaker and a life skill coach at Bhoomaya Foundation, delivered a talk titled *Everything about relationships* for Chemistry students on 19 September 2019. Mr Singh, the author of the book 'The Righteous Rebel', explained to the students present about the nature of inter-personal relationships and how to deal with them. The talk generated a lot of interest among students and was followed by a lively interactive session.

Rasayanika, the Chemical Society arranges interactive sessions with alumnae in different walks of life every year which help the current students to explore new horizons in Chemistry and related areas as well as in fields other than Science. Several distinguished alumnae of Miranda

House visited the Department of Chemistry in 2019-20 and interacted with the students to talk about their career paths after graduation and milestones achieved in life. It was encouraging for the students to hear that the training received while pursuing Chemistry Honours in Miranda House ensured that they would be able to take everything in their stride in the future. These sessions with alumnae gave wide exposure to students about the possible openings for a Chemistry graduate from Miranda House and also imparted a sense of pride in being students of such a prestigious institution whose alumnae had achieved a high degree of professional success in diverse fields. Alumna Dr Bindu Goyal, a Medicinal Chemist who is working at Gilead Sciences Inc., Foster City, California, USA visited on 13 January 2020. She gave an idea about how molecular modelling plays an important role in drug design and spoke about her work as a Research Scientist in pharmaceutical companies in India as well as in the US. Another alumna who visited on the same day was Ms Jyoti Aggrawal, who is pursuing PhD in Leadership Studies, University of Lynchburg, Virginia, USA. She was a member of the University of Lynchburg team visiting Miranda House under the International Collaborations programme. The session with Jyoti proved to be quite interesting for the students as she talked about her journey from Miranda House to Lynchburg and beyond. Alumna Ms. Shaileyee Bhattacharya, PhD scholar in Paul Scherrer Institute, Switzerland also visited the Department in January and spoke to the students about her M.Sc. in IIT Roorkee and her internship in Max Planck Institute for Chemical Physics of Solids in Germany before she got the offer from the Paul Scherrer Institute.

Apart from interactions with alumnae and popular talks for undergraduates, the Department of Chemistry also organized research-based invited talks. Dr R. Krishanappa and Dr Puran Chandra, Senior Scientists, ICAR Meghalaya visited the Department in April-May 2019 as collaborators under the DBT Research Project with Dr Kalawati Saini in the DBT Twinning Programme. A talk was also delivered in Miranda House by Dr Poonam Singh, Central Electrochemistry Research Institute of CSIR, Karaikudi, Tamil Nadu on 30 August 2019.

Several Chemistry faculty members of Miranda House were invited as Resource Persons and Guest Speakers by various reputed national and international institutes to present their research work and share their experiences to motivate students to build careers in science. Dr Kalawati Saini was an invited speaker at Jamia Millia Islamia, on 8 March 2019 and in Moti Lal Nehru National Institute of Technology (MNNIT) Allahabad on 15 March 2019. Dr Saini also gave the inaugural talk at the International Conference organized between 10 and 12 April 2019 by the Department of Zoology, Kalindi College, at the Conference Centre, University of Delhi. Dr Kalawati Saini was a resource person at the *CV Raman Birthday Celebration* organized by Bluebells School International on 25 July 2019. She delivered a technical talk on 23 August 2019 at Department of Biotechnology, IGNOU, New Delhi.

Dr Saini also presented a talk at the *International Analytical Congress 2019* organized, jointly by Amity University and Delhi Chapter of Indian Analytical Scientists, in December 2019. Dr Poonam gave a talk at the International Conference organized by the Hungarian Academy of Sciences in Mátrafüred, Hungary in May 2019 while she was a Visiting Fellow at the Department of Pharmaceutical Chemistry, University of Debrecen, Hungary from 21 to 29 May 2019. Dr Poonam, also conducted a course under the PhD Programme at Department of Pharmaceutical Chemistry, University of Debrecen, Hungary from 6 October to 16 October 2019. Dr Poonam has been recognised as Adjunct-Assistant Professor, Department of Medicine,

Loyola University Medical Centre, Health Sciences Division, Chicago, USA for the period 1 May 2019 to 30 April 2022.

Dr Mallika Pathak was a resource person in the Student Science Village, India International Science Festival 2019 held in November in Kolkata. She was also a resource person for the *Resource Generation Camp for Chemistry teachers*, Homi Bhabha Centre for Science Education (HBSCE), TIFR in September 2019. Dr Mallika Pathak and Dr Malti Sharma conducted a hands-on workshop in January 2020 for Class IX and X students in the School of Excellence in Khichdipur, Delhi to illustrate the concept *Science as Fun* to the students.

Several faculty members and research scholars presented research papers and posters in local and national conferences. Dr Sharda M. Sonkar and Dr Sujata Sengupta received Best Poster award at ACS workshop *Greening Our Education System* organised by Department of Chemistry, University of Delhi in association with Hindu College in December 2019. Best Poster Award was received by Charu Upadhyay and Sumit Kumar, PhD students of Dr Poonam, at the International Conference on *Integrative Chemistry, Biology and Translational Medicine* jointly organized by Centre for Global Health, Hansraj College, University of Delhi and Loyola University, Chicago Stritch School of Medicine, USA in February 2019. Mona Saini, Junior Research Fellow in Dr Kalawati Saini's DBT Research Project, also received Best Presentaiaon award at MNNIT, Allahabad in the National Workshop on *Advanced Microscopy and Foldscope* in March 2019. Sumit Kumar, PhD student of Dr Poonam received International Travel Grant from DBT for the American Society of Tropical Medicine and Hygiene (ASTMH) meeting held from 20 to 24 November 2019 in Maryland, USA. Apart from research papers in established journals, some Chemistry faculty members have also published books in the current academic session. Dr Malti Sharma published the book titled *Chemistry: Inorganic and Organic*. Dr Sharda M. Sonkar and Dr Sujata Sengupta published the book titled *Green Chemistry: An Introduction* in April 2019.

Many Chemistry students have been recipients of a variety of scholarships in this academic session such as INSPIRE Scholarship from DST; JKPMs Scholarship Scheme by AICTE; Jammu State Scholarship; Punjab State Scholarship and Promotion of Science Education Haryana State Scholarship. A departmental trip was organised from 29 September to 4 October 2019 to Kullu-Manali and Kasol, Himachal Pradesh. A group of 53 students from across all three years of Chemistry Honours accompanied by faculty members Dr Shivani and Ms Lishinai and laboratory staff Mr Ravi and Mr Vijay went on the trip, which was highly enjoyable and informative.

Activities of the Department of Chemistry in February 2020 included a National Workshop *Nano Road Show-2020* in collaboration with IIT Delhi. The highly successful one-day event was designed to introduce undergraduate and postgraduate students to nanochemistry. More than 250 articipants, including 199 students from various colleges of Delhi University, Amity University, Central University Mahendergarh and other institutions attended. A Symposium on *Bonding to Create Future Leaders in Sciences—GWB2020* as a part of the Centenary Celebration of the International Union of Pure and Applied Chemistry (IUPAC) was the other high profile activity in February. The symposium featured eminent speakers and attracted enthusiastic participation from students and faculty across the University. Due to the lockdown following the COVID-19 pandemic, the Founder's Day was held in late September 2020. A number of prestigious College

awards went to Chemistry students including the Ved Jolly Resilience Award to Shilpi Yadav, Archana Kumari and Varnika; the Anu Bedi Award and the Miranda House Alumnae Association Awards to Rubal and the most coveted Golden Jubilee Award to Chetna.

From President *Rasayanika* 2019-20



Miranda House is not just a part of my life but it is a bit of me. It has made me a better person all round. The responsibility that moulded me the most was being the President of the Chemical Society *Rasayanika* in 2019-20. It was an experience that could not be replaced by any other.

This year like the previous years was a fruitful and eventful year for the Society. We welcomed the freshers and celebrated Teachers' Day. This was closely followed by two inaugural lectures. *The World in a Grain of Sand*, a talk by Professor Ashok Kumar Ganguli kindled the flame of nanotechnology in students and they could envision it as a great career option. *The Periodic Table: Past, Present and Future* by Shri R. Parthasarthy traced the history of the periodic table. The talk *Everything about Relationships* by Mr. Harjeet Singh: a TEDx speaker and a life skills coach, went down well with students.

A department trip to Kullu-Manali-Kasol was organized by *Rasayanika*. The students were accompanied by the faculty members Dr. Shivani and Ms. Lishinai. The trip was a lot of fun. Two interactive sessions with alumnae were conducted – one was an informative session by Dr. Bindu Goyal, a medicinal chemist at Gilead Sciences Inc., USA and the other motivational session was by Jyoti Aggrawal, pursuing PhD in Leadership Studies in Lynchburg University USA. The sessions with these distinguished alumnae inspired the current students. A one-day national workshop *Nano Road Show 2020* was conducted this year in collaboration with the Department of Chemistry, IIT Delhi in February. The other important event in February was a Symposium on *Bonding to Create Future Leaders in Sciences—GWB2020* as a part of the Centenary Celebration of the International Union of Pure and Applied Chemistry (IUPAC).

Our plans for *Pratikriya 2020*, the annual departmental fest were underway, with everyone very enthusiastic about it. Just then the world took a turn – we were hit by the COVID-19 pandemic. Unfortunately *Pratikriya 2020* could not be organized despite all the preparations. It will not be wrong to say that this pandemic has been devastating for almost everyone but if we choose to look at the positive side, this pandemic equipped us with a lot of new tools and skills. The world learned new ways of operating in this new normal whilst staying indoors. We became the first batch to receive a virtual farewell from our loving juniors and respected teachers and to have online Open Book Examinations for our final semester. The COVID situation has led to new challenges for the current batch. Online classes are held in place of classroom learning; webinars are conducted in place of seminars and much more. This pandemic has taught us how to adapt ourselves to whatever situation we are thrown into. I would urge everyone to make this year as fruitful as possible by adapting to the new methods and skills that are the need of time.

This is the perfect platform to extend my gratitude to our Teacher-in-charge Dr. Mallika Pathak, our staff advisors Dr. Anshika Lumb and Dr. Kalawati Saini and all the other teachers of the

Department as well as the lab staff. I thank my team of office bearers Maria (Vice President), Garima (General Secretary) and Ojaswita (Joint Secretary). A special thanks to Dr. Bani Roy on behalf of the Society. *Rasayanika* could not have functioned without the active participation of the Chemistry students. Thank you, dear friends, for making it all worthwhile. Thank you, *Rasayanika*. Thank you MIRANDA.

Nikita Grover
President 2019 – 2020

Team *Rasayanika* 2018-19

President	Priyanka Jain
Vice President	Surbhi Sharma
General Secretary	Nikita Grover
Joint Secretary	Kajal Srivastava

Report 2018-19

The activities of the Department of Chemistry began even before the current academic session started. A number of Chemistry students carried out Summer Research Projects under the DS Kothari Centre for Research and Innovation in Science Education (DSKC) under faculty supervision. In keeping with the college decision to have departmental colloquia, interactive talks were organised in the Department of Chemistry at regular intervals. On 30 July 2018, a talk was delivered by Dr. Poonam, Assistant Professor of Chemistry in Miranda House on the topic *Biodegradation of Fertilizers*. The talk highlighted ongoing research work in this field as well as her personal contribution. Another talk by faculty member Dr. Smriti Sharma Bhatia provided an insight into her research work on the topic *Computational Chemistry*. Both these talks were of great interest to the student audience since it allowed them to think beyond the classroom and discover new aspects of Chemistry. An interesting talk on the topic: *Second Generation Biofuels – Waste to Energy* was delivered by a faculty member, Dr. Firdaus Parveen, on 15 September 2018 in which she mentioned the work being done by her research group which may lead to commercial applications in this important field. Dr. Santwana Naorem Saikia, Assistant Professor, Department of Zoology, Cotton University, Guwahati delivered a talk on the topic ‘Climate Change and Global Warming – Its impact on Cuisine and Culture of Assam’ on 26 September 2018 which provided the students an overview of how climate change was affecting the vegetation and, in turn, the culinary practices of Assam.

As per the practice in recent years, a Bridge Course on *Lab Safety and Handling of Equipment* for I Year students was organised on 2-3 August 2018. It attempted to bridge the gap between laboratory practices in school and college. It was much appreciated by the freshers, for many of whom it was a first exposure to advanced lab equipment. A Lab Safety Quiz was held for the participants at the end of the course. Teachers’ Day was celebrated on 5 September by Chemistry students, who brought a cake to be cut jointly by them with faculty and gave the faculty a small token of appreciation. The joint inaugural talk of *Rasayanika* the Chemical Society and the Add-on certificate Course on Nanochemistry was delivered on 10 September 2018 by Professor Shyama Rath, Department of Physics, University of Delhi. The talk, titled *A Primer of Nanoscience*, a fitting beginning to the course on Nanochemistry, provided exposure to the students on a topic of enormous current interest.

Miranda House organised a trip to the Regional Centre for Biotechnology (RCB) to attend the RCB Open Day Outreach Program under India International Science Festival on 24 September 2018. RCB had organised different activities and talks by eminent scientists such as Professor Sudhanshu Vrat, Dr. Avinash Bajaj and others with the aim to expose students to the research going on in India and to motivate them to take up research in the government sector as a future career option. Competitions like Scientific Model-making, Sci-Toon, Science Questionnaires etc. which enhanced students' knowledge were also conducted. Six Chemistry students, accompanied by faculty member Dr. Poonam, were members of the MH contingent.

A group of 53 students from across all three years of Chemistry Honours accompanied by faculty members Dr. Rajeswari and Dr. Shivani and laboratory staff Mr. Ravi and Mr. Vijay, along with a group of Botany Honours students and faculty members, went on an educational cum sightseeing trip to Dalhousie, Khajjiar and McLeod Ganj in early October. It was a great learning experience for the students to visit Ayuskama Ayurveda Institute which is a leading Ayurveda school in North India. The visitors were briefed about the advantages of Ayurveda over other branches of medicine and Ayurveda based treatments offered by the institute for a range of diseases. The group also went for sightseeing of popular tourist destinations in the area including Chamera Dam; Khajjiar Lake; Dharamshala Tea Gardens and Cricket Ground and Bhagsunath Falls.

