



সত্য, তবু শেষ সত্য নয়  
কলকাতা একদিন  
কল্লোলিনী তিলোত্তমা হবে  
তবু তোমার কাছে আমার হৃদয়

এখানে গনি গুঁজি  
হোঁচট নামে পাত্রে  
বদমা মছমার এখানে কর?  
জ্বা মছুর প্রগাছ কোঁচুকে  
হামি ও কল্লার মারাৎমার

একা ফুটপাথে  
ওড়ে ছোছনায় মোড়া প্লাস্টিক  
আমি ভুলে যাইঁ কাকে চাইঁতাম,  
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নাগরিক চাঁদ উঠেছে আবার

এই শহর জানে আমার  
প্রথম সবকিছু  
পাল্লাতে চাইঁ যত  
মে আসে আমার পিছু পিছু

2023  
Annual Magazine  
on  
Global Warming



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৯৯শ বছর লক্ষ্যসংকেত ২০২৩

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কতবার বললাম, চলো উঠি  
তুমি বুড়ো বচগাছ বসে রইলে  
কলকাতা দুবলো  
তুমিও দুবলে  
আমাকেও ডোবালে  
কেন আমার কথা শোনো না বলতো?  
আমি কি নির্বাচনের প্রতিশ্রুতি?



## ***Greetings!!***

On behalf of CUA A BOD 2023, we would like to extend our warm wishes to you all as we celebrate reunion of CUA A alumni with their family and friends. We recognize with a heavy heart that we have to miss our beloved departed founding members and alumni in the region, especially Radharaman'da (Ray), Dayamoy Chakraborty and Debkumar Chattopadhyay.

We begin by thanking our previous inspiring leadership for giving us the opportunity to lead the organization in 2023 and beyond. We thank them for their hard work to bring the organization to today's platform and for their continued support in getting us going. We know that this organization has been served by a great many people from our community, who we truly admire and respect. We have assembled a dynamic team comprising of experienced, talented, young, committed, and energetic alumni to serve you.

As you all are aware, post pandemic inflation and shortages pose challenges. We are working keeping these constraints in mind and still trying to provide you with a nice and enjoyable experience at all our events to the best of our ability. We will continue and build on the processes put in place by prior Boards and move the organization forward to match the time and generation. To this end, we have updated after many years, our webpage. This page will provide an opportunity for the community members to provide feedback, participate, appreciate, and understand the nuances, efforts, and challenges in the operation of our organization. We are also trying to reach other organizations, locally and globally, for greater good of our alumni, friends, and alma mater.

Please feel free to offer your suggestions and guidance as our team serves the organization and the community at large. We are counting on your support and goodwill.

Warm regards,  
CUA A DC Board 2023





**“We are the first generation to feel the impact of climate change,  
and the last generation that can do something about it”,**  
Barack Obama, Former President of the USA.

Metaphorically, if Earth is a woman, who just celebrated her 50th birthday, then the first sign of life bloomed when she was at her pre-teen years. It took nearly 30 more years of her life and at the stroke of her 42 nd birthday, the dinosaurs became extinct. We, the homo sapiens began trotting on Earth since last month of her 50-year long life. The Industrial revolution of human civilization happened around 10 minutes back and for the last 5 minutes, she is increasingly tormented by climate change. Compared to Earth's long eventful life, the episode of global warming is immensely short, but its influence is immense, and consequences are becoming absolute.

Sharing the global concern, Praktoni 2023 is focused on climate changes; we presented three articles on this topic penned by some of our eminent community members. In addition, two senior professors shared their associations with two greatest Scientists ever produced by Bengal. We are truly in debt to them. Upon our requests, many of our esteemed community members wrote essays, poems, and short stories. We are honored to publish their works in Praktoni. In addition, we are excited to present writings from some of our talented youngsters. We decorated this year's Praktoni with Kolkata-tuned verses curated from various poems written by the poets like Rabindra Nath Tagore, Jibonanando Das, Budhadeb Basu, Premendra Mitra, Purnendu Patri, Sunil Ganguly, Shibdas Banerjee, Nabanita Deb Sen, Salil Chowdhury, Satyajit Ray, Kobir Suman and Srijato.

Praktoni is a complete team effort; 2023 CUAAC-DC board have been working tirelessly to make this magazine and the Cultural events a grand success. On this occasion, we will be launching a refurbished CUAAC-DC website after taking help from some of our local young talents. Driitan Chakraborty and Tannisha Sen deserve special acknowledgment here. Our warmest thanks to all sponsors, donors, and well-wishers for their continued support and encouragement. Finally, we are proud to publish Praktoni in hard copies braving the tide of inflation and sincerely hope that its legacy remains unabated and flourishing continually.

With warmest regards,  
Editors of Praktoni 2023



## Echoes of the Past: The Climate History Repeats Itself... Almost

Sumitra Mitra Reddy

*"Those who cannot remember the past are condemned to repeat it" - Philosopher George Santayana (1863-1952)*

### Recent Headlines from Across the World

Heat, Floods, Fire: Was Summer 2023 the New Normal? July was Earth's hottest month on record "by a long shot," according to NASA and NOAA. "Extreme August arrives with a warning- Expect More" from the New York Times.

With record-breaking heat waves gripping many regions of the U.S. and unprecedented floods wreaking havoc from China to Germany, the existential threat of climate change has once again risen to the forefront of public discourse.

In China, thousands flee homes as heavy rain lashes regions after Typhoon Doksuri (China's largest storm in years) while Beijing has recorded its heaviest rainfall in at least 140 years. Similarly, parts of Europe and Canada are being devastated by wildfires and the Canadian wildfires even created thick haze and smoke that affected the Manhattan skyline in New York City. In Africa, flash flooding from heavy rains has killed dozens and affected 300,000 people in Ethiopia and Somalia earlier this year.

The damaging flooding came after the region experienced almost three years of extreme drought. Across the globe, wildfires on Hawaii's Maui have killed at least 106 people and forced tens of thousands of residents and tourists to evacuate the island.

In Himachal Pradesh, Shimla residents reel from devastation caused by heavy rains as more than 2,220 homes have been obliterated while another 10,000 houses lie partially damaged. Looking back further, between 2000 and 2019 the world's glaciers lost around 267 gigatons of ice per year. One fact is certain: our current climate is changing. However, this is not the first-time extreme climate changes have occurred.

### Let Us Travel Back in Time:

#### Ancient Climate History

During the Pleistocene Epoch, the Americas were inhabited by some of the largest mammals ever to have walked the Earth: giant ground sloths, woolly mammoths, horses, giant beavers, massive cave bears, and even American lions and cheetahs. All of them went extinct simultaneously around 13,000 years ago due to the stone tool-wielding human hunters that first arrived from across the Bering land bridge. The cause is multifaceted, and the common theory is that these mass extinctions occurred due to human "overkill" of the North American megafauna and climate-induced glaciation periods.

Like the North American megafauna extinctions, Australia's disaster (45,000 to 50,000 years ago) coincided with the arrival of humans. The ancient megafauna of Australia was unlike creatures found anywhere else in the world: They included giant marsupial lions, hippopotamus-sized marsupials called diprotodons (basically giant wombats), lizards that grew to as long as 23 feet, and huge flightless birds related to waterfowl. While the exact cause of their extinctions some 42,000 years ago remains unresolved, the leading theories point to climate change, modified ecosystems caused by the spread of humans, overkill, or a combination of the two.

#### Climate and the Collapse of Ancient Civilizations

Myriad ancient civilizations collapsed partly due to manmade reasons: over farming, overcutting of vegetation, etc. However, climate change hastened the downfall of many ancient civilizations. About 4,200 years ago, a devastating drought lasted for at least 200 years and caused the collapse of many civilizations around the world. Particularly, it ended Egypt's pyramid-building Old Kingdom, the Akkadian Empire, the Indus Valley Civilization, and the Liangzhu Civilization.

Throughout history, other ancient civilizations that may have been destroyed by climate change include: the Ancestral Pueblo Civilization, Angkor Civilization, the Norse, Rapa Nui (Easter Island), the Mayan Civilization, Cahokia, and the Tiwanaku. Further, a long series of droughts in parts of the Americas led to the abandonment of such cities as Cahuachi in Peru while similar climatic changes in southern Africa likely contributed to the demise of Mapungubwe and Great Zimbabwe. These examples of climatic changes and drought highlight the role of climate in affecting the health of a civilization, regardless of carbon emissions in previous times.

#### An Unintended Consequence of Drought:

##### The Migration of People

The Late Bronze Age world of the Eastern Mediterranean, a rich linkage of Aegean, Egyptian, Syro-Palestinian, and Hittite civilizations, collapsed famously 3200 years ago and has remained one of the mysteries of the ancient world since the event's retrieval began in the late 19th century CE. Many researchers have combined data from coastal Cyprus and coastal Syria and found a link: the Late Bronze Age crisis coincided with the onset of a 300-year drought event. This extreme climate shift caused crop

failures, dearth and famine, which precipitated socio-economic crises and forced regional human migrations at the end of the Late Bronze Age in the Eastern Mediterranean and southwest Asia.

Today, the number of people forced to leave their homes because of climate-crisis related events over the last 11 years reached 21.5 million. It is estimated that by 2050 there will be 1.2 billion people displaced around the world due to climate change and related disasters. If the global population reaches 9.9 billion by 2050 as predicted, that will mean 12% of the world will be climate migrants.

*Upasargeannyachakre Cha Durbhikshe Cha  
Bhayaavahe.*

*Asaddhu Jansamparke Palaayati Sa jeevati.*

- Chanakya Neeeti (about 300 BCE)

He who manages to escape from riots or scuffles, from the severe draught or from the evil company, survives.

### **Deforestation and Demise**

Many ancient civilizations experienced deforestation—often by the hands of humans— which led to detrimental consequences as well.