Many Chemistry students and faculty members participated in the *Biodiversity for Everyone's Life* Conclave held on 31 August 2018 and the INSPIRE Science Conclave held from 15 to 18 January 2019 at Miranda House. Chemistry students and faculty also helped in the organisational work for the two events.

In the B.Sc. (H) batch graduating in 2018, Ekta secured third position in the University while Chinky Kochar secured second position in the University in the M.Sc. Final examination 2018. Chemistry graduates of Miranda House in 2018 joined many prestigious institutions for Masters like DU; different IITs such as Delhi, Gandhinagar, Mumbai, Roorkee; IISER Mohali, TERI University etc.

Many interactive sessions were held with Chemistry alumnae of Miranda House throughout the academic year. The first one was held on 25 July 2018 with MH alumna Ms Shweta Jain, who is teaching Chemistry to International Baccalaureate students in an International School in Thailand. The session proved to be quite interesting for the students due to inclusion of her life story and opportunities in the field of Chemistry. Alumna Dr Deboadhonya Sengupta, who interacted with the students on 20 November 2018, recounted her journey from Chemistry Honours in Miranda House to her present occupation of Patent Attorney in the US. MH alumna Ms Ramya Srinivasan, who spoke on *Life after Miranda House* on 8 January 2019, enlightened the current students about the pros and cons of applying abroad for higher studies in Chemistry. These talks helped the students in exploring new horizons in Chemistry. *The Essence of Being a Mirandian* was the topic of alumna Dr Saswati Chakladar's talk on 19 Feb 2019. Students felt encouraged to hear that their training in Miranda House ensured that they would be able to take everything in their stride in future. These sessions with alumnae gave wide exposure to students about the possible openings for a Chemistry graduate from Miranda House and also imparted a sense of pride in being students of such a prestigious institution.

The Department of Chemistry organised a Symposium on *Empowering Women in Chemistry* as a part of the Centenary Celebration of the International Union of Pure and Applied Chemistry (IUPAC) on 12 February 2019. The symposium was held under the aegis of DSKC and was sponsored by Department of Science and Technology (DST), Defence Research and

Development Organisation (DRDO) and Department of Biotechnology (DBT), Government of India. Many organisations all over the world participated in *IUPAC 100* celebration including Miranda House as a leading Partner Institution from India. The first event of the day was a *Global Women's Breakfast*, a global networking event launched in real time around the world, starting in New Zealand, with the final events occurring in the Pacific Region. Miranda House was privileged to host a Panel Discussion as the Breakfast Event, with eminent invited panellists Padma Bhushan Dr. Manju Sharma, Professor Rita Kakkar, Professor Ruchi Anand and Professor Shailja Singh. The women scientists on the Panel had fruitful interaction with the enthusiastic audience. Four of the panellists later gave talks related to their own fields of research.

Three lead-up students' competitions for IUPAC 100 were organised by *Rasayanika*, the Miranda House Chemical Society on 10 and 11 January 2019 with an objective of bringing together creative young minds. The first lead-up event held on 10 January 2019 was *Eureka: The Inter-College Science Paper Presentation and Poster Presentation* competition. The event saw participation from different colleges on given topics like The Periodic Table over the Years, Life and Work of an Extraordinary Woman Chemist, Frontiers of Chemical Research etc. The papers and posters were highly appreciated and prizes were given. The other two events were *Prayog* and *SciQuiz* which were held on 11 January. *Prayog* was the lab work competition while *SciQuiz* was a film-based quiz. In keeping with the theme of Empowering Women, the participants of *SciQuiz* watched a short documentary film based on the life of Rosalind Franklin, one of the contributors to the elucidation of DNA structure and then took a quiz based on it. The event proved to be very successful with good participation.

Recent activities of the Department of Chemistry include a talk *Lead Identification with Molecular Docking and Biomolecular Simulations* by Dr. Whelton Miller from Lincoln University USA on 22 February and an enjoyable interactive session on *The Joy of Learning* on 25 February 2019 with Professor Puspendu K. Das from the Indian Institute of Science (IISc) Bengaluru.

Chemistry students are actively involved in multiple college societies such as Women Development Cell, *Mridang*, Debating Society, *Umeed*, NSS and NCC. Several faculty members are Staff Advisers to college Societies including MH *Vatavaran*, Gandhi Study Circle, Placement Cell, NSS etc. A number of Chemistry students are NCC cadets and are involved in college activities as part of the MH NCC unit. Chemistry students are also doing well in Sports. Muskan Chaudhary, a Chemistry Honours III Year student bagged 1st position in All India Table Tennis Championship which was held in Punjab and has been selected for the International Championship which is scheduled to be held in the first week of April in Bangkok. Also, a substantial number of students are NSS volunteers. The elected Vice President of NSS for 2018-19 is a Chemistry student while all the four office bearers of MH *Vatavaran* are also Chemistry students – two being from III Year and the other two from II Year. Four of the seven Faculty Advisers of MH *Vatavaran* are also from the Department of Chemistry.

Apart from their prominent organisational roles in symposia and conclaves held in the college, Chemistry faculty members of Miranda House have also been at the forefront in outreach and collaborative activities in 2018-19. Two faculty members, Dr. Kalawati Saini and Ms. Nutan Rani conducted a Workshop titled *Plant Structural Changes (Stomata) and Dynamics of Aquatic Micro Flora/Fauna through Foldscope* in MeECL Secondary School, Barapani, Meghalaya on 3 November 2018 for 70 students from Class VII to Class X. The workshop was held under Department of Biotechnology (DBT) Twinning Programme with Indian Council of Agricultural

Research (ICAR), North Eastern Hill (NEH) region, Umiam, Meghalaya and Cotton University, Guwahati, Assam. Dr. Poonam was a Visiting Fellow at the Department of Pharmaceutical Chemistry, University of Debrecen, Hungary in June 2018. She also received the Distinguished Investigator Award during the International Conference on *Integrative Chemistry, Biology and Translational Medicine* organized jointly by Centre for Global Health, Hansraj College, University of Delhi and Loyola University Chicago Stritch School of Medicine, USA. Dr. Poonam has also been selected as Adjunct-Visiting Senior Researcher, Laboratory of Computational Modelling of Drugs, South Ural State University, Chelyabinsk, Russia. Her name figures in an international patent application by her research group on the potential of piperazine compounds to be used as drugs.

The crowning glory of Departmental achievements for the 2018-19 academic session was the selection of Priyanka Jain of III Year for the prestigious Golden Jubilee Award while Asha Pandey got the Certificate of Appreciation. Chetna received the Certificate of Appreciation for Excellence in II Year. Priyanka Jain has also got the Science Award 2018-19. The Department of Chemistry congratulates the students for their achievements.

The Journey from a Hatched Egg to a Flying Bird



My journey from a school pass-out to a graduate was no less than the life of a hatched egg to a bird that flies fearlessly with her wings wide open and eyes ready to explore the world. As a hatching chick has to work hard for days to break through the shell so did I and many others to get into a college as prestigious as Miranda House. Miranda House was a red brick building as I stepped into this place – a college from which I had boundless expectations. But as I stepped out from this place the college had turned into another home where the journey seems unforgettable. The expectations were not only fulfilled but also shaped into a gallery of memories that could be cherished throughout the life.

The most precious gift that this place gave me was none other than me – a changed me, a newer me, a me who actually knew how to dream big and had the audacity to fulfil it. This stupendous journey of mine was a complete blessing as well. The three years spent here were the years of education, enthusiasm, exuberance, courage, spirit, competition and above all character. My college journey, like all others', was an exciting roller coaster. It was loaded with gifts, surprises, ups and downs, achievements and criticism and all of it helped me learn to grow, learn to manage and most importantly learn to explore. Like a chick that puts in immense effort and slowly learns how to fly, I learnt how to sail in spite of the challenges. I was transformed into a more determined and stronger girl beyond my wildest imagination.

From being a member in societies like MH Vatavaran and NSS to forming human chains at times of need during Tempest; from meticulously working in labs wearing lab coats and safety glasses to preparing for and organising *Pratikriya*, freshers' and farewell parties, everything seems indelibly etched in memory. Running from PAM to classes as the bell rang to chilling in lawns and discussing different topics over coffee – everything was a pleasure always. And finally, from the orientation day to the scribble day and then the semester exams – this amazing pathway has left an everlasting mark on my trajectory of life. The biggest milestone of all was the post of

President of *Rasayanika*, which not only enhanced my skills but was transformational for me overall. Single-handedly organising trips to planning and achieving success in various events; balancing academic life with extra-curricular activities to making difficult decisions for the benefit of all were the things that made me the independent and confident person that I am today. In the midst of all this, I formed strong bonds with some people, made good friends for life and acquired a few critics who helped me to improve myself. And, above all, the faculty members were the cherry on top of the cake since they not only supported me but also acted as mentors at times of need and companions when I was experiencing my lows. They motivated me, pushed me and were always a delight to work with. They are an inspiration not only for me but for many. I am highly grateful to all of them for acting as pillars in the life of students like me. The non-teaching staff members were also very cooperative whenever we needed them, be it in the labs, trips or events. Everything was a total package worth experiencing.

Miranda will always carry a special place in my heart. For me it is an epitome of emotion which could not be forgotten. It is a vibe, an aura that can only be felt and realised. I will forever miss every nuance of this terrific journey of mine and will cherish it wherever I am for giving me myself. I am highly thankful and fortunate to be called a Mirandian for life and beyond.

Once a Mirandian, always a Mirandian!

Priyanka Jain
President Rasayanika 2018-19

Team *Rasayanika* 2017-18

President	Amishi Tewari
Vice President	Swati Jain
General Secretary	Priyanka Jain
Joint Secretary	Karisma Agrawal

Report 2017-18

On 18 April 2017, a contingent from the Department of Chemistry comprising a large number of students, six faculty members and one member of the laboratory staff visited the *Indira Paryavaran Bhawan* on Jorbagh Road (near Lodhi Road), where the offices of the Ministry of Environment, Forests and Climate Change are housed. The building has been planned to be a state of the art landmark eco-friendly building, with emphasis on conservation of natural areas and trees to reduce adverse environmental impact, provide sufficient natural light and maximize the energy saving system by installing solar panels on the roof. Optimization of water requirement has been done by recycling the waste water for reuse in the complex. It is a green building which has net zero energy consumption and very low water consumption. Ministry officials showed the team around and explained the special features of the complex. The visitors were shown a documentary on a village where acute shortage of water caused several deaths and then how an idea about conserving and recycling water changed the lives of the people. The visit provided the students a vision of a greener tomorrow.

The Department in collaboration with Amrita University, Kerala organized a Workshop for School Teachers on *Online Labs for School Experiments* on 11 April 2017. The workshop was

held under the D S Kothari Centre for Research and Innovation in Science Education (DSKC) and had 35 participants from various schools of Delhi. During June-July 2017, a number of Chemistry students carried out Summer Research Projects under DSKC. Several Chemistry faculty members supervised these projects.

A Bridge Course on *Lab Safety and Handling of Equipment* for B.Sc.(H) Chemistry I Year students was organized on 1 and 3 August 2017. The course attempted to bridge the gap between laboratory practices in school and college. It was much appreciated by the I Year students, for many of whom it was the first exposure to advanced lab equipment. A quiz on Lab Safety was held for the participants at the end of the course.

The Department organized a workshop for students, *Using Gaussian Software in Undergraduate Education* on 3 August 2017. It was extremely well-attended with 85 students participating.

The joint inaugural talk of *Rasayanika*, the Chemical Society and the Add-on Certificate Course on *Nanochemistry* was delivered on 9 September 2017 by Dr. Dipak Maity, Department of Mechanical Engineering, Shiv Nadar University.

A group of 31 students from across all three years of Chemistry Honours accompanied by faculty members Dr. Deepti Rawat and Ms. Shivani and laboratory staff Mr. Ravi and Mr. Sushil went on an educational-cum-sightseeing trip to Rajasthan from 22-25 September 2017. The group visited one of the largest cement manufacturing factories in North India – Shree Cement at Beawer, Ajmer district, Rajasthan. The visitors were briefed about the materials and process of cement manufacture and quality control and chemical analysis of the product through presentations and a plant tour. This provided a practical insight into the DSE course- Inorganic Materials of Industrial Importance to III year students. The group also went for sightseeing of popular tourist destinations including the City Palace and Lake Fatehsagar in and around Udaipur.

A one-day *Indo Hungarian Symposium on Recent Advances in Chemistry and Biology (INHCAB - 2017)* was organized in association with the Department of Pharmaceutical Chemistry, University of Debrecen, Hungary on 11 December 2017. Professor Aniko Borbas and Professor Pal Herczegh from the University of Debrecen, who are Dr Poonam's collaborators in her DST funded project on Pharmaceutical Chemistry, gave inspiring lectures on their work. The other eminent speakers were Professor Tej Pal Singh, Dr S K Varshney, Professor Agam Prasad Singh and Professor Akhilesh Verma. The audience consisting of researchers and faculty from across the country participated enthusiastically in the scientific sessions.

Dr. Amo Augustus Kubeyinje, Director Graduate Admissions and Enrolment Services, William Paterson University New Jersey USA addressed the Chemistry students on 29 January 2018 regarding their Graduate Program in Materials Chemistry.

Chemistry students were Undergraduate Mentors for high school students participating in the INSPIRE Internship Camp in Miranda House from 18 to 22 December 2017. Chemistry students and faculty were mentors in five workshops under INSPIRE. Some Chemistry students also rendered secretarial assistance to faculty members for organizing INSPIRE. Some faculty members and many students participated in the *Science Conclave* held at Miranda House from 10 to 12 January 2018 and also helped in organizational work. Twelve faculty members and ten students attended the *National Conference on Technological Empowerment of Women* held at Vigyan Bhawan on 8-9 March 2018. Chemistry laboratory staff attended two workshops

organized under IQAC: *Laboratory Techniques and Instrumentation* and *MS Office and Internet Usage*.

Faculty members of the Department of Chemistry, Miranda House presented research papers and posters in a number of local and national conferences. At the international level, Dr. Kalawati Saini was an invited speaker at the *European Advanced Materials Congress-2017* held in Stockholm, Sweden, in August 2017. Dr. Mallika Pathak presented a paper at the *XIV International Conference on Molecular Spectroscopy* held at Kraków-Białka Tatrzańska, Poland in September 2017. Dr Mallika Pathak and Dr Sharda M Sonkar attended Research Based Pedagogical Tools (RBPT) Tier I and Tier II workshops organized by IISER Pune in collaboration with Newton Bhabha Fund and DBT. Subsequently, Dr Mallika Pathak was a Resource Person at a regional workshop held in Mangalore in February 2018.

A number of faculty members are Staff Advisers to various College Societies including *MH Vatavaran*, Gandhi Study Circle, NSS, Placement Cell, WDC and the Website Committee.

Rasayanika, organized its annual Chemistry Festival, *Pratikriya 2018* on 23 March 2018. The day commenced with *Life after Chemistry Honours at Miranda House: A Panel Discussion*. The panelists were

- Dr Irani Mukherjee, Principal Scientist, IARI,
- Dr Kalpana Bharara, Associate Professor, Department of Chemistry, Kirori Mal College,
- Ms Leena Singh, Publishing Head (Education), Cambridge University Press,
- Ms Praveena Nair, School Teacher, DAV Public School,
- Dr Sujata Sengupta, Assistant Professor (*Ad hoc*), Department of Chemistry, Miranda House
- Ms Deepika Bansal, PhD student, CIE, University of Delhi.

This was followed by *Eureka* – the Scientific Paper and Poster Presentation competition. The online photography competition *Wonders of Science* received a number of high quality entries on the assigned themes. *Prayog – the lab work competition* tested the participants' sense of smell, knowledge of lab apparatus and their awareness towards their surroundings. The final event for the day was *Chemiscellany* which consisted of a set of two independent rounds: Crossword and Guessing Game for two-member teams.

A substantial number of Chemistry students are members of various societies in the College and NCC. Three Chemistry students are office bearers of *MH Vatavaran* and spearhead activities generating environmental awareness in College. The NCC cadets are involved in college activities as part of the Miranda House NCC Unit. Meena, a B.Sc.(H) Chemistry III year student plays basketball, netball and korfbal and received the award for the Most Versatile Athlete in 2017. Muskaan Chaudhary, a B.Sc.(H) Chemistry II year student has won a gold medal for table tennis at the National Urban Games held in Hissar in November 2017. Based on her outstanding performance, she has been selected to represent India at the International event. Kanchan, a B.Sc.(H) Chemistry III year student, was elected Central Councillor to the Delhi University Students Union 2017-18. Two Chemistry students were in the top ten of the merit list of the IIT Joint Admission Test for M.Sc. (JAM) 2017, with Raksha Jain topping the all India list. Five Chemistry students are in the top hundred of the IIT Joint Admission Test for M.Sc. (JAM) 2018. Several Miranda House Chemistry alumnae have also distinguished themselves in 2017. Nitu Singh was selected for the Indian Administrative Service (IAS) in 2017. Nitu also addressed the current students on 5 February 2018 about her experiences while preparing for the UPSC examinations. IAS officer Gitanjali Gupta was selected for the award as a representative of the

nineties decade in the 7 Decades of Excellence celebrations of the College on Founder's Day 2017. Vasudha Sharma received the Outstanding Two-Year College Teacher Award of the American Chemical Society, Orlando Section in 2017. The Department organized *Rasayanika Re-Bonding* a get-together for MH Chemistry Alumnae on 24 March 2018; the alumnae were delighted to come back to their *alma mater*.

From President *Rasayanika* 2017-18

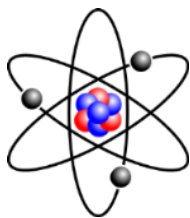


Writing this piece for *Rasayani* has brought back fond memories of my time in the Chemistry Department of Miranda House. It was an experience that I always cherish and will continue to do so for the rest of my life. Contrary to popular belief, a girls' college is an amazing place to spend the growing years of your life – you spend time in the company of strong, independent women, forge friendships of a lifetime and learn to stand up for yourself and those around you. These are a few of the many things I learnt as a student at Miranda House.

I served as the President of *Rasayanika*, the Chemical Society of Miranda House for the session 2017-18. Being the President of the Society taught me a lot – organizing events, making proposals, negotiating with people. With the guidance of faculty members, Dr Bani Roy and Dr Amrita Tripathi Sheikh being at the forefront, and support from students, we organised events like guest lectures and seminars, freshers' and farewell parties, the annual departmental fest, *Pratikriya*, the MH Chemistry alumnae meet- *Rasayanika Re-bonding*, and an educational-cum-excursion trip to Udaipur.

During my time at MH, I was also an active member of MH-Vatavaran, the Environment Society of Miranda House. The Department and the College as a whole instilled an environmentally conscious behaviour within us. This contributed to my inclination towards disciplines dealing with the worsening state of our environment and its mitigation. So after graduating from MH, I pursued Masters in Environmental Studies and Resource Management from TERI School of Advanced Studies, New Delhi. I am currently working as a Research Analyst at the Centre for Air Pollution Studies with Centre for Study of Science Technology and Policy (CSTEP).

Amishi Tewari
President Rasayanika 2017-18



THE NOBEL PRIZE IN CHEMISTRY 2019

On 9 October 2019 the Royal Swedish Academy of Sciences has decided to award the Nobel Prize in Chemistry 2019 to three laureates with a prize amount of 9 million Swedish krona (7,48,46,521.62 Indian Rupee), to be shared equally among the Laureates, “for the development of lithium-ion batteries”;



John B. Goodenough, born 1922 in Jena, Germany. Ph.D. 1952 from the University of Chicago, USA. Virginia H. Cockrell Chair in Engineering at The University of Texas at Austin, USA.



M. Stanley Whittingham, born 1941 in the UK. Ph.D. 1968 from Oxford University, UK. Distinguished Professor at Binghamton University, State University of New York, USA.



Akira Yoshino, born 1948 in Suita, Japan. Ph.D. 2005 from Osaka University, Japan. Honorary Fellow at Asahi Kasei Corporation, Tokyo, Japan and professor at Meijo University, Nagoya, Japan.

The Royal Swedish Academy of Sciences, founded in 1739, is an independent organisation whose overall objective is to promote the sciences and strengthen their influence in society. The Academy takes special responsibility for the natural sciences and mathematics, but endeavours to promote the exchange of ideas between various disciplines.

About the Nobel Prize organisation

The Nobel Foundation: Is tasked with a mission to manage Alfred Nobel's fortune and has ultimate responsibility for fulfilling the intentions of Nobel's will. Nobel Prize is a registered trademark of the Nobel Foundation.

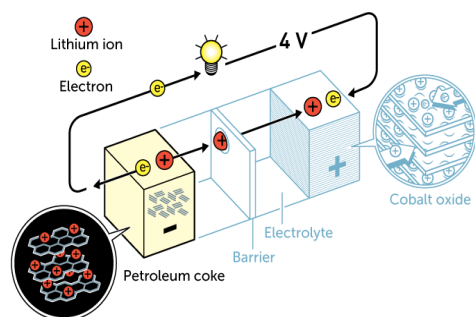
The prize-awarding institutions: For more than a century, these academic institutions have worked independently to select Nobel Laureates in each prize category.

Nobel Prize outreach activities: Several outreach organisations and activities have been developed to inspire generations and disseminate knowledge about the Nobel Prize.

“This battery has had a dramatic impact on our society,” Olof Ramström, a chemist at the University of Massachusetts Lowell and member of the 2019 Nobel Committee for Chemistry, said on October 9 during the announcement of the prize by the Royal Swedish Academy of

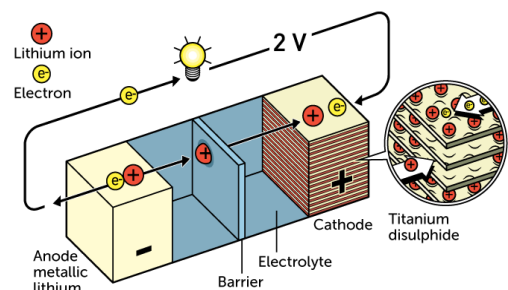
Sciences in Stockholm. “It’s clear that the discoveries of our three laureates really made this possible. It’s really been to the very best benefit of humankind.”

The Nobel Prize in Chemistry 2019 rewards the development of the lithium-ion battery. This lightweight, rechargeable and powerful battery is now used in everything from mobile phones to laptops and electric vehicles. It can also store significant amounts of energy from solar and wind power, making possible a fossil fuel-free society.



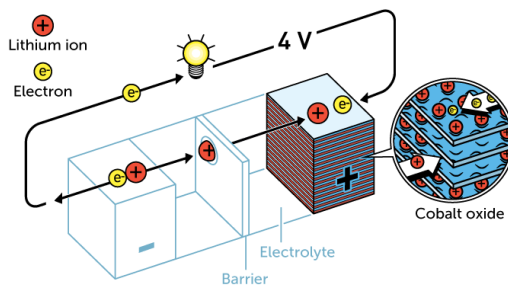
In the 1970s, Whittingham began experimenting with lithium as an anode material, because it’s so lightweight, and it readily releases electrons and positively charged lithium ions. His rechargeable battery scheme used a cathode made of titanium disulfide, which contains many layers that can house lithium ions released from the anode. Whittingham combined lithium metal and titanium disulfide in a battery, creating the first lithium battery. His battery boasted 2 volts. However, metallic lithium is reactive and the battery was too explosive to be viable.

John Goodenough predicted that the cathode would have even greater potential if it was made using a metal oxide instead of a metal sulphide. After a systematic search, in 1980 he demonstrated that cobalt oxide with intercalated lithium ions can produce as much as four volts, “a gigantic leap in the battery world,” said Ramström during the news conference. This was an important breakthrough and would lead to much more powerful batteries.



In 1985, Yoshino explored using a by-product of oil production called petroleum coke as an anode. Like cobalt oxide, petroleum coke was finely layered, and while not made of lithium, it could store lithium ions when charged. When paired with Goodenough’s cathode, Yoshino’s anode material resulted in an even safer, more durable, lightweight, and rechargeable 4-volt battery. That basic design was used in the first commercially available lithium-ion batteries in 1991.

The result was a lightweight, hardwearing battery that could be charged hundreds of times before its performance deteriorated. The advantage of lithium-ion batteries is that they are not based upon chemical reactions that break down the electrodes, but upon lithium ions flowing back and forth between the anode and cathode. Lithium-ion batteries have revolutionized our lives since they first entered the market in 1991. They have laid the foundation of a wireless, fossil-fuel-free society, and are of the greatest benefit to humankind. These lightweight, rechargeable batteries power everything from portable electronics to electric cars and bicycles, and provide a way to store energy from renewable but transient energy sources, like wind and sunlight.



For example: Lithium-ion batteries can be used with solar panels, where sunshine in the day can be used to power the battery and at the night when the sun is down, we can use the energy from the battery to power the grid.

Researchers are now developing different types of rechargeable lithium batteries, such as lithium-oxygen or lithium-sulfur that could pack more power in a more lightweight package than traditional lithium-ion batteries. Other scientists are trying to figure out how to efficiently recycle lithium-ion batteries or build batteries using more sustainable resources than today's power cells.

Sources:

- <https://www.nobelprize.org/prizes/chemistry/2019/press-release/>
- <https://www.sciencenews.org/article/lithium-ion-battery-chemistry-nobel-prize>

Pooja Yadav
B.Sc. (H) Chemistry II Year 2019-20

THE NOBEL PRIZE IN CHEMISTRY 2018

The Nobel Prize in Chemistry 2018 was divided, one half awarded to Frances H. Arnold "for the directed evolution of enzymes", the other half jointly to George P. Smith and Sir Gregory P. Winter "for the phage display of peptides and antibodies."



Frances H. Arnold (1/2 share)



George P. Smith (1/4 share)



Sir Gregory P. Winter (1/4 share)

The laureates:

Frances H. Arnold: Born: 25 July 1956, Pittsburgh, PA, USA

Affiliation: California Institute of Technology (Caltech), Pasadena, CA, USA

George P. Smith: Born: 10 March 1941, Norwalk, CT, USA

Affiliation: University of Missouri, Columbia, USA

Sir Gregory P. Winter: Born: 14 April 1951, Leicester, United Kingdom

Affiliation: MRC Laboratory of Molecular Biology, Cambridge, United Kingdom

The power of evolution is revealed through the diversity of life. The Nobel Prize in Chemistry 2018 is awarded to Frances H. Arnold, George P. Smith and Sir Gregory P. Winter for the way they have taken control of evolution and used it for the greatest benefit to humankind. Enzymes developed through directed evolution are now used to produce biofuels and pharmaceuticals, among other things. Antibodies evolved using a method called phage display can combat autoimmune diseases and, in some cases, cure metastatic cancer.