The epic Sumerian tale of Gilgamesh inscribed on ancient clay tablets describes vast tracts of cedar forests in what is now southern Iraq. In the tale, Gilgamesh defies the gods by cutting down the forest, and in return, the gods say they will curse the land with fire and drought. In fact, the Sumerians themselves likely deforested the land, causing widespread desertification. Soil erosion and salt buildup devastated agriculture by 2100 B.C.E., forcing residents to move north to Babylonia and Assyria.

Archaeological evidence from the Minoan civilization of Crete (lasting from 3000 to 1100 BCE) has shown **proof of deforestation** during the late stages of development, leading many scholars to suggest that environmental mismanagement may have been a chief culprit in its collapse. Since the Minoans were a mighty sea power, they likely needed large quantities of wood to construct their ships. They also used wood for economic transactions, and when the supply ran out, Crete was hit with detrimental soil erosion and flash flooding. The change in weather caused Minoans to relocate or close their production facilities. The social and natural challenges combined were likely the reason for their gradual demise.

Famous for constructing the cryptic "Nazca Lines," Peru's ancient Nazca culture (from 100 to 800 CE) likely **perished because of the deforestation** and subsequent desertification of the landscape. The land, which was once a vast riverside oasis with fertile soils capable of supporting thousands of people, was held together by the ancient root systems of trees called *huarangos*, which were systematically cut down by the Nazca people for fuel and wood. The loss of these

trees made the Nazca people and their vital agricultural crops more susceptible to El Niño flooding, soil erosion, and drought.

Climate change today, as scientists emphasize, is unprecedented in its rate of change. This suggests that it is largely human made, a key difference from the natural processes that characterized climate change in antiquity.

*"Great civilizations are not murdered, they take their own lives"* Arnold Joseph Toynbee (1889-1975) an English historian, and an expert analyst of the cyclical development and decline of civilizations.

### **The Thawing of Glacial Ice and Rainfall:**

#### **The History and Consequent Seismic Activity**

Geologists have long identified a relationship between rainfall rates and seismic activity. In the Himalayas, for example, the frequency of earthquakes is influenced by the annual rainfall cycle of the summer monsoon season. Research reveals that 48% of Himalayan earthquakes strike during the drier pre-monsoon months of March, April and May, while just 16% occur in the monsoon season.

The impact of water's weight on the Earth's crust goes beyond just precipitation; it extends to glacial ice as well. As the last ice age came to an end roughly 10,000 years ago, the thawing of heavy glacial ice masses caused parts of the Earth's crust to rebound upwards. This process, called **isostatic rebound**, is evidenced by raised beaches in Scotland – some of which are up to 45 meters above current sea level. Evidence from Scandinavia suggests that such uplift, coupled with the destabilization of the region's tectonics, triggered numerous earthquake events between 11,000 and 7,000 years ago. Some of these earthquakes even exceeded a magnitude of 8.0 which indicates severe destruction and loss of life. The concern is that the continued melting of glacial ice today could result in similar effects elsewhere.

### **Volcanic History vs Human Activities:**

#### **CO<sub>2</sub> Emissions**

Throughout history, there have been a multitude of volcanic eruptions that have later been discussed in relation to climate change because they release CO<sub>2</sub> into our atmosphere. It has been asserted that the previous volcanic eruptions have had a massive impact on our climate and could have been a driving force of climate disasters in previous times.

However, human contributions to the carbon cycle are more than 100 times those from all the volcanoes in the world...combined. In comparison, while volcanic eruptions do cause an increase in atmospheric CO<sub>2</sub>, human activities emit a Mount St. Helens-sized eruption of CO<sub>2</sub> every 2.5 hours and a Mount Pinatubo-sized eruption of CO<sub>2</sub> twice daily. Essentially, CO<sub>2</sub> emissions from human activities dwarf those of volcanoes, which makes our modern-

day events stand out from previous climate changes throughout history.

### Behind Long-Term Climate Patterns: The Milankovitch Cycles

Now, what is behind this history of climate patterns? Well, cycles play a key role in Earth's short-term weather and long-term climate. A century ago, Serbian scientist Milutin Milankovitch hypothesized the long-term, collective effects of changes in Earth's position relative to the Sun is a strong driver of Earth's **long-term** climate and is responsible for triggering the beginning and end of glaciation periods (Ice Ages).

The Milankovitch cycles include:

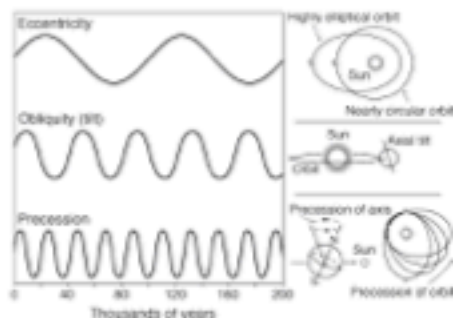
1. The Earth's eccentricity (shape of the Earth's orbit) is very slowly decreasing and is approaching its least elliptic (most circular), in a cycle that spans about 100,000 years.

2. The angle Earth's axis is tilted with respect to Earth's orbital plane and is known as **obliquity**. Obliquity is why Earth has seasons. Over the last million years, it has varied between 22.1 and 24.5 degrees with respect to Earth's orbital plane. Earth's axis is currently tilted 23.4 degrees, or about halfway between its extremes, and this angle is very slowly decreasing in a cycle that spans about 41,000 years.

3. The direction Earth's axis of rotation is pointed, known as **precession** (with periodic wobbles of the Earth on its axis). The cycle of precession is about 26,000 years.

These cycles cause the levels of solar radiation received on Earth to wax and wane. As a result, it causes the planet to go through periods of natural climate change. That said, these shifts occur on far

longer time scales than today's climate change, in which human activity plays a major role, but over time ice ages and warm eras dramatically altered habitats



around the world according to the machinations of the astronomical clock.

### The Protection of the Environment in the Ancient Texts

The ancients realized the importance of the climate in a civilization's well-being for prosperity. As a result, many ancient texts and works include laws and protections for the environment specifically, paralleling modern environmental laws as well. Examples include:

**A. Sumerian Text:** Some of the first laws ever written to protect forests were decreed in the Sumerian settlement of Ur. The *Code of Ur-Nammu* is one of the oldest such documents known, preceding the Code of Hammurabi by 300 years; the area was struck by drought conditions from 2200 to 2000 BCE. The population dropped by 93%.

**B. Indian Tradition:** The following verse from the *Sukla YajurVeda* (36-17) from 3000 years ago:

*“dyauh śāntirantarīkṣan śanti pṛithivī śāntirāpaḥ śāntiroṣadhayaḥ vanaspatayaḥ śāntiviswadevaḥ śāntibrahma śāntiḥ sarva śāntiḥ śāntireva śāntiḥ sāmā śāntiredhi”*

May peace radiate there in the whole sky as well as in the vast ethereal space everywhere.

May peace reign all over this Earth, in water and in all medicinal herbs and trees.

May peace flow over the whole universe.

May peace be in the Whole Universe.

And may there always exist in all peace and peace alone.

*“Trees are the earth's endless effort to speak to the listening heaven”.* Rabindranath Tagore (1861-1941)

### Our Climate Savior: Trees

At Santiniketan, Tagore started the festival of the Earth through *briksharopan* (planting of trees) in 1927. On one such occasion, Tagore wrote the song *“Maruvijayera ketana urao he shunye”* (raise aloft the banner of the conquest of the desert), which was a clarion call to increase the green cover across the deserts through tree plantation.

Among the many gifts forests give us is one we desperately need: help with slowing climate change. Trees capture greenhouse gases like carbon dioxide, preventing them from accumulating in the atmosphere and warming our planet. When we clear forests, we're not only knocking out our best ally in capturing the staggering amount of greenhouse gases we create but we're also creating emissions by cutting down trees as when trees are felled, they release into the atmosphere all the carbon they have been storing. What the deforesters do with the felled trees, either leaving them to rot on the forest floor or burning them, creates even further emissions. Deforestation alone causes about 10 percent of worldwide emissions today.

The systemic failure and climate change experienced so many centuries ago by the Mayans, the ancient Pueblos, the Akkadians, the Viking Greenlanders, and many more caused mass migrations and devastation to human civilizations. It is clear that climate history is repeating itself. And it is not for the better and at an unprecedented rate due to human causes. The only difference, between now and the past, is that we may have no place else to go (except perhaps to the Moon since Chandrayaan-3 has already landed there recently)!

## On Climate Change

Arun Guha

Greta Thunberg is not yet an adult by the usual definition. Born in Sweden on January 3, 2003, she has already accomplished enough to be named the person of the year of the TIME magazine, received by the Pope, invited to address the United Nations, nominated for the Nobel Peace Prize four years in a row and awarded numerous other honors. What did she do?

She first heard about climate change when she was eight years old. (I have not found her source but will mention my conjecture later.) She started learning and thinking about it. The fact that so little was being done about it depressed her. At age 11, she lost ten kg in two months, and was eventually diagnosed with Asperger syndrome and other psychiatric conditions. (Incidentally, the recent biography of Elon Musk says that he also has Asperger syndrome. This may lead some to wish they had it too!) It took her a couple of years to convince her family to become vegan and stop flying in order to reduce their carbon footprint. At age 15, she started protesting outside the Swedish Parliament every Friday and calling for stronger action on climate change. Pretty soon it caught on and schoolchildren worldwide joined in similar protests. She was invited to address the UN climate Action Summit in 2019. In order to avoid flying she crossed the ocean on a yacht in 15 days. At the UN, the 16-year-old rebuked the diplomats "We are in the beginning of a mass extinction, and all you can talk about is money and fairy tales of eternal economic growth. How dare you!" It is remarkable how influential she has become at a young age because of the strength of her conviction and devotion to the cause.

Before we proceed further, let us define the problem. When you open the front door of your house or apartment complex and step outside in the open, you experience the weather conditions for the day, for that time of day. It is highly variable with time and by location. Considering for instance the temperature readings, they may vary by many degrees over the 24-hour day. Even at the same instant, it may be bright sunshine in one location and raining a mile away so that temperature readings would vary. If you take temperature readings point-by-point over a large area, such as a state, a country or a continent, and over a large period of time (typically 30 years) and take the average, what you get is the temperature value defining the climate for that area. Because of averaging over very long time and very large space, the random variations cancel out and the result is expected to be fairly stable. There is a common saying that "what you expect is climate, what you get is

weather." Global climate varies for many natural reasons beyond our control, primarily orbital dynamics and effects of other celestial objects. At one time, the arctic was covered in dense forest. (In a place called Longyearbyen in Spitsbergen Island, at 78 deg N latitude (close to the North Pole), there is a coal mine active for many decades proving the point. Coal forms when dense forest gets buried and stays that way under pressure for a long time.) A good book is "History of Climate Change" by Antonello Provenzale (translated from Italian) that describes the history from earth's origins to now. The problem is that the average global temperature is now increasing not because of natural causes but human activity, burning of fossil fuels (coal and petroleum) and meat production (mainly beef-cattle.) Such activities produce carbon dioxide and sometimes methane gas that together with natural water vapor act like a blanket keeping the world warmer than it would be otherwise. The effect of such warming is visible in many places. Many of the glaciers in the U.S. Glacier National Park near the Canadian border are gone. People who visited Antarctica in 2010 saw everything covered in white ice. People who went in 2015 saw many black rocks sticking out. Sea level is rising – several island-nations in the Indian ocean are desperately looking for places where they can relocate their population.

The first comprehensive explanation of the problem for the general public was produced by Al Gore, vice president to Bill Clinton during 1992-2000. He lost his 2000 presidential bid when the Supreme Court stopped the normal process and awarded it to Bush. Later, he overcame his disappointment by using his time to produce a flip chart presentation with numerous graphs, charts and tables to educate the public on global warming or climate change. As a Harvard student, he had heard one of his professors talk about global warming and discuss experiments he, Revelle, conducted when in the Navy. Gore believed in global warming and spent time collecting data and evidence. He presented his flip charts to various audiences over a thousand times by his estimate. It was extremely effective in increasing public awareness of the issue and inspired some film personnel to produce a documentary in 2006 called "An Inconvenient Truth" featuring Gore presenting his slide show. It became a worldwide sensation and earned more money outside the country than in America (profits went to charity.) Gore was awarded the Nobel Peace Prize in 2007. It is available on YouTube and is a must-see for those interested in the problem. A printed version is also available. The book "How Are We Going to Explain This?" by Jelmer Mommers (translated from Dutch) is a good book explaining the impact of Gore's efforts as

xwell as those of many others. There are many other documents and books, too many to mention here. Almost surely Greta Thunberg saw Gore's presentation or something else based on it.

Even though Gore became the main spokesperson, he is not a scientist himself. Here is the story of how Climate Science developed. Many early scientists – Joseph Fourier (French), Eunice Foote (American woman), John Tyndall (Irish), Svante Arrhenius (Swedish) – had realized that water vapor and carbon dioxide in the atmosphere trapped heat and speculated about the effects of increasing use of fossil fuels but only in qualitative terms. Guy Callendar, a British engineer and amateur meteorologist, was the first to perform a quantitative analysis with available meteorological data. In a paper published in 1938, he predicted that global temperature would rise by 0.39 deg C by the 21st century. The actual number is 1.2 deg C, more than three times. However, he had no inkling of the speed of industrialization that was to come. China for example has been building a new coal-fired electrical generating station almost every week during the last thirty years.

The quantitative study of global climate involves collecting and processing a vast amount of data. That became possible only around 1960 with the advent of the space age and the development of computers. October 4 is an important date in world history. On that date in 1957, the Soviets launched the first earth satellite they called the Sputnik (fellow traveler.) The Eisenhower administration took that as a challenge to America's supremacy in science. The space race was on. A new planning group in a corner of Langley Air Force Base in Virginia started thinking up new programs to send man to the moon and rockets to other planets such as Mars. Goddard Space Flight Center (GSFC) in Greenbelt, MD became the premier NASA center for science missions (Robert Goddard was a pioneering American rocket scientist.) It built up to about 3000 scientists and engineers, as well as a large number under support contracts. Around 1962, it started flying satellite missions for studying the earth from space.

During 1965-9, I taught two courses every semester and one in the summer in the Electrical Engineering Department of the University of Maryland, College Park, where I was also a PhD candidate. There was close cooperation between Goddard and UMCP, about ten miles away from each other. In January 1970, I joined Goddard full time. This gave me the opportunity to observe and participate in many of the Goddard efforts. Goddard conducted numerous missions such as Orbiting Geophysical Observatories, Nimbus (for studying weather), Earth Resources Technology satellites, and Earth Observation Satellite missions. My last contact was as a consultant to

Tropical Rainfall Measuring Mission about twenty years ago.

Goddard had a sounding rockets division responsible for building rockets (carrying experiments) that went straight up and came down without reaching orbit – these were flown from Wallops facility in the Virginia coast. Goddard had a weather balloon program – over a thousand balloons carrying measuring instruments were flown from Palestine, Texas. There was an outpost at Christ Church, New Zealand to coordinate the collection of core samples of Antarctica ice – the scientists recreate the weather history of the world by inspecting the ice at different depths. The outpost has been converted to a museum. There was a massive surge in the scientific effort to study the earth because of NASA support of academic research in many institutions. Goddard Science Directorate (Code 600) created an outpost in New York City called Goddard Institute of Space Studies in collaboration with Columbia University. It was part of Goddard for many years (the employees were in NASA civil service) but later became an independent entity. Those who have seen the Seinfeld situation comedy series should remember the restaurant where the friends met – the Goddard facility was housed on the upper floor of the same building. Many academic scientists in earth science research in U.S. universities were associated with Goddard missions.

In 1988, the US Senate asked James Hansen, head of Goddard Institute, to testify where he declared the scientific conclusion that human activities are contributing to global warming. In the next thirty-five years there has been more acknowledgement worldwide in support of this conclusion. The people who disagree do that primarily for political reasons; Ronald Reagan, George W Bush, Donald Trump are on record as nonbelievers as are many other Republicans. Many industry executives also fall in this category.

The United Nations has accepted this finding on Climate Change (as was obvious from the invitation to Greta Thunberg) and made it an official policy position. It organizes a Conference of Parties to UN Framework Convention on Climate Change (abbreviated as COP) about once a year. COP21 was held in Paris in December 2015 and was one of the largest gatherings lasting two weeks. All attending nations made emission cutting pledges with the objective of keeping the global temperature increase below 2 deg C – goal being below 1.5 deg C – compared with pre-industrial levels. It was adopted by 196 participants of COP21 and came into effect on November 4, 2016. Specifically, the USA aims to cut greenhouse gas emissions from the baseline level of 2005 at least 50% by 2030 and 100% by 2050. The EU plans to cut by 50% compared to 1990 levels. China targets to reach peak CO2 emissions latest by 2030.

The last meeting, COP27, was held in Egypt in November last year. Donald Trump had pulled the USA out of the Paris accord in 2020. Under Joe Biden, the USA rejoined on the first day of his presidency. The next meeting is scheduled for Nov-Dec 2023 in the United Arab Emirates.

How effective has the Paris Accord been? The September 23rd issue of the Economist magazine has a cartoon showing a mighty roaring lion representing promises and thirteen kittens roaming aimlessly showing performance. It is not very encouraging. Of course, the Ukraine situation had its impact. Many countries now impose carbon tax on manufacturers.

New technologies are being developed to help. Injecting sulphur dioxide up in the air helps eliminate carbon dioxide. Carbon capture technologies are being developed (trees do that cheaply). USA already has the largest number of nuclear power plants but, because it is a large country, only 14% of the electricity used is generated by nuclear power, compared to 65-70% in France. A problem with nuclear power plants is that they produce radioactive waste. USA is investing in fusion research that will create something like a miniature sun in the laboratory to avoid the problem, but commercial availability is many years away. Wind farms and solar panels are being installed. India has built a very large solar power generating system. Elon Musk has a dream to create energy independent houses. Solar panels on the roof top will charge a very large storage battery in the house that will provide all the power used in the house including charging the EV in the garage. But it may be a long wait.

What should a common person do to reduce his carbon footprint as a responsible citizen? To avoid flying altogether following Greta Thunberg's example is impossible for most people. Now I can fly from Washington to Delhi non-stop in twenty hours or so. Going by boat and train may take twenty days or more. Many people have installed solar panels on their rooftops. But I get the same effect by just choosing the appropriate option with my electric supply company in Maryland. They still act as distributors to supply power generated by another company using solar, hydro and wind. I get a single bill but in two parts, for generation and for distribution. Very convenient.

It was mentioned in the opening that Greta Thunberg became vegan to reduce her carbon footprint. This requires some explanation and discussion. It applies primarily to animals raised specifically for human consumption, especially beef cattle. When killed and consumed, they return only a small fraction of the calories they use to grow up. If the same resources – land, labor etc. – were used in agriculture, we would get back about seven times or more calories than the animals provide. Therefore, we are wasting a lot of calories, in effect. There is also a health argument in favor of consuming plant-based diet.

We humans evolved from apes over millions of years when we lost our tails and body hair and developed bigger brains. But our alimentary canals – the digestive systems – are close to that of the apes. They are long as in herbivores (such as apes), not short as in carnivores (such as lions and tigers.) Our bodies were made for plant-based diet through the evolutionary process, or, if you like, by God. Medical Science has confirmed that within the last fifty years or so. The largest study in human nutrition was done in China with help from experts from UK and USA. The American expert was Joseph Campbell of Cornell. His book "The China Study" is a classic and produce evidence of many harmful effects of meat diet. It also cites accounts of opposition by the food industry. The chair of his department in Cornell, who was a paid consultant to industry, once tried to cancel his course. Dr Esselstyn of Cleveland Clinic developed a treatment regime for cardiac patients based on diet only (which Bill Clinton sought out) but was unable to get it adopted by his institution.