Since the first seeds of life appeared around 3.7 billion years ago, almost every crevice on Earth has been filled by organisms adapted to their environment: lichens that can live on bare mountainsides, archaea that thrive in hot springs, scaly reptiles equipped for dry deserts and jellyfish that glow in the dark of the deep oceans. We first learn about these organisms in biology, but let's change perspective and put on a chemist's glasses. Life on Earth exists because evolution has solved numerous complex chemical problems. All organisms are able to extract materials and energy from their own environmental niche and use them to build the unique chemical creation that they comprise. Fish can swim in the polar oceans thanks to antifreeze proteins in their blood and mussels can stick to rocks because they have developed an underwater molecular glue, to give just a few of the innumerable examples. The brilliance of life's chemistry is that it is programmed into our genes, allowing it to be inherited and developed. Small random changes in genes change this chemistry. Sometimes this leads to a weaker organism, sometimes a more robust one. New chemistry has gradually developed and life on Earth has become increasingly complex.

This process has now come so far that it has given rise to three individuals so complex they have managed to master evolution themselves. The Nobel Prize in Chemistry 2018 is awarded to Frances H. Arnold, George P. Smith and Sir Gregory P. Winter, because they have revolutionised both chemistry and the development of new pharmaceuticals through directed evolution.

In 1979, as a newly graduated mechanical and aerospace engineer, Frances Arnold had a clear vision: to benefit humanity through the development of new technology. The US had decided that 20% of its power would come from renewable sources by 2000, and she worked with solar power. However, prospects for the future of this industry changed radically after the 1981 presidential election, so instead she turned her gaze to the new DNA technology. The tools of DNA technology have been refined since the early 1990s, and the methods used in directed evolution have multiplied. Frances Arnold has been at the leading edge of these developments; the enzymes now produced in her laboratory can catalyse chemistry that does not even exist in nature, producing entirely new materials. Her tailored enzymes have also become important tools in the manufacture of various substances, such as pharmaceuticals. Chemical reactions are sped up, produce fewer by-products and, in some cases, it has been possible to exclude the heavy metals required by traditional chemistry, thus considerably reducing environmental impact.

Things have also come full circle: Frances Arnold is again working with the production of renewable energy. Her research group has developed enzymes that transform simple sugars to isobutanol, an energy-rich substance that can be used for the production of both biofuels and greener plastics. One long-term aim is to produce fuels for a more environmentally friendly transport sector. Alternative fuels – produced by Arnold's proteins – can be used in cars and aeroplanes. In this way, her enzymes are contributing to a greener world.

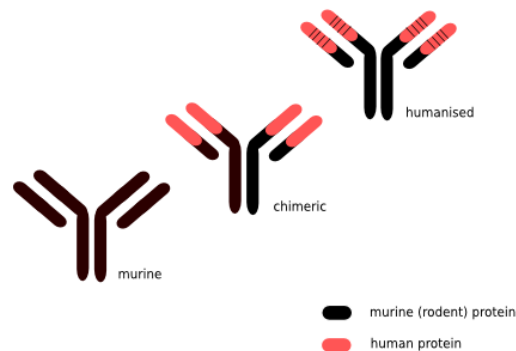
Bacteriophages – a link between a protein and its unknown gene

Bacteriophages are simple by nature. They consist of a small piece of genetic material that is encapsulated in protective proteins. When they reproduce, they inject their genetic material into bacteria and hijack their metabolism. The bacteria then produce new copies of the phage's genetic material and the proteins that form the capsule, which form new phages. George Smith's idea was that researchers should be able to use the phages' simple construction to find an unknown gene for a known protein. At this time, large molecular libraries were available, which contained masses of fragments of various unknown genes. His idea was that these unknown gene fragments could be put together with the gene for one of the proteins in the phage capsule. In 1985 he developed an elegant method known as "phage display", where a bacteriophage – a virus that infects bacteria with its genes – can be used to evolve new proteins.

Winter puts antibodies on the surface of phages

Antibodies are Y-shaped molecules; it is the far end of each arm that attaches to foreign substances. Greg Winter joined the genetic information for this part of the antibody to the gene for one of the phage's capsule proteins and, in 1990, he demonstrated that this led to the antibody's binding site ending up on the surface of the phage. The antibody he used was designed to attach to a small molecule known as phOx. When Greg Winter used phOx as a kind of molecular fishing hook, he succeeded in pulling the phage with the antibody on its surface out of a soup of four million other phages. After this, Greg Winter showed that he could use phage display in the directed evolution of antibodies. He built up a library of phages with billions of varieties of antibodies on their surfaces. From this library, he fished out antibodies that attached to different target proteins. In 1994 he used this method to develop antibodies that attached to cancer cells with a high level of specificity. Greg Winter and his colleagues founded a company based on the phage display of antibodies. In the 1990s, it developed a pharmaceutical entirely based on a human antibody: adalimumab. The antibody neutralises a protein, TNF-alpha, that drives inflammation in many autoimmune diseases. In 2002, the pharmaceutical was approved for the treatment of rheumatoid arthritis and is now also used for treating different types of psoriasis and inflammatory bowel diseases.

Diagram showing different protein components of engineered monoclonal antibodies



Source:

1. <https://www.nobelprize.org/prizes/chemistry/2018/>
2. <https://www.whatisbiotechnology.org/index.php/exhibitions/campath/engineering>

THE NOBEL PRIZE IN CHEMISTRY 2017

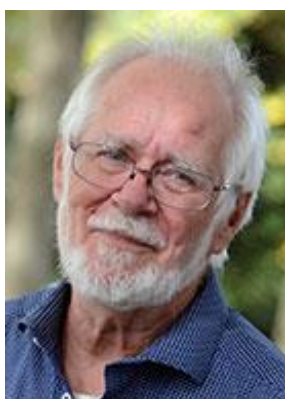
The Nobel Prize in Chemistry 2017 was awarded to

Jacques Dubochet, University of Lausanne, Lausanne, Switzerland

Joachim Frank Columbia University, New York, NY, USA

Richard Henderson MRC Laboratory of Molecular Biology, Cambridge, United Kingdom

"for developing cryo-electron microscopy for the high-resolution structure determination of biomolecules in solution".



Jacques Dubochet



Joachim Frank

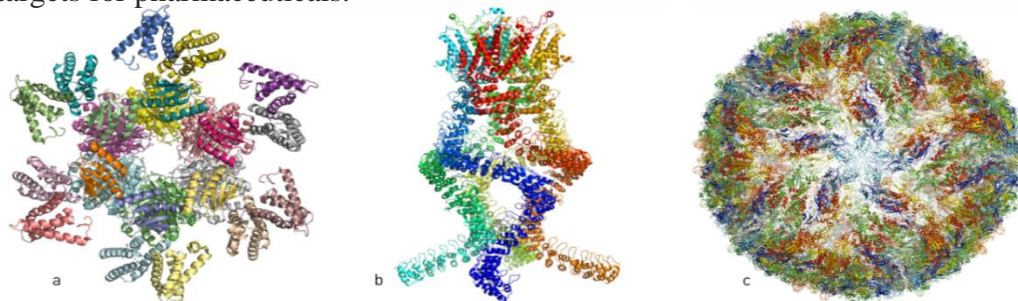


Richard Henderson

They captured life in atomic detail

Jacques Dubochet, Joachim Frank and Richard Henderson are awarded the Nobel Prize in Chemistry 2017 for their development of an effective method for generating three-dimensional images of the molecules of life. Using cryo-electron microscopy, researchers can now freeze biomolecules midmovement and portray them at atomic resolution. This technology has taken biochemistry into a new era.

Over the last few years, numerous astonishing structures of life's molecular machinery have filled the scientific literature (figure 1): Salmonella's injection needle for attacking cells; proteins that confer resistance to chemotherapy and antibiotics; molecular complexes that govern circadian rhythms; light-capturing reaction complexes for photosynthesis and a pressure sensor of the type that allows us to hear. These are just a few examples of the hundreds of biomolecules that have now been imaged using cryo-electron microscopy (cryo-EM). When researchers began to suspect that the Zika virus was causing the epidemic of brain-damaged newborns in Brazil, they turned to cryo-EM to visualise the virus. Over a few months, three-dimensional (3D) images of the virus at atomic resolution were generated and researchers could start searching for potential targets for pharmaceuticals.



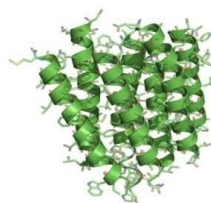
a. A protein complex that governs the circadian rhythm. b. A sensor of the type that reads pressure changes in the ear and allows us to hear. c. The Zika virus.

Jacques Dubochet, Joachim Frank and Richard Henderson have made ground-breaking discoveries that have enabled the development of cryo-EM. The method has taken biochemistry into a new era, making it easier than ever before to capture images of biomolecules.

Pictures – an important key to knowledge

In the early 1980s, the use of X-ray crystallography was supplemented with the use of nuclear magnetic resonance (NMR) spectroscopy for studying proteins in solid state and in solution. This technique not only reveals their structure, but also how they move and interact with other molecules. Thanks to these two methods, there are now databases containing thousands of models of biomolecules that are used in everything from basic research to pharmaceutical development. However, both methods suffer from fundamental limitations. NMR in solution only works for relatively small proteins. X-ray crystallography requires that the molecules form well-organised crystals, such as when water freezes to ice. The images are like black and white portraits from early cameras – their rigid pose reveals very little about the protein's dynamics. Also, many molecules fail to arrange themselves in crystals, which caused Richard Henderson to abandon X-ray crystallography in the 1970s – and this is where the story of 2017's Nobel Prize in Chemistry begins.

Bacteriorhodopsin is a purple-coloured protein that is embedded in the membrane of a photosynthesising organism, where it captures the energy from the sun's rays. Instead of removing the sensitive protein from the membrane, as Richard Henderson had previously tried to do, he and his colleague took the complete purple membrane and put it under the electron microscope. When the protein remained surrounded by the membrane it retained its structure; they covered the sample's surface with a glucose solution that protected it from drying out in the vacuum. The harsh electron beam was a major problem, but the researchers made use of how the bacteriorhodopsin molecules are packed in the organism's membrane. Instead of blasting it with a full dose of electrons, they had a weaker beam flow through the sample.



Bacteriorhodopsin structure at atomic resolution presented by Henderson in 1990

At the next stage, the researchers turned the membrane under the electron microscope, taking pictures from many different angles. This way, in 1975 it was possible to produce a rough 3D model of bacteriorhodopsin's structure, which showed how the protein chain wiggled through the membrane seven times. It was the best picture of a protein ever generated using an electron microscope. Many people were impressed by the resolution, which was 7 Å (0.0000007 millimetres), but this was not enough for Richard Henderson. His goal was to achieve the same resolution as that provided by X-ray crystallography, about 3 Å, and he was convinced that electron microscopy had more to give. Over the following years, electron microscopy gradually improved. The lenses got better and cryotechnology developed (we will return to this), in which the samples were cooled with liquid nitrogen during the measurements, protecting them from being damaged by the electron beam. Richard Henderson gradually added more details to the model of bacteriorhodopsin. To get the sharpest images he travelled to the best electron microscopes in the world.

On the other side of the Atlantic, at the New York State Department of Health, Joachim Frank

had long worked to find a solution to just that problem. In 1975, he presented a theoretical strategy where the apparently minimal information found in the electron microscope's two-dimensional images could be merged to generate a high-resolution, three-dimensional whole. It took him over a decade to realise this idea. Joachim Frank's strategy (figure 4) built upon having a computer discriminate between the traces of randomly positioned proteins and their background in a fuzzy electron microscope image. He developed a mathematical method that allowed the computer to identify different recurring patterns in the image. The computer then sorted similar patterns into the same group and merged the information in these images to generate an averaged, sharper image. In this way he obtained a number of high-resolution, two-dimensional images that showed the same protein but from different angles. The algorithms for the software were complete in 1981.

In 1978, at the same time as Frank was perfecting his computer programs, Jacques Dubochet was recruited to the European Molecular Biology Laboratory in Heidelberg to solve another of the electron microscope's basic problems: how biological samples dry out and are damaged when exposed to a vacuum. In 1975, Henderson used a glucose solution to protect his membrane from dehydrating, but this method did not work for water-soluble biomolecules. Other researchers had tried freezing the samples because ice evaporates more slowly than water, but the ice crystals disrupted the electron beams so much that the images were useless. The vaporising water was a major dilemma. However, Jacques Dubochet saw a potential solution: cooling the water so rapidly that it solidified in its liquid form to form a glass instead of crystals. A glass appears to be a solid material, but is actually a fluid because it has disordered molecules. Dubochet realised that if he could get water to form glass – also known as vitrified water – the electron beam would diffract evenly and provide a uniform background. After the breakthrough in 1982, Dubochet's research group rapidly developed the basis of the technique that is still used in cryo-EM. They dissolved their biological samples – initially different forms of viruses – in water. The solution was then spread across a fine metal mesh as a thin film. Using a bow-like construction they shot the net into the liquid ethane so that the thin film of water vitrified. After Joachim Frank presented the strategy for his general image processing method in 1975, a researcher wrote: "If such methods were to be perfected, then, in the words of one scientist, the sky would be the limit."

Now we are there – the sky is the limit. Jacques Dubochet, Joachim Frank and Richard Henderson have, through their research, brought "the greatest benefit to mankind." Each corner of the cell can be captured in atomic detail and biochemistry is all set for an exciting future.