There is evidence that in ancient times, people in India did eat meat. Indian sages realized that it was bad for health. The religious prohibition against beef may have come out of that recognition. Unfortunately, they did not realize that cow's milk was designed for rapid growth of calves – it has an insulin like growth factor (IGF). Today, the saying is "milk is liquid meat." It may promote uncontrolled cell growth leading to cancer. Prevalence of cancer above age 70 – especially among males – can sometimes be attributed to milk consumption (Milk may be ok for children during their growth period.) There is no good medical explanation for intermittent fasting or food deprivation to increase longevity other than the fact that they mimic evolutionary conditions when food was scarce. To summarize, using a plant-based diet is not only good for the planet, but also for health.

Finally, a word of caution. There is tendency now to connect each natural calamity to Climate Change. This has caused a controversy. Washington Post published such a story on September 14th this year. In science, nothing is final. What is accepted as scientific truth today may be modified when new evidence emerges. That is why many scientific truths are called "theories" such as Theory of Evolution or Kinetic Theory of Gases. This confuses many non-scientists. Ronald Reagan once dismissed the theory of evolution saying, "it is only a theory."

I end with a puzzle. Mahatma Gandhi was a vegetarian because of his family tradition but he also gave up drinking cow's milk. But since he liked milk, he traveled with a goat to have goat-milk always available. What did he know that he never shared with anyone? It is a pity that poet Tagore died of cancer at age 80, seven years before Gandhi – it was a loss to humanity.

## Climate Change and Bengal

Dipak Dasgupta

As far as we can tell with very high scientific confidence, the average annual global surface temperatures everywhere, including Bengal, will cross 1.5C above historical (pre-industrial) levels in the near-term because of human induced global greenhouse gas emissions (GHG) and there is very little we can do to stop that. We have already seen a rise of 1.1C till 2019, and the past five years have been the warmest on record. The chances that global warming will well exceed 2C sometime in the future are also very high, unless we can collectively reduce global net GHG emissions dramatically in the near-term till 2030, and to zero by 2050. The consequences of such global warming are already evident and will rise quite catastrophically, especially for the most highly vulnerable regions and populations, such as Bengal.

There has been not enough attention paid to the impacts and situation in Bengal, but what we know already and are confident about, is that our region is likely to be among the worst affected globally, for two main reasons. It is largely a coastal region sitting on the Bay of Bengal in the tropics where average temperatures are already very high and it has a population with very low incomes and therefore highly vulnerable to adverse consequences that the people will have great difficulties in dealing with. There are several channels of these expected adverse consequences. Multiple sources are already pointing to these dangers ahead, including climate assessments locally, regionally, in India and globally.

The first is extreme heat stress, especially in cities and towns because of concentrated populations in urban 'heat islands' but also in rural areas. The combination of rising extreme temperatures and high humidity are potentially lethal. The limits to human survival with exposure over several hours to 'wet-bulb' temperatures (heat effect taking into account humidity) are 35C at 100 percent humidity (and variations around that), and extremely dangerous to wet-bulb temperatures above 31C. We already know that much of Bengal is exposed to such dangerous conditions in early summer May-June and again in mid-late monsoons in August. We have already seen such conditions in recent years, which will happen with greater frequency almost every year from now on. It has already become critical therefore that we need to plan and implement measures urgently to deal with these consequences—planting tree cover aggressively, providing large shelters in the open for exposed populations (e.g. cooling stations), changing our work and school hours, painting concrete and paved surfaces white and many other options that we

need to design, with dedicated urban heat planning units and officials thinking about what to do. We are behind the curve and scientists and citizens need to start alerting ourselves and municipalities and governments.

The second is the impacts of more severe and frequent cyclones and storms. The Bay of Bengal is a shallow sea with large surface temperatures that heat up more rapidly, making cyclones more frequent and consequent coastal damages from the cyclone and storm surges, coastal flooding, and loss of lives. Multiple named cyclones have occurred already (e.g. Mocha, Amphan, Fani, Yaas) and more every year might be expected. Early warning systems from IMD (Indian Meteorological Department) and coastal emergency measures, including large-scale evacuations, are helping but will need more attention for more sustainable coastal protection measures (stronger cyclone shelters, aggressive mangrove afforestation buffers, embankment strengthening, and drainage).

The third and related is rising sea levels. The coastal areas in the Bay of Bengal are especially vulnerable because of very high and rising near-coast massive sedimentation loads from inland rivers, massive rainfall run-offs and deltaic subsidence. Limited data suggests sea levels are rising 4-8 mms every year and a rise of 0.3-1.5 meters in sea levels by 2050 might be expected, as compared to the average current height of coastal lands of 1.5 meters. Added to this are the effects of storm surges, cyclones and tidal inundation. The results are likely to be very high risks of coastal flooding and their duration, with rising salinity, water-logging, and loss of previously cultivable lands. Again, strengthening and planning coastal protection structures, aggressive mangrove afforestation, strengthened and well designed embankments are now extremely urgent, along with improved access to potable drinking water and health facilities to deal with some millions of households increasingly at risk, especially in the Sundarbans.

Fourth, we should be thinking much more about the risks of more erratic rainfall including increased risk of droughts. The incidence of droughts has been rising, with delayed monsoons, early monsoon declines and failures and mid-monsoonal stoppages of rainfall. Again, the most vulnerable districts in West Bengal are also the ones with very high and vulnerable poor households, in districts such as Bankura, Purulia and many others.

Fifth, vulnerable communities exposed to these climate risks are greatest among the poorer households—within our towns and cities such as



Kolkata and Howrah, coastal areas such as Sundarbans, inland areas such as Purulia, Birbhum, Bankura, Uttar Dinajpur, Malda, Murshidabad, and others. These are all areas with some of the highest and most vulnerable poor households.

Sixth, our public health systems will need to be strengthened to guard against the rising health risks of climate change, including dengue and malaria, safe drinking water availability, salinity and consequences for diseases and maternal and children's health. Our public health systems will need considerable stepped up attention.

All of these climate risks make Bengal one of the highest risk regions in the world, some 60<sup>th</sup> most at risk against some 2,600 such assessed regions around the world, and among the eight most at climate risk sub-regions and states within India. Yet, Bengal has had little or nothing to contribute to the rising global climate warming risks and challenges, which originates from continued very high carbon emissions by the richest countries and populations the world over.

Massive new public investments and resources and so much more new scientific and technological ways are possible and will need to be found and mechanisms to channel these to Bengal to protect our poorest households and large swathes of our population. How will we do it? One of the ways is to strengthen our own personal understanding and awareness so we all

can act as our region's best ambassadors the world over. If you live and work abroad, as a very large and influential scientific diaspora, talk to your local politicians, administrations, governments, asking and requesting that they do much more. Take up a cause. Read more about our dangers, alert and advise, and channel your tax dollars and scientific clout towards this. Second, tell the younger generation to step up their direct help and attention, direct your energy and activities towards your own region's needs, and contribute yourselves to dozens and hundreds of research institutes, NGOs and smaller organizations working locally in Bengal. Third, support the scientific work on the design of risk reduction measures globally and in Bengal, especially our universities, on climate change. Engage, activate your networks and support. Pick one of the topics of interest and start to engage more actively. Within the global scientific community, many Bengali climate scientists are already very active and working at the forefront of global efforts. They range from loss and damage specialists, water and agriculture experts, climate science specialists, economic and social scientists, and finance and public policy specialists. But we all tend to work in isolated ways, and not yet fully engaged and organized on our own crisis and dangers on our homeland. It's time to look inwards. We can do a lot more in small and big ways and help spread the word. Support wherever and whatever you can to strengthen the efforts, since this crisis is already upon us.

**About the author:** Dr. Dipak Dasgupta is a Distinguished Fellow, The Energy and Resources Institute and Author, Inter-governmental Panel on Climate Change

*It's important for me to have hope because that's my job as a parent, to have hope for my kids, that we're not going to leave them in a world that's in shambles.*

James Cameron, Movie director

সুকান্ত ভট্টাচার্য্য, কবি

এই পৃথিবীকে শিশুর বাসযোগ্য করে যাবো আমি,  
নবজাতকের কাছে এ আমার দৃঢ় অঙ্গীকার

## Sir P. C. Rây at the College of Science —Tribute of a grand student

Gurunath Mukherjee

### Education

Prafulla Chandra Rây (born August 2, 1861, in Khulna, now in Bangladesh), while studying his Intermediate (I.A.) and B.A. courses at the Metropolitan Institution (now Vidyasagar College) in Calcutta, established by Pandit Iswar Chandra Vidyasagar, became immensely interested in English literature from the teachings of distinguished Professors like Surendra Nath Banerjee and Prasanna Kumar Lahiri, and this passion lasted throughout his life. During his study in this College, Prafulla Chandra had to learn some elementary aspects of physics and chemistry by attending classes at Presidency College as an external student. Dr. Alexander Peddler, the distinguished Professor of Chemistry of Presidency College, used to demonstrate interesting experiments during his classes, which so



immensely attracted young Prafulla Chandra into the chemistry arena that, leaving his B.A. course incomplete, he joined the Edinburgh University (1882) for B.Sc. course with chemistry major along with botany and zoology as minor subjects, after obtaining the prestigious *Gilchrist Scholarship* for higher studies in a British University.

After obtaining the B.Sc. degree (1885), Prafulla Chandra joined the research group of the eminent chemist, Professor Alexander Crum-Brown, F.R.S., and obtained his D.Sc. degree (1887) from Edinburgh University for his work on *Isomorphism and Chemical Homology*. He also obtained the prestigious *Hope Prize* and carried out further research at this University. Hugh Marshall, the discoverer (1891) of peroxydisulfuric acid, was one of Rây's lab mates.

### Teaching

Back in India, Rây served as a professor and subsequently the Head of the Department of Chemistry of Presidency College, Calcutta (1889-1916). After the establishment of the University College of Science (1914), he, on

invitation of the then Vice Chancellor, Honourable Sir Asutosh Mookherjee, joined the University College of Science, University of Calcutta, as the first *Sir Tarak Nath Palit Professor of Chemistry* (1916) and subsequently became the Head of the Department. He served the University as a *Professor Emeritus* of Chemistry from 1937 after retirement, till his death (June 16, 1944).

### Chemical research

Rây had varied research interests, ranging from isomorphism and chemical homology, chemical analysis of Indian food stuff, through oxides and oxy acids of nitrogen and their metal derivatives, organic nitro compounds and nitrates, organothio compounds and their metal derivatives, heterocyclic compounds, fluorination of organic compounds, to electrochemistry, thermodynamic and kinetic aspects of chemical reactions and finally coordination chemistry, particularly on varying valences of platinum metals and gold, upto metal-metal bonded compounds. During 60 years of his long research life, Prafulla Chandra published 158 odd research papers and mentored 38-40 odd research associates either for their M.Sc. projects and or for their research degrees.

*Isomorphism and chemical homology* were hot topics of advanced chemical research in those days in view of discovery of the *Periodic table* a few years back, by Drimiti Ivanovich Mendeleev (1869). Rây established the chemical homology among  $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{NH}_4^+$ ,  $[\text{R}_4\text{N}^+]$ ,  $[\text{R}_4\text{P}^+]$  and  $[\text{R}_3\text{S}^+]$  ions from isomorphism and mixed crystal formation of their sulfate salts. From comparable ionic radii of  $\text{F}^-$  and  $\text{O}^{2-}$  ions ( $1.32-1.33\text{Å}$ ) and those of  $\text{Be}^{2+}$ ,  $\text{P}^{5+}$  and  $\text{S}^{6+}$  ions ( $0.34-0.35\text{Å}$ ), Rây predicted and established the isomorphism of simple salts, double salts and alums derived from  $[\text{SO}_4^{2-}]$ ,  $[\text{BeF}_4^{2-}]$  and  $[\text{PO}_3\text{F}^{2-}]$  anions. Rây concluded that the, "*Ability to form mixed crystals, homomorphism and identity of chemical formula are not necessary coexistent*". This stood as a modification of *Mitscherlich's law of isomorphism*, which restricted isomorphism and mixed crystal formation only among the compounds with similar chemical formula. The unusual compound, *Mercurous nitrite* was discovered by Rây unintentionally, while he tried to dissolve mercury in dilute nitric acid in order to prepare mercurous chloride for fabricating a *calomel electrode* required for some electrochemical experiment of one of his research scholars. It was the first compound discovered by an Indian chemist working in Britishruled India, published in foreign journals, and

well-acclaimed and corroborated by various laboratories abroad. Through this discovery, not only Rây became famous among the World's chemists as *The Master of Nitrites*, but at the same time, the research findings of Indian chemists working in British-ruled India earned international recognition. Rây's contribution in the field of coordination chemistry was of fundamental nature. In establishing the structure and bonding of some of his platinum complexes, derived from mercaptanic ligands, Rây for the first time, proposed *metal-metal bonding* in coordination compounds, a concept that was not pronounced in *Werner's Theory of Coordination Compounds* (1893), which earned Werner the *Chemistry Nobel* (1913). This concept subsequently gave birth to a large number of such compounds of the platinum group of metals. Metal-metal bonded *cluster compounds* formed one of the most fascinating areas of modern coordination chemistry. By writing the book, *The History of Hindu Chemistry* (Vols. 1, 1902; 2, 1907), Rây gifted to the scientific World, the glorious achievements of the ancient Indians in the fields of chemical and medical sciences. The word "Hindu" of course, had no religious implication. It was possibly originated from "*Hindustan*", India's name, derived from the ancient "*Indus valley*". Foundation of the *Indian Chemical Society* (1924), a forum of chemists for publication of research findings of Indian chemists working in India under the British rule, had been another great contribution of Rây to the chemistry community. The *Journal of the Indian Chemical Society (JICS)* now publishes research findings of chemists from all over the World.



Instruments in the museum, fabricated by Sir P. C. Rây for his research work

The *Bengal Chemical and Pharmaceutical Works* established by Rây (1903) stands as a symbol of India's first step towards achieving self-reliance in chemical industry for elimination of unemployment from among the educated youths of Bengal. His greatest contribution to chemistry was, however, the creation of a *school of chemistry* at the University College of Science, which nurtured several

distinguished chemists of the country. Many of Rây's disciples moved to the other parts of the country as torch bearers of chemical science and illuminated different Universities, Colleges, Research Institutes and Industries with their knowledges. That was how Prafulla Chandra became the *Acharya, the founding father of modern chemistry and chemical industry in India*.

#### **Swadeshi andolan**

Right from his young age, Rây was a *great patriot and humanist*. He even refused to use their family title, "*Rây Chaudhury*", meant for the land lords or *zamindars* and used only *Rây* as his title. All his thoughts and works were aimed at the welfare of India and her people. Sufferings of Indian people under British rule so deeply hurt him that while preparing for his B. Sc. Degree Examination (1885) at Edinburgh University, Rây participated in an essay competition, and created a sensation by his essay entitled, "*India Before and After the Mutiny*", wherein he described India's conditions before the *sepoy mutiny* (1857) and thereafter, showing thereby, tremendous courage to criticize the British rulers while studying in Britain. Naturally, his essay was not adjudged for the prize, but his article earned honourable mentions in British news papers and appreciations from several members of the British Parliament. Back in India, Rây became very close to Mahatma Gandhi. Alongside chemical research, he participated in the nationalist movement, *swadeshi andolan*, for India's freedom through non-violence and non-cooperation. He was so deeply involved in the freedom movement that once he said, "*Science can wait but Swaraj cannot*". He was, of course, totally opposed to India's partition on the basis of religion. A lover of *World peace*, he was dead against Hitler's fascism and opposed to India's joining the World War. Along with Roman Rolla, Rabindranath Tagore and Jawaharlal Nehru, he sent a peace message to the *World Peace Congress* (1936) held in Brussels.

As a *Companion of Indian Empire (C.I.E.)*, Rây acted as India's representative to the *Empire University Congress* and pressed for greater Govt. support for higher education and research in India. He was in the forefront in *teachers' movement* in undivided Bengal and was the founder President of *All Bengal College University Teachers Association (ABCUTA)*, established in 1929, which was subsequently transformed into *West Bengal College University Teachers Association (WBCUTA)*.

#### **Humanitarian works**

Whenever flood, draught, famine, epidemic, *etc.* broke out in Bengal villages, the kindhearted Professor would stop his research work in the chemical laboratory, collect relief materials and rush to the victims for *relief works* with a group of young

volunteers comprising research scholars and students from the University and Colleges, which even included the likes of *Netaji Subhas Chandra Bose* and eminent scientist *Dr. Meghnad Saha*. Through such humanitarian works, Rây could rediscover the *Indian society*, which was deep stricken in poverty, illiteracy, superstitions and above all untouchability. Worst were the conditions of women, particularly in regard to literacy. Since the Indian society, by and large, were family centric and mothers in all families had to play the central role, Rây gave top priority to *women education*. He established and or patronized several girls' schools in different parts of Bengal. He published his autobiography, "*Life and Experience of a Bengali Chemist*" (Vols. 1, 1932 and 2, 1935) in English and "*Atmacharit*" (1937) in Bengali, which he dedicated to the youths of India for motivating them to work for national regeneration.

#### Donation

After attaining superannuation, Rây did not take any salary (Rs. 1000/-pm.) due to him as the University Professor and returned the entire accumulated amount to the University of Calcutta as donation for establishment of research laboratories, purchase of equipment and institution of various research scholarships and prizes, viz., Nagarjuna Prize and P. C. Ray Research Award (Chemistry), Asutosh Scholarship (Botany and Zoology), for the worthy research scholars. He lived on his pension (Rs. 420/-pm.), due to him for his past service at Presidency College, but did not spend more than Rs. 200/- for his personal expenses and donated the rest for welfare works and fellowships (@ Rs. 20/- each) to needy students. The University offered him a suite in the part of the *Palit Building* that is assigned to the department of chemistry constructed out of his donation, where the *Acharya* lived with some of his research associates a life of extraordinary *simplicity*, which even surprised Mahatma Gandhi.

#### Tribute

The great humanist and patriotic Professor breathed his last on June 16, 1944, leaving the entire scientific community and the Indian society as a whole, in a state of mourning. His place in the Indian society could be revealed from the headlines, "*Bijnaner Rishi, Swadesh Premik, Acharya Prafulla Chandra Rayer Lokantar. Desh Sebay Utswagikreetapran*

*Manab Shresther Parolokgaman*" appeared on the very next day's *Ananda Bazar Patrika*, the most widely circulated daily news paper in Bengal.

The great chemist, and a kind-hearted, benevolent, humble and patriotic Professor, who had become an icon of *plain living and high thinking*, was devoid of any vanity and pride, like a saint, "*Bijnaner rishi*", as people would call him, often used to say, "*I have no sense of success on any large scale in things achieved...but have the sense of having worked and having found happiness in doing so.*" His quest for knowledge, however, remained unending even at the end of the day, when he said, "*I was never a more bonafide student than today*", which would remain as the last words in science. As a mark of tribute to the great Professor and the great Chemist, the University in 1997 established the '*Acharya P. C. Rây Museum*' in the department of chemistry, covering part of the space used for his living. The museum houses his personal belongings including his collection of books, manuscripts and reprints of his articles and lectures and a few equipment he fabricated for his research. A *temple of learning*, pilgrimage of the chemists all over the India, the museum is kept open to the public on all working days. Here lived the man who initiated modern chemical research and chemical industry in India.