Sources:

- <https://www.nobelprize.org/prizes/chemistry/2019/press-release/>
- <https://www.sciencenews.org/article/lithium-ion-battery-chemistry-nobel-prize>

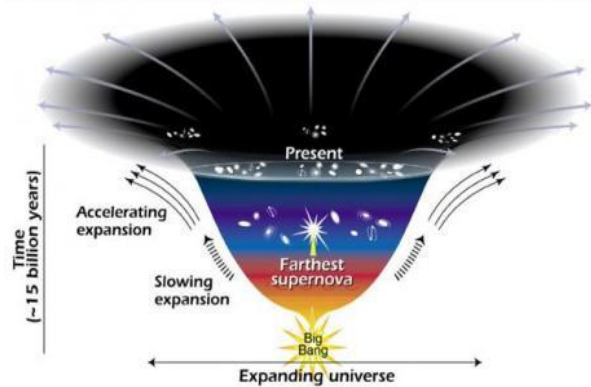
Amishi Tewari
B.Sc. (H) Chemistry 2015-2018

UNRAVELLING THE UNIVERSE

Looking at the sky one must wonder how old this universe is. What is the composition of this universe? What are all these stars and heavenly bodies made of? Space – the more it looks beautiful the more mysterious it is. It is a commonly held belief that this 10 billion light years old universe was formed after the big bang that created all the galaxies, planets, stars and other space elements but that is not all. It is a little known fact that the universe consists of 0.4% ordinary

visible matter (stars, planets and hot intergalactic gas), 3.6% non-luminous matter, 27% dark matter and remaining 68-69% dark energy. This sounds strange but it is true. Talking about dark matter, it cannot be seen nor does it emit or reflect light but its behaviour is the same as gravitational normal matter. It cannot be considered as normal celestial body because it is not in the form of dark clouds of normal matter, matter made up of particles called baryons. If it was baryonic cloud it could have been detected by absorption of radiation passing through them.

The diagram depicting expansion of universe over time
Credit: NASA/STSci/Ann Field



Nor is it antimatter because it doesn't emit any gamma rays. Unlike black holes it does not even bend the light rays. Because of all these reasons the international community of astrophysicists gave it the name 'dark matter'. Everyone knows this universe is expanding but the reason wasn't clear until the scientists concluded it is because of dark energy. Albert Einstein was the first to explain it by his gravity theory under the General Theory of Relativity. One version of it contains a cosmological constant which says empty space can possess its own energy and as more space comes into existence, more of this energy-of-space would appear. The existence of dark energy is partially confirmed by studying cosmic background radiation and so cosmologists believe that dark energy determines the expansion and evolution of the universe. It is believed that dark energy opposes the attraction between the galaxies and causes accelerated separation between them.

This is the understanding today but the universe is so vast and full of mystery that no one knows what new surprise it will bring tomorrow and which theory will fail and throw up a new definition. But it can surely be said that the big bang that happened nearly 13.7 billion years ago not only created matter but also a lot of unravelling mysteries that need to be discovered. Some even doubt the truth of the big bang theory but it is clearly proven by research. On studying with a very sensitive microwave receiver, scientists found electromagnetic waves coming from all the points in space and filling the space. This cosmic microwave radiation is the glow of the big bang, and these microwaves coming out as a result of the expansion of the universe explain the beginning thus corroborating the big bang. Just looking at the sky does not give as much pleasure as learning the science and gathering proofs of everything that appears there. It is hard to reach a conclusion about space and universe in a few words. One must keep looking forward to new discoveries because the universe is too big to be discovered so easily!



One of the most complicated and dramatic collisions between galaxy clusters is captured in this new composite image of Abell 2744. The blue shows a map of the total mass concentration (mostly dark matter).

Sources:

1. Chandra X-Ray observatory, NASA; <https://chandra.harvard.edu/photo/2011/a2744/>
2. Universe, NASA SCIENCE share the science; <https://science.nasa.gov/astrophysics/focus-areas/what-is-dark-energy>
3. The Universe; <https://www.slideshare.net/mobile/belmariablanca/the-universe-42314730>

Muskan Singh
B.Sc. (H) Chemistry I Year 2019-20

IN THE LAP OF NATURE

“Between every two pines there is a doorway to a new world”

– John Muir

A year ago from today nobody could have painted the bizarre picture that the world has now become. Covid-19 has given birth to a plethora of problems for people from all walks of life, sparing none, across the globe. Mother Nature is perhaps the only one rejoicing in this vicious pandemic crisis. To stay afloat, we all need to see the silver lining in the prevalent, unprecedented scenario and I found my salvation in Mother Nature’s revival.

Early evening walks with mom have become a quarantine ritual. We would stroll together at a calm pace with comfortable silence brewing in between us. The hurried play of squirrels and the rare sight of a little, yellow canary perched upon a branch hidden behind the dense cover of leaves is something I discovered myself relishing in. An eagle's admirably graceful flight would always render me awestruck. Sometimes a crow would fly past too close to my head scaring the living daylights out of me! These regular walks with mom have served as an excellent mental detoxing routine. A quiet hour of introspection every day makes for a healthy and sunny me!

To be honest as a toddler, I was never a nature lover. My nerdy nose would remain buried in books and novels. I could appreciate a bowl of spicy spaghetti, but not the vast, blue expanse of sky. I could extol an author's writing prowess, but not the sweet lord's creations. The lockdown period blessed me with a beautiful opportunity to adore nature. To gaze out of my window for long hours, and see the enthused dance of trees as the boisterous, bustling winds blanket the afternoon. To stand on the balcony with closed eyelids and feel the cool breeze caress my skin, lulling me into oblivion whilst my black locks flail in all possible directions enjoying their unrestrained freedom. To listen to the energy-charged, furiously rustling leaves. In a matter of a

few months I've learnt to resonate with Mother Nature, and every moment spent in doing so is boundlessly blissful. Willie Nelson's exquisite composition, quoted below in all its glory, says it all for me:

*"Gravedigger when you dig my grave, could you make it shallow
So that I can feel the rain."*

*Saumya Tyagi
B.Sc. (H) Chemistry II Year*

VEGAN FASHION

We don't eat our clothes, accessories, shoes, etc. so what exactly is vegan fashion? Veganism is not only a diet abstaining from the practice of eating meat but also a lifestyle that avoids the exploitation of animals in any way. Vegan Fashion is any garment or accessory which is not made of animal fibres, skin, body oils, etc. Vegan fashion is increasingly important, considering both, animal welfare and negative impact on the environment due to fur trade and animal agriculture which leads to global warming and climate change. There are many famous clothing materials like leather, fur, silks, cashmere, wool, etc. which are made out of animal fibres.

According to PETA, animal products used in clothing manufacture aren't just by-products. The production of various animal products includes raising animals in the farms where animals are mistreated, given antibiotics/steroids for fast growth and eventually slaughtered for products like leather and meat, which is truly inhumane and cruel. Many luxury brands such as Hermes, Louis Vuitton, Chanel, etc. use pure leather for bags and shoes. Nowadays, snakeskin pattern is the new trend and it is debatable if that comes cruelty-free. Cosmetics industries can exploit animals in two ways: by either using animal ingredients or testing the products on animals. The various animal ingredients include; adrenaline, amino acids, albumen, etc. There are many substitutes like vegetable fibres or synthetics. Talking about leather, the most expensive clothing material, it is not just a by-product of the meat industry, it is a flourishing industry on its own as the demand for leather products is constantly increasing. Many innocent fellow creatures such as crocodiles, snakes, cow, goats, etc. are slaughtered for leather. According to PETA, due to the increasing demand, Asian dogs and pigs are also being used for leather production. Animal skin is processed with dangerous carcinogenic chemicals like formaldehyde, cyanide-based oils etc. to turn it into finished leather.

Hugo Boss, Aldo, Zara, H&M, etc. are some of the reputed vegan brands. Vegan clothing is more affordable when compared because it is sustainable, it can be recycled. We need to realise that it is important to protect the environment and ecosystem and stop exploiting other beings in any way. Let us take every step to protect animals and the soil. Veganism is a major but easy step. A little consciousness can make the world a better place to live in.

*Siri Mereddy
B.Sc. (H) Chemistry II Year*

THE COLOURS OF LOVE

Mary had always been a lively person. She had this charm which would make people want more of her company. She used to be extremely loving and caring, ready with alternative plans to rescue her friends from any demanding situation. Mary had a wonderful son and a daughter-in-

law. But they lost their lives in the 2008 Mumbai attacks. The two were survived by their 8-year-old son named Peter. All these years, Peter and Mary were each other's only strength. They used to play board games, go for long walks, have all their meals together, and spend almost every day in each other's company. So when Peter left for Ohio to study literature, Mary was exhilarated, but the thought that she will now have to stay all by herself in Mumbai would get her nightmares. As they say, "Time is the best teacher" – Mary now learnt to live alone. She used to do all the house chores and made herself food.

She spent her free time usually interacting with her neighbours and their children. Watching television was never exciting to her, but reading books and making cookies was more of her thing. She used to knit sweaters for Peter and intended to give him on his return to Mumbai. An everyday custom also included a video call with Peter. This was the best part of her day! Due to the lockdown imposed globally as a result of the spread of the novel Coronavirus, Mary's life was hit drastically. All her evening walks, interactions with her neighbours and the small children playing in the park, were terminated. No human interaction made her extremely vulnerable and unhappy. This started to take a toll on her health.

One day, she saw a beagle near her house. It seemed as if someone had abandoned him. He appeared to be weak and hungry. She quickly brought him inside and provided him with some food. She made the dog wear the sweater she had knit for Peter. She was happy that she finally got a companion amid the global pandemic. Craving for human company, she now decided to adopt the dog as a pet instead. That night, Fluffy (Mary named the dog so) Mary and Peter celebrated Mary's birthday virtually over a video call. Mary's delicious cookies marked the happiness of their small celebration. She found contentment and a will to live in the most unprecedented times. She realised that there's always a ray of hope in the darkest times!

Ojaswita Pant
B.Sc. (H) Chemistry II Year

EXPLORING BEYOND BOUNDARIES

It is well said by Neil Gaiman, "A book is a dream that you hold in your hand."

In this contemporary scenario, where everything revolves around taking up and performing tasks efficiently in the smallest possible time frame, we have left the extra effort way behind. One such effort is reading a book. Yes, my dear, the above statement might seem really queer to you, or let me make it simpler, really common to you but it has deeper insights in it. Especially if I look from the viewpoint of a student, we all prefer to seek a shortcut in the field of academics, trusting the screen more over self-gathered knowledge from the book, thus doing away with the so called tedious task of reading a book, be it inside or outside the curriculum. But let me tell you, my friend, it is not just about reading a book, it is more about a way of life probably adding a high definition (HD) to it. We all love HD LEDs, don't we? So why not be an HD person?

Can't we have a moment of book discussion over what happened in the fourth episode of third series of so and so on Netflix – the so-called 'chill' of today's tech-savvy generation? Is it too hard? A book reader can not only understand well but is understood well because, guess what, she is equipped with skill in interpreting as well as expressing things.

Since the word screen has been mentioned above, I believe it would be essential to draw your kind attention to the fact that according to a study by Victoria L. Dunckley (MD), published by the Kaiser Family Foundation, too much screen time is inflicting subtle damage in children. Many children suffer from sensory overload, hyperactivity and a lack of sleep. Individuals of age 13 to 25 spend an average of more than seven hours a day looking at screens. The trend worsens further when the teen enters her college life. She prefers to step back from the library and step into the sketchy world of notes, web and other sources, the accuracy of which cannot be predicted.

In a nutshell, if practical experiences strengthen your heart, books nourish your soul. Every individual must undergo this enriching experience as and when possible and try to explore and view the world through her own glasses amidst the already existing prejudices and – as the title says – explore beyond boundaries.

Lakshita Hasija
B.Sc. (H) Chemistry II Year

CHEMICAL WEDDING

Dear Krypton,

How are you doing? I hope you are continuing your work for the good of the people as a filling gas for energy-saving fluorescent lights.

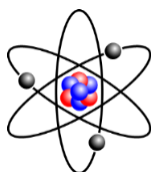
Well, you must have heard, that Ms. Phenol has finally said yes to Mr. Carbon dioxide for the marriage after being persuaded by Mr. Sodium hydroxide. Sir Kolbe-Schmitt has informed that the bride and groom will first be provided with a pressure of 100 atmospheres and a temperature of 125 degree Celsius at the entrance and then they would be blessed by Ms. Sulphuric acid, who has been invited as a special guest to grace the occasion and help in forming salicylic acid, which will later serve as a medicine to treat warts, dandruff, acne, etc. and in the preparation of aspirin (a painkiller).

This is going to be an incredible and remarkable wedding. Also, Helium has been invited to inflate the party balloons, so you won't be feeling lonely. I look forward to meeting you at the wedding.

With all good reactions,

Yours nobly,
Neon

Pooja Yadav
B.Sc. (H) Chemistry II Year



LESSONS LEARNT FROM COVID-19: A POSITIVE OUTLOOK

The current COVID-19 pandemic will be known as the biggest pandemic of history. When it is gone, it will leave us with these 12 reviving life lessons to be treasured:

1. Corona Virus doesn't discriminate

"All are equal for the virus, whether President, King, Prime Minister, rich or poor."

The corona virus doesn't differentiate or discriminate on the basis of colour, money, gender, region or religion. Hence, making us all equally prone to the attack of virus showing us we all are Humans.

2. Money cannot always save you

"Although money is always worshipped, but it is nothing in front of this biggest pandemic."

Even the rich are in the clutches of the virus. In fact, the luxury of travelling globally has enabled the easy spread of the virus. Now, after the lockdown, it is visible that the world can function without so much of travelling, hence indicating that one should not be so money-minded, instead one should try to live a reviving, grounded and happy life.

3. Respect and higher pay for social workers.

"Social workers are the real heroes."

We all have come to the realization that our workers, cleaners, security, doctors, researchers all deserve more respect and higher incomes. As this pandemic progresses, the country is run by them and will always be run by them only. Rich can give money and weapons, but the real fight is fought by our social workers. They are the real heroes.

4. Mental Health and Self-Acceptance.

"Mental health of people is as important as physical health."

Staying isolated has put us under a lot of stress. But in this hour of stress one must understand the importance of learning self-acceptance and introspection. One has learnt the value of reviving human connections. Quarantine has made us realize that one should find some time for mental peace each day.

5. Opportunity to find your passion and interests

"Adversity doesn't build character, it reveals it." -James Lane Allen

It is a hard time to remain isolated, especially for extroverts but it is a great opportunity to find your interests, to revive old ones, to be calm amid the panic and unwelcome circumstances due to the virus. Now is a good time for exploring, connecting with and reviving the past lost hobbies.