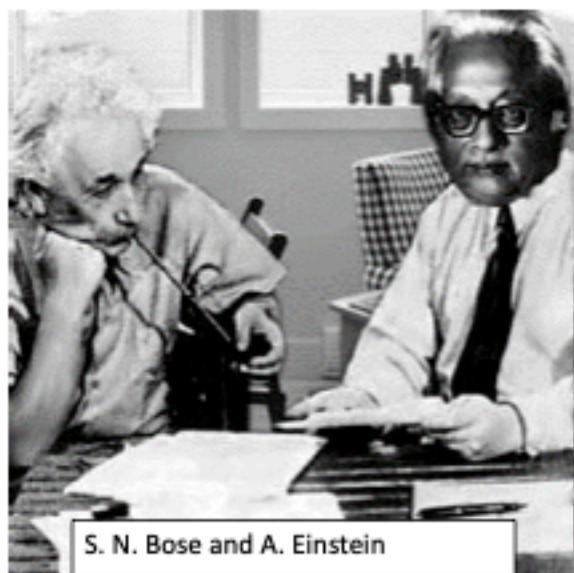
Coincidence of his 150<sup>th</sup> Birth Anniversary with the *International Year of Chemistry* (2011) had been a blessing in disguise, which gave all Indian chemists an opportunity for celebrating both the occasions together in an auspicious manner. As a mark of paying its most respectful homage to its illustrious Professor, the University of Calcutta, on the occasion of his 150<sup>th</sup> Birthday (2010), has installed his bust at the main entrance of the University College of Science at 92, Acharya Prafulla Chandra Road, Kolkata-700009, facing the *Acharya Prafulla Chandra Road*, named after him. *The Royal Society of Chemistry (London)* on September 29, 2011, declared Acharya Sir P. C. Rây as the *Father of Indian Chemistry* and honoured his life and works by conferring on him the first ever *Chemical Landmark Plaque* outside Europe. The author would remain grateful to the "CU Praktoni DC" for giving him an opportunity to pay tribute to his *Grand-Teacher* through this article.

**About the author:** Professor Gurunath Mukherjee (M.Sc., Ph. D., Calcutta University), held the coveted chair of Sir Rashbehary Ghose Professor and Head of the Department of Chemistry, University of Calcutta. He specialized in inorganic chemistry, did his Ph. D. research with Professor N. N. Ghose, the last disciple of Sir P. C. Ray, in the same laboratory, where the Acharya of Indian chemistry used to guide his research students.

Mukherjee's research interests had been in the fields of coordination chemistry, analytical chemistry and bioinorganic chemistry, especially in computer modeling of mixed ligand complex equilibrium of biological relevance, wherein, he published extensively in reputed National and International Journals and guided several Ph. D. scholars. He also authored a few books on UG and PG level inorganic chemistry for Indian Universities.

## Meeting Professor Satyendra Nath Bose: A memoir

Gokul C Das



It was quite chilly, otherwise a sunny morning in Kolkata in the first week of January 1974. I was on my way from my apartment to the Palit laboratory in the Physics department, Science college, on Acharyya Prafulla Chandra Road. I was captivated by a group of gentlemen in formal attire enjoying the warmth of the rising sun directly over Brahma Balika Vidyalay in front of Bose Institute and conversing in a Bangladeshi accent. I came to know that they are from Dhaka University; they came here to celebrate the Golden Jubilee year of Bose-statistics coincided with the 80<sup>th</sup> birthday of their teacher Prof. Satyendra Nath Bose, the founding father of Bose-Einstein statistics. This groundbreaking discovery was made when Prof. Bose was a reader in the Physics Department of Dhaka University. I came back from the laboratory to join and while waiting in the lawn in front of the lecture hall of Bose Institute, Prof. Bose came in about an hour wearing an off-white sport coat and a matching trouser, thick eyeglass and had gray hair, and seemed as if a yogi is immersed in his own mind. After many of his students, I got the opportunity to pranam him by touching his feet. His hand touched my head in a gesture of ashirwad. When I introduced myself, he responded, "O tumi Niroj-er chhatra" (referring to my revered professor Niroj Nath Dasgupta, Palit Professor and Head of the Department of Physics). I felt a spark entering in my body when I touched him; his presence and radiating personality created a heavenly atmosphere around him. In my recollection he did not deliver any speech. One by one his students from Dhaka University came to the dais, touched the feet of their master before delivering a short speech about their association with

him; in my recollection, the first one was probably from the Vice Chancellor of Dhaka University or from Prof Abdul Latif Chowdhury of the Physics department. I remembered his name as I witnessed a very emotional encounter of a successful student and his world-famous teacher after many years! There were a sizable number of speakers from Kolkata as well. This was the first time I met Prof. Bose.

My second and the last visit ironically to Prof. Bose was in a month later on February 4, 1974, and that was regrettably to bid him farewell for forever. He lived in the neighborhood of Hedua park near Scottish Church College. The Head of the department of Physics of my college, Prof B. N. Ghosh, a former Student of Prof Bose, was living nearby at 6B Sahitya Parisad Street. From his stairs to the first floor, Prof Bose's study room on the second floor (third floor in USA) was clearly visible. In the morning of February 4, he informed me that Prof Bose passed away last night. I joined him to put a wreath on his master's body. His body was lying in peace on the ground floor. I touched his feet second time for my immense respect towards him, wishing his immortal soul to be rested in peace. I was terribly depressed! I met him just a month ago, now only his body is here but his soul has moved to an unknown world! Prof. Ghosh came back, but I joined the funeral procession with my professors of Physics department and of neighboring institutes, such as, Prof Sibabrata Bhattacharya who was his PhD student leading the procession in a bare foot to the best of my recollection.

Before meeting Prof. Bose, I read about his discovery in our MSc physics class. The discovery of Bose-Einstein (B-E) statistics happened accidentally in one sense and the related story is well known to most physics' students. Prof. Bose at that time was a Reader in Physics in Dhaka University. It was a golden era of Physics filled with many fundamental discoveries one after another, such as, Einstein's theory of relativity, Planck's black body radiation, Einstein's photoelectric effect, Bohr's model of atomic structure, de Broglie's wave-particle dualism, etc., to name a few. In his class of mixed mathematics/physics of postgraduate students Prof. Bose was teaching the theory of radiation and existing ultraviolet catastrophe (the problem of predicting energy distribution of blackbody radiation that diverges at high frequencies). He mentioned that contemporary statistical theory is not adequate as its prediction of results does not agree with experimental data. His belief was that that Maxwell-Boltzmann (M-B) distribution would not be right for microscopic

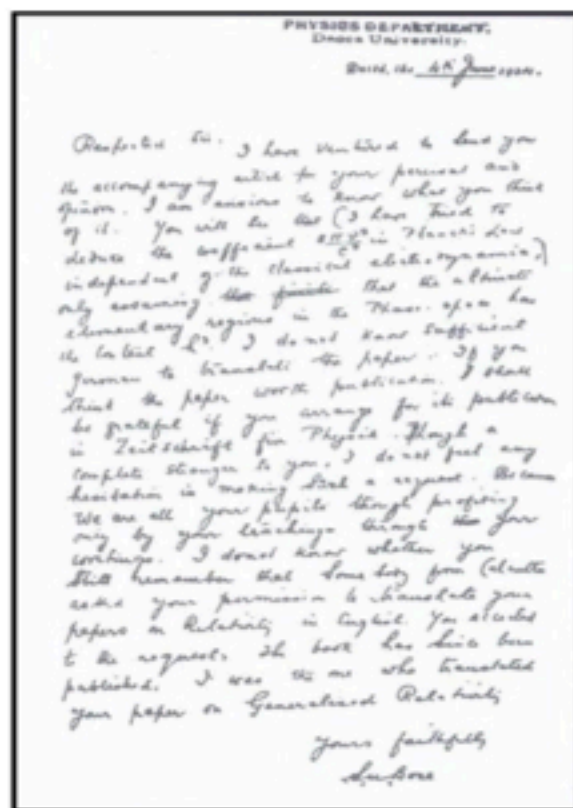
particles, where the fluctuations due to Heisenberg's uncertainty principle (impossibility of knowing both the position and speed of a particle with perfect accuracy at the same time) is significant. Rather, he favored to find the probability in a phase-space (a multidimensional space in which each axis corresponds to one of the coordinates needed to specify the state of a particle) instead of considering their positions and momentum. But in the deduction, he made a statistical error himself and got the correct result. This simple mistake was that he considered the particles non-distinguishable that basically changed the probability of finding two identical particles in a given space. This modified probability of outcome could be easily understood from the following example. By flipping two different fair coins with one side head (H) and opposite side tail (T), the outcome of two heads (H) could be put down as: HH, HT, TH, TT suggesting the probability is 1/4; for non-distinguishable fair coins, the probability of finding two heads is actually 1/3 (HH, TH, TT). The M-B statistics was developed for gaseous atoms and molecules, and the particles there are distinguishable from one another. Prof. Bose labeled the particles non-distinguishable and got logically satisfactory derivation based on Einstein's photon concept of light. This opened the door of a new world- The Bose- Einstein statistics. Extraordinarily talented Bose was also blessed with high level of academic spirit at the same time. He submitted the entire lecture as a manuscript to a philosophical magazine in London, but it was turned down. Probably, his science was not understood, or the journal was not suitable for publishing articles in Physics at that time.

Prof. Bose believed seriously in the concept of Einstein's light quanta proposed in 1905 to explain photoelectric effect for which Nobel prize was awarded to him. He next prepared a paper on "Planck's Law and Light Quantum Hypothesis" applying his statistics and sent this paper directly to Dr. Albert Einstein with the following letter on June 4, 1924, as quoted, which is exemplary in the history of science (the original is shown in the box):

*Respected Sir,*

*I have ventured to send you the accompanying article for your perusal and opinion. I am anxious to know what you think of it. You will see that I have tried to deduce the co-efficient  $8\pi\nu^3/c^3$  in the planck's law independent of classical electrodynamics, only assuming that the ultimate elementary region in the phase space has the content  $h^3$ . I do not know sufficient German to translate the paper. If you think the paper worth of publication, I shall be grateful if you arrange for its publication in Zeitschrift fur Physik. Though a complete stranger to you, I do not feel any hesitation in making such a*

*request. Because we are all your pupils though profiting only by your teachings through your writings. I do not know whether you still remember that someone from Calcutta asked your permission to translate your papers on relativity in English. You acceded to the request. The book has since been published. I was the one who translated your paper on Generalized Relativity.*



Einstein translated the paper into German, sent it to Zeitschrift fur Physik for publication, and wrote back to Bose: "Your paper is a beautiful step forward...". The publication brought recognition to Bose, and he spent two years with a leave of absence from Dhaka University in Europe to work at X-ray and crystallographic laboratories, where he worked alongside Einstein and Marie Curie, among others. In October 1925 Bose travelled from Paris to Berlin to meet Einstein for the very first time. Einstein generalized Bose's theory in 1924-1925 to atoms in collaboration with Bose and named the new statistics as the B-E statistics with Bose's name first. All elementary particles in nature obey either the BE Statistics, or the contemporary Fermi Dirac (F-D) statistics; the associated particles are called Boson or Fermion, respectively. Both are for indistinguishable particles. B-E statistics do not obey Pauli's exclusion principle (two electrons cannot occupy the same quantum state in the atom) but the other does. Another major distinguishing characteristic between

the two statistics is that Bosons have integer spin (0,1,2,3...) in contrast to Fermions which have half-integer (1/2, -1/2, 3/2, -3/2, 5/2, etc.) spin. When Bosons with spin 1,2,3 and so on were identified but particle with 0 spin was not, for many years until Higgs Boson was discovered. In 1964 Peter Higgs proposed an electromagnetic field in which the whole universe is immersed. This Higgs's field and a Boson associated with it (Higgs Boson, dubbed the "God particle") were later verified in 1995 in CERN in Italy/Switzerland in the Large Hadron Collider (LHC), the largest one in the world, that gives the mass to all elementary particles. This discovery brought the Nobel prize to Peter Higgs and his colleague. After Bose's death six or seven Nobel prizes were awarded on subjects related to Bose's work, the very first one being the demonstration of Bose-Einstein condensate in 2001 by Eric Cornell, Wolfgang Ketterle, and Carl Weiman. As the particles obeying B-E statistics are non-distinguishable and can occupy the same energy state at low temperature, they become crowded and give rise to Bose-Einstein condensate (considered as the fifth state of matter after solid, liquid, gas, and plasma) according to what Bose and Einstein predicted in 1920s; they could not prove it due to the lack of sophisticated technical development. In contrast, contemporary F-D statistics, which is valid for electron, proton, and neutron, obeys the Pauli exclusion particles and cannot occupy the same energy states at low temperature. It is very unfortunate that Prof. Bose himself was not awarded a Nobel prize in his lifetime although he was nominated; it is probably due to the lack of experimental proof of his quantum statistics at that time, similar to what happened for Einstein's theory of relativity or Hawking's radiation from black body.

Prof Bose's office with a name plate "Prof. S. N. Bose, National Professor of Physics", which was on the ground floor in science college. Our Palit Laboratory, which was once occupied by Prof. Meghnad Saha, was assigned to my professor, N.N. Dasgupta (a student of both Prof Bose and Saha) was just two rooms down the hallway. In eight years of my life in science college, every day I used to pass his office many times! Never I have seen Prof Bose in his office. When I used to leave the laboratory in the late evening, I usually found some of our Class D staff (Suren and Ram) were already preparing their bed for a good-night sleep in front of his office in the hallway as if to guard the office at night! After Prof. Bose's death, Prof. Mahadeb Datta of Applied Mathematics used to come in the evening to spend an hour or two in this office in a dhoti and a Punjabi, or in hot summer afternoon in bare body displaying his initiation thread well below the waist. I had an opportunity of exploring Prof. Bose's personal library

inside the room. Two parallel running metal bookshelves, wall to wall, with multiple racks were full of books, all signed mostly by his full name, Satyendra Nath Bose, at a stretch by a handle-pen and ink. Out of curiosity, I opened many of them. These were mostly the complimentary copies from eminent physicists around the globe, such as, Louis de Broglie, Marie Curie, Erwin Schrodinger, Paul Langevin, P.M. Dirac, to name a few; most of them, if not all, were awarded Nobel prize in physics or chemistry. What a great feeling as there was a touch of the renowned physicists on these books while signing their names from the other part of the world! It reminded me in the rapidly developmental phase of modern physics, relativity or quantum mechanics, Einstein labelled one of his drawers in his patent office as the department of theoretical physics that housed, in fact, the materials for three different branches of physics! Hopefully, these books are now preserved in the library of the Physics Department or in S. N. Bose National Center of Basic Sciences in Kolkata.

Bose's interest at later stage of his life was very diverse- including physiology, biophysics, literature, and music. He wanted to take science to the people and believed education in mother tongue is the best for a developing nation where majority of population is illiterate. He even inspired everyone to write scientific articles in Bengali. He was the Founder-President of Bangiya Bijnan Parishad and launched a Bengali journal, Jnan O Bijnan.

Many years later, I had the opportunity to visit Dhaka University when I delivered a lecture at the International Diarrheal Disease Research Center in Dhaka on a subject of molecular biology. Particularly, I visited the Physics department and the office Prof. Bose used during his stay in Dhaka. The office was a room of about 25'X25' with a wooden table and a few chairs, a steel almirah, and a small show case. There was also a stand for hanging coats on the floor on one side. In the back wall there were a long clock, and a small wooden board with the names of the faculty members. In the opposite side, there was a sofa with a small wooden coffee table, a board to write, and a portrait of Prof Bose hanging from the wall. It is my understanding that Prof. Bose made his discovery while teaching in the postgraduate class of eight-ten students in his office.

What a joyous feeling and adventure! I came from where Bose was born, now am standing right at the birthplace of Bose-Einstein statistics! So far, many discoveries (at least six or seven) are carrying Bose's name in one way or other, as they were based on the foundation that Bose made. Their interaction is exemplary and purely academic, exceedingly rare in real world. Prof. Bose will be immortal with his name associated with Einstein and with Boson.



গল্পে ও ভাবনায়



## The Others

Driitan Chakraborty  
Grade 7

A bright streak of light cut through the night sky, as millions viewed. Standing out in the black and starry, the phenomenon was dismissed as a shooting star until it crash-landed on the border of the Mid-Western US. When people rushed to investigate, what they discovered shocked them. The object was no meteorite, it was completely smooth and devoid of cracks, dents, or any kind of damage, except for a mysterious engraving. Upon further investigation, it was discovered to be hollow and empty. Within the next several months, an international body of renowned scientists gathered to probe the object, and they concluded that this object came from an alien world, as it was made of an alloy from a metal not found on Earth and a unique type of gold that is usually found along the Nile River. The world was in an uproar; they named it "Ignotus", meaning "unknown" in Latin. Ignotus was possibly the greatest proof of extraterrestrial life, but still, mysteries remained. Who sent it? Where did it come from? And, what do those engravings mean? World's top scientists and linguists failed to solve it, but humanity would not give up. Soon private sectors began to devote themselves to solving the mysteries behind Ignotus. Telescopes were pointed toward the stars to check for any more incoming pods, but none were found. Time passed, progress slowed, and funding was about to be dried up and turned to more pressing matters.

It had been 5 months since the discovery of the alien pod. Jason Brown the head linguist of one of the divisions in the E.R.P. (Extraterrestrial Research Program) devoted all his assets and experience to solving Ignotus but nothing came out of it. Now, he had heard rumors that his superiors were about to take away funding from his project.

With a weary sigh, he decided to wrap up another fruitless day and headed toward his car. Upon returning home he saw his open suitcase reminding him of his upcoming trip to the UK to visit his family. His time limit grew shorter if he didn't make some progress by tomorrow, and with a lack of funding, he may have fewer hands to work when he got back. Sitting on his bed, he began to think of ways to speed up progress; there had to be something that had been overlooked, but nothing came to mind.

When returning to work the next day he had a new theory. Various people said that they felt uncanny familiarity when working with the engravings on Ignotus. Maybe this pod contained some form of language found on Earth. Jason started with more known languages like Chinese and Korean to find some patterns between them and the engravings. By lunch, he had gone through half of his entire language database but was still no closer to deciphering Ignotus. Gritting his teeth, he slammed his fist on his desk in anger.

"You good?", a voice behind him asked. Jason turned around to find one of his coworkers, Dr. Elena Stratt,

"Yeah, I'm fine", he replied.

"You gonna have lunch? You look pretty busy."

"Yeah", he replied. As he walked toward the cafeteria, he knew he was running out of options, and time.

Finishing up his meal, he hastily returned to his workstation. He had realized something on lunch break. A lot of languages don't necessarily read from left to right; some are reversed. There was a small chance that whoever sent this pod, their order of reading could be different from any language on Earth. This new input command increased the number of options to almost infinity. It took him a couple of hours to alter his script, which was now enabled to scan characters regardless of order, and at least give him some recognizable letters if not completely translate it. "If this doesn't work, nothing will", he muttered, getting to work.

After a few hours, however, he was completely demoralized. His fresh script had come up with no matches whatsoever, and he was slowly growing numb to it. He had spent the last half an hour troubleshooting his code, but his debugging had turned up with no errors whatsoever. As his clock slowly counted down to the end of the day, he had to admit defeat. He would continue but it was clear that his methods were not working, besides he had a plane to catch. Exhaustedly packing up his things, he left his office preparing to head back home.