6. Being independent

Doing things on our own is making us see our helpers in a light of respect.

"This pandemic is leaving us with the responsibility to learn to be self-sufficient and self-dependent."

Covid-19 has made us realize the importance of learning everything from cooking to sweeping and mopping. It is important not to completely depend on house help or the lady of the house, we should do all our daily tasks on our own.

7. Value of Life and human connections

"Witnessing death closely has made us realize the value of life, family and friends."

Life is unpredictable but this situation of corona has made us learn to accept this uncertainty. We have started to cherish our bodies by taking care of ourselves. We all have now got time to revive our lost selves.

8. Importance of Eastern/Indian values

“Greet with a Namaste, instead of a handshake or hug.”

After the spread of coronavirus disease people started valuing Indian culture as a way to revive. People have started eating green and vegetarian food. Yoga is now appreciated all over the world as the best way of exercise for all. The natural herbs of Ayurveda are being considered as the best way to boost our immunity.

9. Health

“Sadly, sometimes it takes a crisis and economic meltdown to help people understand the importance of prevention and care.”

The crisis had made us see clearly the importance of Health Care Systems. There is an urgent need to invest more amount of GDP into healthcare worldwide. Whether the virus is there or not, it is unquestionable that hygiene and cleanliness are very important.

10. Importance of science and technology

“Access to internet for all is vital. “

Today everything from education, grocery, meetings, entertainment to religious events are done online. People are able to connect with each other and can work from home, only because of Digitalization and Social networking. We have learned to value science a lot, as during the prevailing condition of distress the only hope is science. To fight corona virus we all are looking forward to the development of vaccine.

11. Every living being has equal rights over Mother Earth.

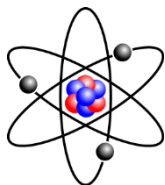
“Nature has its own cope up mechanism where the major loss is to human species.”

If humans won't let other creatures have their space and will invade into their space, they will come closer to all new species. This will result in coming into contact with unique microorganisms and birth of all new diseases/infections such as coronavirus. Improving the economy doesn't mean to compromise the environment. Therefore, it is time for us to respect nature and live in harmony with it.

12. Since Humans are now CAGED, it is evident that world can function without humans.

“Mother Earth has grounded us, and told us to sit in our rooms and think what we have done to earth.” It is evident that once man is caged, nature has found its own way to come back to life. This indicates that humans are the biggest enemy of nature. Definitely human like any other species is not to be caged. It is a spirit which needs to live free like our ancestors lived in the open, close to nature. The lockdown circumstances have made all of us realize the pain of other species, birds and animals living caged inside a zoo or a house. All creatures need their free space and forests for reviving.

Mansi Sharma
B.Sc. (H) Chemistry II Year



SHE...



She was found in the dark,
She had a bright spark.
She burnt alone like a fire,
She burned others like the wire.
She was torn and drew apart,
She played well on her part.
She had the challenges ahead,
She was the one who always led.
She cried alone she wept alone,
She screamed all the way along.
She moved head held high,
She never had a sigh.
She lost a part of her at every stage,
She had sometimes been in rage.
She was feared she was hidden,
She was who could never be written.
She loved all she hugged them,
Finally she left them.
Congrats society you lost that gem.

Ishika Bansal
B.Sc. (H) Chemistry I Year

ONCE AGAIN MH STANDS AT NIRF 1

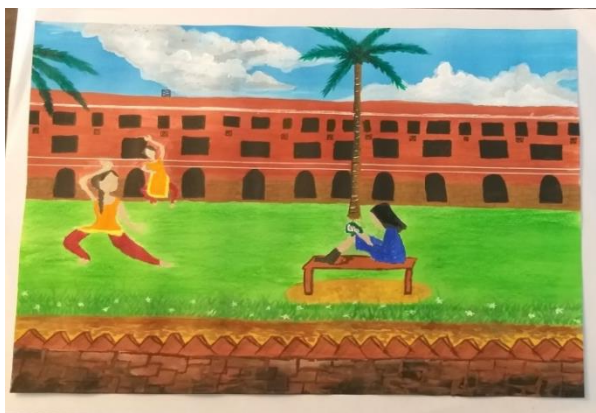
On a scorching day in July, many girls were standing in long queues at a place which would be their home for the coming 3 years, from where they would graduate as beautiful young women. No one seemed to be bothered by the trickles of sweat rolling down their faces or by the fact that it was so crowded they were getting stomped on – none of it mattered compared to the smiles on their faces that had been pasted there ever since they found out that they had got into the dream college of many, Miranda House! Yet that admission day was just a glimpse of the journey that lay in front of them, the nerve-wracking but amazing journey.

Then began the fights to get the bench under the fan, the endless trips to the cafeteria, the begging before friends to get one's proxy marked, the long naps in the lawn and so many first-time memories. What is the best thing about our college? When tired of obnoxious humans the cutest creatures on earth, cats, give you company. Being from a co-ed school I was little unsure about how I would survive in a girls' college but to my surprise it is the most comfortable place on earth and I dreaded going back to my PG. So my question to all the hostellers is how does it feel to be God's favorite? Before we even realized, it was the Diwali season aka the mini fests season. So me with my group of girls dressed up all pretty went to as many colleges as we could and compared every aspect to our very own college and needless to say we ended up concluding we are for sure in the best college in DU. No wonder MH is NIRF Rank 1 again.

'There's light at the end of every tunnel.' Just a spoiler alert guys, it's true the other way around too. You must have guessed that I'm talking about the DOOMSDAY, the END OF THE

WORLD, the APOCALYPSE. Yes, our semester exams were coming up. So it was finally time to check out the library that everyone was talking highly of. It was the first exam of my life when my dad wouldn't ask me to study every 5 minutes and my mom wouldn't make coffee for me. It was all so overwhelming that I ended up having a panic attack, but thanks to the teachers and my amazing friends I eventually came around. I may not have scored well in the exams but I did learn a lot from life. That was my first year of college with all its ups and downs, which I wish I could relive once again. At the end I'd like to give a shout out to my besties Anamika and Muskaan. College wouldn't have been the same without you guys, it would have been better :p

Kalpna Mahala
B.Sc. (H) Chemistry I Year



SLEEP

Well people often ask me why I love to sleep...
The fact is that I don't love sleep rather I love the world where sleep takes me.
I love the isolation that I find there,
The place where I could find me and only me,
No headaches, no heartaches,
Just my soul and forever peace.
No love, no hate, no feelings hence no aches,
Beneath the sea I watch myself in the crystal clear water,
Falling in love with my own eyes and away from the daily war,
Lying in the lap of Earth I enjoyed my birth.
I wish I could stay back for some more time but I have to go back for the ones at home.
The touch of air and voice of rain
Made me always fall again,
One day I'll be back again leaving behind all the gains,
Because I love the world where there is no love and no hate.

Ishika Bansal
B.Sc. (H) Chemistry I Year

ROLE OF CHEMISTRY IN AGRICULTURE

“You can’t force chemistry to exist where it doesn’t, in the same way you can’t deny it where it does.”

Chemistry is thought to be just a branch of science but actually it is the heart of science. It exists in every field of the world, be it in technology, environment, medicines, food industry, and cosmetics industry and even in agriculture. As we know, we all need food to live. Food is the fuel of our body and this fuel comes from the agricultural fields. It is agriculture which feeds the entire population of the world. Agricultural industry is regarded as the mother of all industries also because chronologically it was the first one known to humans.

So, firstly, we should know: **What is Agriculture?**

“Agriculture is the art and science of growing crops and raising animals for food, other human needs, or economic gain.” It deals with the production of products using both organic and inorganic inputs.

Revolution in Agriculture with time

The cultivation of crops and domestication of animals led to the transformation of the early *Homo sapiens* from their usual hunting and gathering lifestyle. Around 9500 BCE, cultivation marked the transition of people from their nomadic lifestyle to a settled Neolithic lifestyle. During the Bronze Age, from around 3300 BCE, cultivation intensified in civilisations such as Sumer, Egypt, the Indus Valley, ancient China and ancient Greece. At that time and for several thousand years after that, agricultural practices were performed using simple and organic methods without any use of harmful chemicals and fertilizers. People were satisfied with what and how much they grew and got to fulfil their needs. However, around 1700 CE, modern agriculture started making its appearance. Modern agriculture is the aggregation of intensive and large-scale farming through monocropping, use of scientific machines and use of organized irrigation scheme. It highly depends on the use of advanced scientific techniques. These scientific techniques rely mostly on chemistry. Through the production of pesticides, fertilizers and antibiotics, it is evident that chemistry has played a significant role in maximizing the yield of crops and animal products.

Agriculture deals with the production of products using both organic and inorganic methods. Chemistry forms an integral part of agriculture from atomic to organ level. It does its job from the basics of photosynthesis to the utilization of agricultural produce. The advancements in this practice is only because of active research carried out in chemistry and then its applications to cause the land to produce more abundantly and at the same time to protect it from deterioration and misuse.

Diverse roles of Chemistry in Agriculture

Role of chemistry in agriculture can be classified as follows:

- **Fertilizers** – Fertilizer is any material of natural or synthetic origin that is applied to soil or to plant tissues to supply one or more plant nutrients essential to the growth of plants. Fertilizers have increased the yield of the crops by about 50%. They are of two types:

- (a) Organic (natural) fertilizers: The organic fertilizers are naturally derived from the animal manure, compost or the fish and bone meal. These fertilizers release nutrients through decomposition by the microorganisms which are found in soil.
- (b) Inorganic (synthetic) fertilizers: Inorganic fertilizers are synthesized through the Haber-Bosch process. In this, ammonia is produced as the end product which is used in combination with other nitrogen fertilizers.
- **Pesticides** – Chemistry produces pesticides including insecticides, fungicides and herbicides which have minimized the crop damage to a great extent. These chemicals are used to kill pests that can spread livestock diseases, can eat stored grain and can feed on growing crops.
 - **Plastic Pipes for Improved Irrigation** – Plastic comes from chemistry. Use of plastic in agriculture has increased irrigation massively which results in a better environment for the crops to prosper in.
 - **Storage and Preservation of Agriculture Produce** – Food Preservatives like sodium benzoate and salicylic acid are used for longer shelf life. Chemicals are added to promote the ripening of fruits or the germination of seeds. Food packaging has improved due to the material produced by advancements in chemistry.
 - **Food Processing** – Chemists develop sweeteners, vitamins and minerals that help in enhancing the flavour, appearance, availability and nutrient value of the food.
 - **Chemicals from Agriculture Waste** – The advancement in chemistry has resulted in development of technologies to produce a variety of chemicals from agricultural waste as we see in production of alcohol from bagasse.

‘Cons’ of Using Chemicals

Everything in this world has its pros and cons. In the same way, inclusion of chemical techniques in agriculture has its disadvantages. As we see that some of the harmful chemical fertilizers may cause waterway pollution, chemical burn to crops, increased air pollution, acidification and mineral depletion of soil. The use of chemical pesticides has harmful effects on the environment, our health and even inside our home.

Work in the Field of Improvement

However, after observing the adverse effects of these chemicals, the scientists are now finding new ways to improve these chemical formulas and control their use in order to minimize the risks to our health and the environment. Now the concerned authorities carry out risk assessments of pesticides and provide the government with scientific support in the decision-making process. Approvals are then given based on these intensive evaluations. They manage the laws on classification and labelling of chemicals. How a chemical is assessed and labelled is based on the hazardous properties they may have.

Conclusion

Thus we can say that chemistry is closely related with agriculture. It is continuously working towards innovative ways to improve the agricultural products as well as to take care of health and environment. In the today’s world, chemistry has proved its effectiveness in every sphere of the universe.

Garima Saini
B.Sc. (H) Chemistry II Year

CHEMISTRY IS EVERYWHERE

Yes, you read it right! Chemistry is all around us. Okay, read and speculate with me....

If you look above...you see the sky – zillions of chemical reactions take place in the layers of the atmosphere. When rain and lightning occur, we smell a distinct soothing odour. It is nothing but the odour of ozone! Did you know? Have you ever thought about why Mars is red? The simple explanation is because the major constituent of its soil is Fe_2O_3 (ferric oxide) that is red in colour.

If you look down, you see sand, which is nothing but silicon dioxide! Why do we add salt to clear the roads when the temperature is very low? Have you ever wondered? It is just the application of depression in freezing point. If you look more closely at what we have in our washrooms: soap is nothing but long chains of fatty acids and toothpaste is a mere paste of bases!

We traditionally know on heating things melt but don't solidify. Have a look at scrambled eggs, omelettes. The liquid inside the egg solidifies. Doesn't it? This is because at a particular temperature while heating, a reaction takes place. Also, find out why fresh eggs sink and rotten eggs float!

So, egg reminded me of the kitchen and my favourite, FOOD! How could one ever forget about culinary matters while talking about chemistry! Truly, cooking is actually chemistry! NaCl , our table salt, is a chemical and vinegar is diluted acetic acid!

So, let me share a few cool applications of chemistry while cooking!

- While cooking tomato sauce, people typically add sugar to take away the acidic taste, but the addition of baking soda works better here, it neutralises the acid!
- Chill onions in water before cutting it, it will retard the enzymes which create noxious chemicals. So, No Tears!

And do you know why we actually feel good after eating pizza or ice cream or food with high fat, salt or sugar?

Because it releases a happy chemical, serotonin in our brain!

Hope my article worked the same way!

Thank you!

Shallu
B.Sc. (H) Chemistry III Year

MY JOURNEY IN MIRANDA HOUSE

I was about to be 17 when I stepped into the magnificent doors of Miranda House. I was a bright student but very low on confidence. I had heard that Miranda House had produced some great personalities. Never in my wildest dreams, had I imagined that one day this red brick house was going to be my home for the three most important years of my life. I walked inside Miranda as a timid girl and somewhere in the corridors of this home away from home I developed a thirst for freedom and learning. My thrilling journey in the galleries and labs of the Department of Chemistry, Miranda House cannot be expressed by words found in any work of literature. The support I got from my faculty at every step helped to transform me into who I am today,

definitely a confident young woman. Miranda House and its Chemistry faculty helped me to find my true self. Being the President of MH Vatavaran, the Environment Society, helped me to learn how to be a leader. Each word of advice given by every teacher seems like a blessing. They have empowered me inside out and at the end of three years I find myself much more confident and self-reliant. My time in Miranda House has kindled a hunger for freedom, learning, and giving back to society. Being mentored to develop my personality by my teachers, who themselves have great personalities, is a dream come true!!

Chetna

B.Sc. (H) Chemistry III Year

MY MIRANDA

The purpose of life is to live it, to taste experience to the utmost, to reach out eagerly and without fear for newer and richer experience.

-Eleanor Roosevelt

I remember the day when I stepped into the world of MIRANDIANS. Those brick red walls, those mighty arches, and those breezy corridors called out to me. Words lack the power to describe what Miranda House is, from the most beautiful hostel, amazing infrastructure to the best professors, who let you live on your own, help you find out yourself, Miranda House gave me the best three years of my life. Talking about these three years would not be complete without the role of MH Vatavaran – the Environment Society of Miranda House – in my life.

It is evident that the air we breathe, the land that we live on, the oceans that we thrive on are gifts from an unknown deity. It is an act of treason by humans to spoil these gifts while being a part of the earth. But there is no court martial where you are punished for your offence immediately for degrading and destroying Nature, the innocent soul caring for us all our lives. Treating it with maximum respect and care is our primary duty, being the beneficiaries of its products.

Since the beginning, from being a rookie to a veteran in this Society, working in this beautiful environment was a blessing for me. The Society itself was a place to gain much knowledge and a place to serve Mother Earth. The work done was not the routine garbage picking or the usual acts for publicity; the organisation has rendered us an opportunity to do our bit for the community within the DU campus as well as the surrounding parts of the city. Out-of-the-box thinking from the members makes this Society a dream to work in. The selfless work done by the faculty, non-teaching staff and student members made me realise how kind people could be towards Mother Nature if they chose to.

I remember showing those beautiful recycled paper bags, soilless plantation and our clean and green campus to the College visitors; I used to be proud to say that this is our college, our **Miranda House**. Ever since my childhood I always dreamt of doing some good work so that the sins committed by humanity against Nature could be neutralised to some extent. I am glad that I could do something for the environment by being a part of MH-Vatavaran. Apart from the natural hazards, human activities have led to damage to Nature and the prime motto of our Society was to spread awareness on how to reduce the risks and to heal the wounds created by the such activities.

My experience in these three years can't be expressed with in just a few words because one has to look deep into my heart to understand how beautiful my journey was. From being an ordinary member to General Secretary to President, each role helped me to *imagine, create* and *decide* for the betterment of society. I regret that now I can't be of any direct help to the Society, staying far away from the College. However, what I was taught by this wonderful environmental society has become a part of me. Just like a caterpillar turning into a butterfly, it has changed me into a better person who deeply desires to create a better place for people to live in. We are a small part of this humungous universe made up of thousands of galaxies. Possibly the only place with life is this earth and we can save this beautiful heaven from doom just by being responsible citizens. That is what MH Vatavaran has taught me throughout my time in the Society.

My only words of advice to the present and future members and to those who are reading this is that opportunity always knocks on your door but you have to choose the right guest to admit, the devil or the angel. The choice is yours to make but always remember that what we give is what we get. Our environment is not doing so well and we cannot change anybody's mentality without changing ourselves, so a small sacrifice for this greater cause is what we need to do. Our Environment Society might not have made any major changes in the atmosphere or the Hydrosphere but it surely has made us aware of what we could do to make our earth a better place for us to live and thrive in.

At the end, I just want to mention how grateful I am to have been a part of this Society and this institution. Every time I think of Miranda and the wonderful girls who make it what it is, my heart swells with pride. As they say, "You can take the girl out of Miranda, but you can't take Miranda out of the girl". I hope one day, I will have a daughter who will see the place which is closest to my heart and get a chance to be a part of it.

Asha Pandey
B.Sc. (H) Chemistry 2016-2019

MIRANDA HOUSE: WHEN A DREAM CAME TRUE

A girl sitting in front of the screen, waiting for her Class XII result to come and with a small dream in the corner of her mind and heart to get admission in Miranda House.... when she finally got it, it was the best thing that could ever happen to her. That is when the journey of her life began. Miranda House – the name creates magic. It is a college for many.... but for Mirandians, it is a feeling. It is a feeling of being confident women, who want to change themselves and society for a better future, it is a feeling to dream big and have the courage to achieve it. This institution gives shape to a girl's dream. It taught me to speak out my mind and to do it with such confidence that it can bring down any barriers. The learning started from Day 1 in the college – waiting with unknown people for the orientation and a new beginning, and went on to the last day of the college, when there were tears in everyone's eyes.

Leaving one's home isn't a good feeling but the fire to grow keeps one ahead and this college has kindled that fire in us. Each day taught us how to fight our battles in life. There can be no suitable words to explain that feeling about the teachers in Miranda House. They were constantly motivating each one of us, taking the best out of us and at the same time making us feel that the college was our home away from home. They enlightened our path and taught us to face everything with a smile. They put their heart and soul in making us learn not only our subjects

but about our life. Being a part of Rasayanika has taught us that giving up is not a choice. With all this we grew and three years passed. We were ready to take the Miranda House legacy forward. They say once a Mirandian, always a Mirandian, but each one of us wants to live those three years again. During those three years I never realized that I am going through so many changes but now when this confident woman that I have become looks back, I want to thank Miranda House, all my teachers, my mentors for making me feel this way about myself.

Surbhi Sharma
B.Sc. (H) Chemistry 2016-19

EXPERIENCES IN MIRANDA HOUSE

Instead of me, my parents were more worried about my survival in a girls' college after the co-ed schooling. I remember the very first day when I entered the College on the 2nd cut-off in 2016. I was quite nervous about the new life which was getting started in this esteemed institution. But the helpful nature of my seniors and my teachers persuaded me that there are people who are always there to console me. Then on Orientation Day, when I was introducing myself everyone thought that I was a sportsperson because of my Haryanvi tone but it was not like that. I met some of my classmates but on that day I was diffident because I was not able to express myself properly. But I want to thank Punisha Di (President of our departmental society) for motivating me. I have never met such a kind and calm person in my life.

In Miranda House, having 2-minute talks with Gatekeeper Aunty was the best way to start the day in the college. There is no doubt that Miranda is known for its discipline, whether it is about class timings or about our lab work, especially viva tests. The adorable beauty of this place mesmerizes everyone. In the coffee break, the entire Chemistry and Physics departments could be seen in the 'science lawns' of the College either with samosas or coffee while playing with Miranda's pets (cats). Miranda House taught us to be calm in every situation. I remember the syllabus scenario in 2nd year, there was plenty of pressure of different subjects with 4 labs per week. At that time, we all were exhausted during such long labs but now when we are in new places, we have understood the value of that hard work and consistency.

The best part of Miranda House is its teachers who are always ready to help each and every student to get out of any situation either personal or professional. I was personally influenced by Dr. Amrita Tripathi Sheikh – we call her ATS Ma'am. She taught us not only quantum but also the value of discipline, consistency and hard work in life. She always says, "Chemistry, physics are always going to be with you but give your priority to health first". I would also like to mention some other teachers who played a crucial role to make me a better person – Dr. Smriti Sharma Bhatia, who taught us that education is not the only criterion to be a happy person in life and Dr. Sujata who is the epitome of calm and helpful person in every way. Most especially I would like to thank Dr. Rajeswari with whom I could discuss anything freely.

When the time of our farewell came, we all were feeling very emotional about leaving this red brick house. But at the same time, not only I but every student of Miranda House was feeling proud of being a Mirandian because it gave us the opportunity to see the whole world from a different perspective. On leaving Miranda for higher studies, I find myself a different person from the one who entered it on the 2nd cut-off in 2016. Now I feel more confident about putting

forward my views, being vocal against any discrimination, mentally stronger in every situation of life and more keenly able to appreciate the value of hard work in life. This beautiful place and the beautiful journey in Miranda House is the best part of my life and I will remember it throughout my life. I feel lucky to have been a part of Miranda House.

Varsha Verma
B.Sc. (H) Chemistry 2016-19

THE PANDEMIC

When Covid-19 started hitting us in early March 2020 after creating havoc in China, Spain and Italy, India went into lockdown on 25 March. We had hoped to contain the virus but the lockdown being marred by various hindrances, coupled with the lethality and adaptability of the virus, it did spread. The world was looking at India: because it locked down 1.3 billion people, the most by any country in the world! Our country tried to do the unimaginable – to supply essential commodities to the remotest parts where even food security is not confirmed. We tried to combat the virus, which had already defeated premium ones like the NHC of Great Britain, with the most burdened healthcare system in the world. While these countries are out of the first wave, we are still reeling under it. However, let this not take the credit away from our frontline Corona warriors – our doctors, nurses, support staff, testing labs across the span of the country, and our police. I offer my condolences to the deceased and best wishes to everyone on the battlefield. The circumstances were unforeseen for everybody, but the adjustments they made are commendable. Amidst the clamour, we have forgotten a class of warriors of paramount importance: our teachers and educators.

The pandemic, lockdown and the temporary shutdown of all educational spaces will have a lasting impact on the way children learn. What are going to be worst hit are the efforts over the past three decades of educational inclusion of especially adolescent girls and tribal children. A gap of one year might force their parents to resort to old practices of marrying off girls at a young age as poverty and uncertainty loom large in life. Other than this, a crucial challenge that is staring us right in the eye is: Can we ensure equitable learning opportunities for everybody, be it the privileged, the marginalized, the middle class or the Divyangs (differently able) through technology? These efforts might get hampered due to various factors like the number of devices at home, the limitation on availability of high-speed internet, a threshold digital literacy etc. We can understand the enormity of the challenges faced in not-so urban areas through this story shared by @ForbesIndia: Twenty-year-old Shivani from Ajmer, an ITI student, runs up to the terrace with her phone and notebook to catch network to attend her online class. It is blisteringly hot, but she manages to find a shade against the wall. Her mother works at a local medical centre. She does household chores left by her mum in the morning and takes care of her younger siblings' education too. They also have online lectures, and it is not possible to accommodate three in internet packs. She sacrifices a couple of classes herself for her siblings.

This whole online learning would have been even more difficult in the pre-Jio era. Proper digitalization, however, is yet to reach the last person in the queue. The tightrope we are walking reminds us of the old saying: "The danger lies in thinking new technologies can substitute old realities or replace them without consequences." We have a well on one side and valley on the other. There is indeed no substitute for physical classrooms. Technology-driven teaching is difficult for our teachers and parents too; a lot of them are under-equipped to help their children in this venture. So this word is for students: please do not laugh if they can't connect to Zoom/

Google Meet as fast as you. It is a difficult time for them. They are more willing to go back to the old normal than you.

A vital impact of the shifting paradigms will be the brake on the mushrooming of coaching classes. I believe the time has come when we begin de-congesting Kota industry. Learning from home will encourage students and parents to ditch Kota and remain at home to prepare for various entrance examinations – this will reduce the monetary constraints and increase parents' satisfaction. It might also help a lot of students to come out of substance abuse at the most vulnerable age. Online teaching-learning is leaving part footprint, part handprint like everything else. One of the priorities is to provide high-speed internet to everyone. In this area, there is an urgent need for a public-private partnership. The governments must step up their efforts in prioritizing education. Some telecom companies, the biggies in the Education sector can join hands with the government in ensuring affordable WiFi is put in everyone's reach with appropriate measures to curb its misuse like banning dirty sites from airing.

I believe we can minimize the effect of the pandemic on students and academia as a whole by adjusting to the needs of the hour

Garima Singh
B.Sc. (H) Chemistry 2016-19

A LEAP OF FAITH

As I reminisce about my time at Miranda House, I find myself filled with bittersweet emotions, emotions that might be hard to describe all at once. I keep the memories of my years in college in a little treasure box that I open occasionally. And perhaps, only in retrospect do I realize how those three formative years of my life have shaped me into the person that I am today.

It was the year 2015 when I joined college. On my way to Miranda House, I was asked if I knew the name of any former Chief Minister of Delhi. I quickly gave the late Mrs. Sheila Dikshit's name in response, and added that she herself was an alumna of Miranda House. My brother who had posed the question smiled a bit, giving away the intention behind the question. Perhaps he wanted me to realize that I should look up to these strong women who not only broke the stereotypes about women but overturned the very fabric of an otherwise patriarchal society.

If I must describe my years in the 'red brick home', I can only begin by saying that I fondly remember our orientation the very first time I stepped inside the beautiful premises of Miranda House. Our then Principal, Dr. Pratibha Jolly, herself a Miranda House alumna, had given a wonderful speech describing every facet of the 'home'. Her never-ending energy and vigour left me awe-struck. With time I came to realize that every student in my class had some special innate talent – some were gymnasts, some great orators and some others were just fearless women who held their heads high and aspirations even higher.

I began my academic journey by studying Chemistry, a subject full of fascination and mystery. Our days would usually be filled with lecture periods and labs. Only now that I look back, I realize how those tedious hours in the lab have made me more patient and precise, and how my teachers have not only demystified the truths of Chemistry but have inculcated in the students the ability to question what is accepted as the obvious, not just in the Sciences but in society as well, for example, by making us reflect upon the (in)correctness of adjectives like 'manmade'.

Perhaps it was the desire to follow in the footsteps of these teachers and my talented classmates that made me try my hand at each and everything in College – from poetry to drama to quizzing – the works. After all, I had always had the desire to follow an unconventional path. I soon became a part of the Hindi Drama Society, *Anukriti* and the Quiz Society, *Jigyasa* of the College and started writing and reciting poetry. My days in *Anukriti* added the volume in terms of decibels and *Jigyasa* took care of the curiosity. Yet, I sometimes felt like a ‘lost child’ filled with immense ambiguity. There are times when uncertainty becomes the central theme of life. However, I feel that it is this uncertainty that makes one take a leap of faith. This, in my case, led me to make a foray into the world of Liberal Arts through the Young India Fellowship. I was persuaded to do so by Dr. Bani Roy, who knew about my interest in the field and wanted me to explore the same. Needless to say, I couldn’t have made a better decision. During the Fellowship, I studied some twenty five subjects, worked with a social organization for a year, made friends who became mentors and met professors who became friends. I was also fortunate to meet yet another alumna of the college, my professor in the course ‘Women Society and Changing India’, Ms. Urvashi Butalia. Ms. Butalia decoded Feminism in simple words as “a fair opportunity or right of a woman to live a life of dignity”. Oh! How much I cherish those words!

Well, if someone is to ask which memories make me most nostalgic, Ashoka would surely top the list. My days were hectic but filled with fun, compassion and loads and loads of learning! Undoubtedly, the kind of exposure and education one gets there is tremendous. If given a chance, I would gladly pack my bags again to head to my other red brick home called Ashoka University (how would someone not miss having a nukkad chai with one’s peers in chilly winter nights of Haryana, discussing if nihilism is really a thing!). My time as a Fellow filled me with new passions and dreams, one of them being to work for the education sector of the country – to reform the teaching pedagogies and to build sustainable models of education. I began to feel that a fair and equitable opportunity for education can be one of the major paths towards unleashing the potential of an astounding country like ours. Thus today I work as a curriculum designer in an ed-tech firm with a vision to make education holistic and fulfilling and most importantly, interesting!

Only now when I reconnect the dots can I see how my life events have led me forward in this journey and for that, I would forever be indebted to Miranda House, a place that made me realize that I need not follow a linear path to make my dreams come true, that it is okay to live with uncertainty and to make the most of it! As they say in Chemistry, you will get the right products once you choose the right reactants, but until then, keep exploring, keep trying!!

Priyanshi Verma
B.Sc. (H) Chemistry 2015-2018

Why social scientists should engage with natural scientists

Indeed, the nineteenth century founders of social science (amongst whom were engineers, social reformers, philanthropists) saw it as an essential counterpart to natural science and engineering, helping to steer the enormous technical possibilities they generated and to guide the potential they unleashed for destabilising change. Auguste Comte, who coined the word sociology, first used the term ‘social physics’, reflecting his vision of social science as the essential guide and counterpoint to the technical sciences – a sort of science of the sciences.

Philip Lowe, Jeremy Phillipson & Katy Wilkinson (2013) *Why social scientists should engage with natural scientists*, Contemporary Social Science, 8:3, 207-222, DOI: 10.1080/21582041.2013.769617

DEPARTMENT OF CHEMISTRY 2017-18

Third Year 2017-18



Front Row 1 (L to R): Kanchan, Harshita, Neehar, Ekta, Deeksha, Pratiksha, Priyanka, Ojasvi.

Row 2 (L to R): Sanjana, Nishtha, Swati, Aakanksha, Sukriti, Sristi, Amishi, Vrinda, Anushka, Shalini Raghav, Simran, Priyanshi, Divya, Kavita, Ankita Sharma.

Row 3 (L to R): Anonjaya, Sajal, Shelly, Meena, Anshu, Shiva, Himanshi Soni, Vinika, Alka, Bhavya, Rashmi, Divya Yadav.

Row 4 (L to R): Divya Mahajan, Ekta Malik, Megha, Jyoti, Himanshi Singh, Anju, Rimjhim, Shivani, Khushboo, Ruchi, Monika, Upasana, Bhawna, Nikshita, Purnima, Sana.

Row 5 (L to R): Isha, Aashi, Aditi, Samridhi, Shubhangi, Anamika, Aranya, Siri, Goldy, Meghna, Ankita Kumari.

Second Year 2017-18



Front Row 1 (L to R): Bhavna, Vibhuti, Shaivi, Sheetal Yadav, Ananya, Anshupriya, Sakshi Jaiswal, Sonam, Priyanka (721), Anju, Khushboo Varshney, Priyanka 655, Vandana, Neha Patheja, Ayushi, Nidhi Priya, Alka

Row 2 (L to R): Simran Chivan, Yashasvi, Pooja, Zahara, Nidhi Singh, Elizabeth, Tanvi, Jyoti, Aditi, Versha, Km. Akriti, Vartikaa, Renu, Pragati, Toshi, Karisma, Harshita

Row 3 (L to R): Karuna, Naina, Surbhi, Palkaran, Priyanka (908), Vidushi, Km. Garima, Nidhi (48), Rashmi, Priyanka Singh, Megha, Anupma, Taru, Palak, Deepa Shekhawat, Priyanka Jain, Sakshi Antil, Asha Sheetal Kalra, Aakriti Khushwaha, Muskaan

Row 4 (L to R): Samridhi, Namrata, Sapna, Rupal, Mansi, Anjali, Divya, Bhairvi, Tiya, Bhumika, Priya (1618), Anshika



Front Row 1 (L to R): Chetna, Sheetal, Pankhuri, Deepti, Aman, Varnika, Jyoti, Menka, Kajal, Tanya, Shivanshi

Row 2 (L to R): Prachi, Sheetal, Kusum, Hairen, Kanika, Priyanka, Geetika, Pallavi, Aarti, Tanya, Kranti, Utsa, Shivangi, Mamta

Row 3 (L to R): Nitisha, Nandini, Surbhi, Sakshi, Aprajita, P.V. Saranya, Shweta, Anuja, Deepanshi, Pooja, Manju, Ayushi, Himani, Renu, Sugandha, Nikita, Parveen

Row 4 (L to R): Avika, Pulkit, Jyoti, Ankita Kumari, Astha, Eknoor, Divya, Shivani Tomar, Sneha, Neha

Row 5 (L to R): Mamta, Monika, Bhavika, Priya, Sneha, Sheetal, Komal, Deepanshi, Mohini, Jyoti, Sudiksha, Urvika, Tisha, Riya, Ritika, Soumya, Shallu, Muskan, Ankita Duggal

Lab Staff March 2018



Sitting L to R: Shri Pawan, Shri Amit, Shri Vikash, Shri Sushil, Shri Sunil Bharadwaj

Standing L to R: Shri Subhash, Shri Shashi, Shri Gauri Shankar, Shri Sunil, Shri Mahesh, Shri Vijay, Shri Devender, Shri Deepak, Shri Jaswant, Shri Sachin, Shri Prakash, Shri Sanjeev

Inset: Shri Ravi, Shri Harkesh; **Missing:** Shri Rajendra

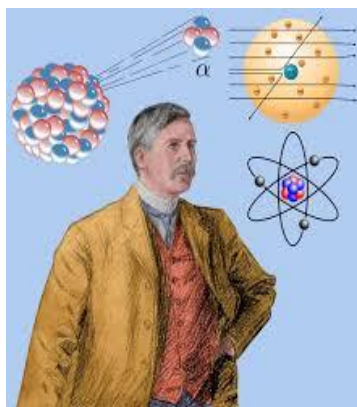
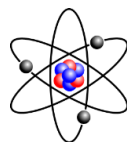
Chemistry Faculty 2017-18



Front Row L to R: Ms Anita, Dr Sujata Sengupta, Dr Adarsh Gulati, Dr Sharda M Sonkar, Dr Bani Roy, Dr Rajeswari

Back Row L to R: Dr Ritu Arora, Dr Anshika Lumb, Dr Amrita T Sheikh, Dr Smriti S Bhatia, Dr Mallika Pathak, Dr Deepti Rawat

Inset L to R: Dr Madhulika J Verma, Dr Kalawati Saini, Dr Malti Sharma, Dr Poonam, Dr Manika Dewan, Dr Shivani, Dr Firdaus Parveen; Missing: Dr Rashmin Khanam



In 1908, Ernest Rutherford, a physicist, was awarded the Nobel Prize - for Chemistry! The award citation read: "for his investigations into the disintegration of the elements, and the chemistry of radioactive substances." The chemists were of course impressed that Rutherford was fulfilling their ancient alchemical dream of transmuting elements, or at least demonstrating that it happened. Rutherford himself remarked at the ceremony that he "had dealt with many different transformations with various time-periods, but the quickest he had met was his own transformation from a physicist to a chemist"!

Source: http://galileo.phys.virginia.edu/classes/252.old/Rutherford_Scattering/Rutherford_Scattering.html



FUN WITH CHEMISTRY

Q. What kind of ghost haunts chemistry faculties?

A. Methylated Spirit.

Q. Why did the employer force his employees to walk between high-voltage plates before entering the workplace?

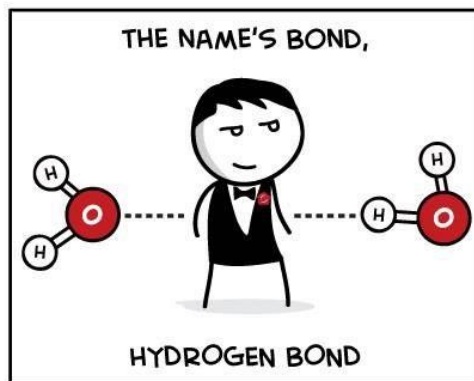
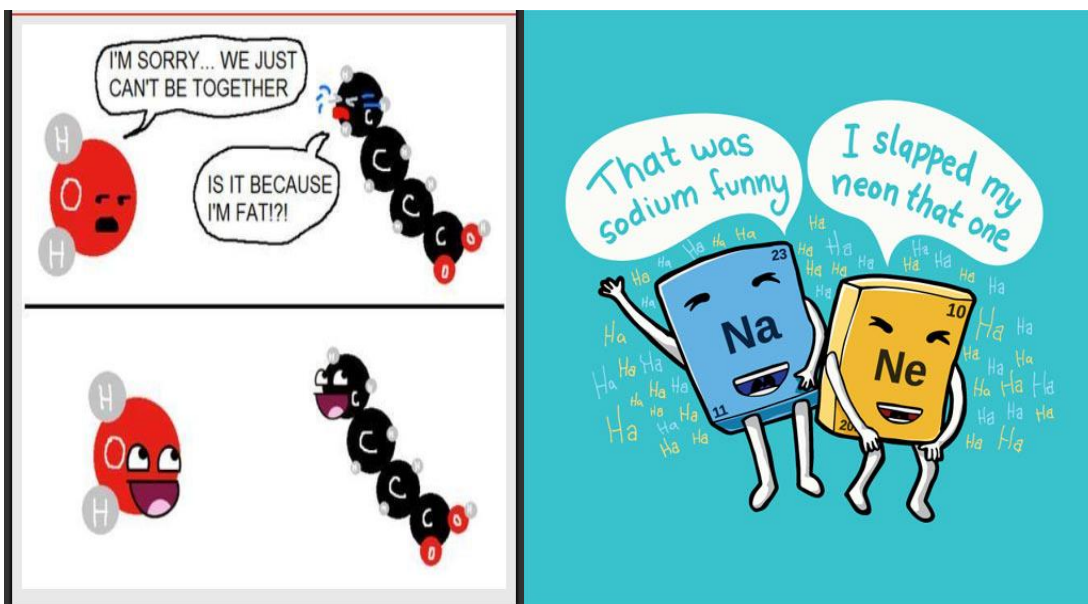
A. Because he didn't want any unionized workers!

Q. What did the thermometer say to the graduated cylinder?

A. "You may have graduated but I've got many degrees."

Q. What do chemists call a benzene ring with iron atoms replacing the carbon atoms?

A: A ferrous wheel.



VICTIMS OF CIRCUMSOLAR

EXCURSION TO UDAIPUR

An educational trip of Chemistry students was organised to Udaipur-Mount Abu, Rajasthan from 23-25 September 2017. 31 students along with 2 faculty and 2 non-teaching staff members joined the group for the 3 day-2 night trip. The group travelled to Udaipur by bus. After checking into their overnight accommodation, the group visited the beautiful City Palace and Lake Fateh Sagar. Everyone enjoyed boating at the picturesque Fateh Sagar in the evening. Other attractions were the local market and Sahelio Ki Bari.

On Day 2, the group left for the only hill station in Rajasthan – Mount Abu. The grand architecture and artistic carvings of the first destination at Mount Abu, the Dilwara Jain temples amazed everyone. The group trekked to the sunset point and enjoyed watching the sunset in the spectacular surroundings. A walk around Nakki Lake while collecting souvenirs from the market was a perfect end to the day.

Day 3 was entirely devoted to visiting the Sri Cement Industry at Beawer. The group checked out of the hotel in Udaipur and left for Beawer. Sri Cement's manufacturing unit at Beawer is one of the biggest in India. The resource team at the manufacturing unit briefed the group about the company and manufacturing process in detail through presentations and diagrams. The group also visited the actual manufacturing site, the quality assurance labs and central control unit. It was an enriching experience for the students. It added to their classroom knowledge about the cement manufacturing process. The topic is included in the curriculum for Discipline Specific Elective paper – Inorganic Materials of Industrial Importance.

The group travelled back to Delhi by bus via Jaipur while looking at the astonishing pink city from the windows of the bus at night. The trip was an exciting and informative break from the routine that will remain memorable for all.

Nishtha
B.Sc. (H) Chemistry 2015-2018





NOBLE CHEMISTS



John B. Goodenough

The University of Texas at
Austin, USA

M. Stanley Whittingham

Binghamton University
State University of New York,
USA

Akira Yoshino

Asahi Kasei Corporation
Meijo University, Nagoya
Japan

NOBEL PRIZE IN CHEMISTRY 2019

"For the development of lithium ion batteries"