Packing his suitcase he headed to the airport, and after a couple of hours, he boarded his plane and flew to London. When arrived at the London airport his family was waiting for him. As soon as he stepped out of the exit door, his family rushed to greet them before even London's morning breeze touched his face. Ever since moving to the United States a few years ago, this was the longest they had been apart.

"How is life in the U.S.?", Jason's mom asked.

"Pretty good",

"Meet anyone?", that was his dad.

"Not yet", his family laughed, and his dad slapped him on the back. Exhausted and happy he could almost forget his failure back in the U.S., but the guilt remained; the feeling that he could have contributed to something great, but ultimately failed lingered. The next day he went out with his family, they ate out, walked around, and generally spent time together before he would leave. That afternoon, he went out to visit his favorite place in all of London, the British Museum. In addition to being a linguist, Jason was a huge history buff and would spend most of his free time reading and studying history. He especially liked ancient civilizations, which made the British Museum his favorite place to visit. He also needed a way to forget the decline of the E.R.P., which he felt responsible for. Wandering through the museum he felt awed, he had spent countless hours as a child here, and still couldn't get over the feeling of amazement as he looked at all the artifacts surrounding him. However, it still wasn't enough to quell his guilt.

"You like it here, huh?", his mom asked.

"Yeah", he said, but it came out wrong.

"What's wrong?", his mom asked, picking up on his tone of voice.

"It's nothing,"

"Tell me,"

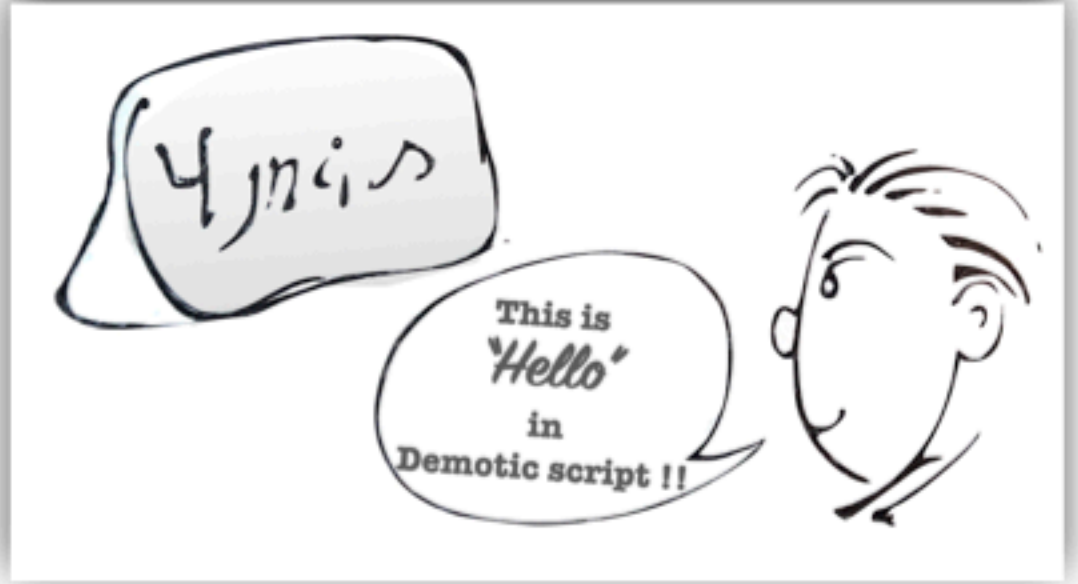
"It's just that I feel responsible for the failure of the E.R.P. We spent so long studying Ignotus, but it just didn't matter in the end", he sighed.

"Failure is a part of life

Jason. Sometimes we must accept that we can't do something, but that doesn't take away from who or what we are".

"That honestly sounds like some cheesy quote from a Disney movie", "Probably is actually", his mom replied.

He laughed, it was probably the best feeling he had felt during the past week, but he quickly fell silent, something catching his eye. The Rosetta Stone, his favorite artifact out of them all. Discovered by Napoleon's forces in Egypt, it contained Greek, Demotic script, and hieroglyphics, allowing paleontologists to finally translate hieroglyphics. *Wait a minute.... Egypt, Jason thought to himself, Wasn't the pod made from gold from Egypt? Up to this point, he had tried modern languages, but nothing like the pod had happened in recent memory or when these languages were widely spoken. If it was made from gold from Egypt, then the only time it could have happened was when recorded history was unreliable or non-existent. The thought gave him hope for one last try, one last shot in the darkness.*



As soon as he stepped out of the car, he booted up his computer. Opening his application, he started to analyze the engravings. Right off the bat, he could see that it looked nothing like hieroglyphics or the Greek alphabet. That left two options: Demotic script and hieratic script, something not on the Rosetta Stone but still used by the Egyptians. Feeding both systems into the application, it didn't take long for the computer to find a match. The engravings turned out to be Demotic script characters rotated at a 45-degree angle. Jason stared at the computer in shock. He had spent countless weeks pouring his blood, sweat, and tears into this, and finally, after all this time he had solved it. His translation wasn't perfect, but he decrypted it and found this message: "Greetings, we know it has been a long time since we have spoken to you, but our species is running out of time. Our sun is on the verge of exploding and taking out everything along with it. We are heading towards you, be ready!"

কলিকাতা শোনে নাকো  
চন্নার খেয়ানে  
নৃত্যের নেশা  
তার স্তম্ভে দেওয়ানে

## A Glimpse of HOPE

Anushka Chakraborty



After fundraising for The Hope Foundation (HOPE) for a year, and raising awareness about its causes, I witnessed with my own eyes for the first time what the organization truly works toward. I also learned about the circumstances of each group HOPE works to help. In truth, the information and context about each of HOPE's

efforts made my trips to their sites far more valuable than I could have ever imagined. I visited four HOPE sites in Kolkata, all of which cover different aspects of the organization's mission. In this article I will share my experience at the HOPE Crèche.

This facility is for 3 to 6-year-old street-connected children whose parents are unable to provide hands-on care for their children throughout the workday. What intrigued me were the reasons these children attended this crèche. Often both parents work all day to make a living, and these small children have no one else to look out for them. Sometimes both parents are unable to care for the child due to a medical illness or physical disability. These problems all lead to the stifling of a growing child's learning and well-being. Street and slum-connected children are not in the situation to be able to receive holistic support from both their parents, let alone financial support. This is where the HOPE Crèche comes in. It serves as a free-of cost pre-school for the street-connected and slum children that do not have the resources to learn otherwise. At the crèche, they utilize activity-based learning to teach the children.

As soon as I entered the Crèche, all of the adorable little kids welcomed me with big smiles and outstretched hands. I felt warm and welcomed by everyone there, not only the kids, but also the

teachers, who were kind enough to let me sit and play with the kids. I watched the children sing educational songs together, guided by the teachers. The songs covered fun and basic topics like the days of the week, months of the year, fruits and vegetables, and more. The kids all sang along enthusiastically and even encouraged me to join them. Afterwards, I sat on the carpet with the kids, and they taught me games they like to play, like making a "kola gach" by stacking fists on top of each other. A few children also sang and danced for me, showing me their 15th August celebration performances. They all had the warmest smiles on their faces, and I felt so lucky to be able to experience their happiness and enthusiasm for learning. The kids also made me a card, and gave it to me after everything was over.

I visited three more centers; Naboasha – supportive education for the school going children; Skill development unit- for the underserved youth looking to gain marketable skills; and Brian's Way – for the children with special needs. Throughout my visit, I learned that charity means more than just money for impoverished communities. Many street and slum-connected communities in Kolkata do not have access to proper healthcare, or to after-school support. So often, money by itself does not amount to a fulfilled life. HOPE works to create supportive resources for them which add value to their lives. HOPE creates opportunities for education and skill building, and support people receive their identity documents, to claim the services they are entitled to. Now I know my fundraising for HOPE doesn't just mean giving money, it means enhancing the resources that furnish their lives with equal opportunity. From toddlers without parents who deserve to learn, to school-attending children deserving of a place to study and feel safe, to young adults that deserve the foundational skills for a job, to special needs children who deserve care and acceptance. Equal opportunity. That is what The Hope Foundation is all about. And in a world full of people in need, it is quite a promising glimpse of HOPE.

*The Hope Foundation (HOPE) is an international NGO dedicated to ensure sustainable development goals for the urban poor communities in Kolkata. To learn more and get involved please visit [www.hopefoundationusa.com](http://www.hopefoundationusa.com) Fifteen years old Anushka Chakraborty is a HOPE volunteer and a junior at the Downingtown STEM Academy, Pennsylvania. She visited HOPE projects in Kolkata on August 2023 as part of the School Immersion Program.*



## Rockies Trip Log

Ishayu Ghosh  
Grade 7



Over the summer, my family went to the Canadian Rockies, some of the most visited national parks in Canada, Banff & Jasper national park. The Canadian Rockies are some of the most vast, beautiful mountains in North America, let alone the world. The Canadian Rockies of Alberta and British Columbia include some quite remarkable national and provincial parks. These fascinating peaks, lakes, and chasms bring plenty of people from all over the globe.

Banff National Park is one of all of the national parks in the Canadian Rockies and is the most visited national park in Canada. Banff is known for attractions like Moraine Lake and Lake Louise. The unique touch to these lakes in this part of the Rockies are the color of the lakes. The lakes are rather more cyan or turquoise than other lakes. This is caused by the way air molecules reflect light to what we eventually see. The fine rock dust at the bottom of these lakes, caused by rubbing together glaciers, make the light reflect in a way that appears to be turquoise. Although these lakes seem like a must visit, you have to reserve a shuttle ticket to get to lake Moraine, or either do the same for Lake Louise, or park at Lake Louise. Another exceptional part of Banff National Park is Icefields Parkway, with lakes, glaciers, and even more than that. Icefields Parkway is a road towards the town of Jasper, passing some very picturesque lakes, glaciers, and mountains. Perhaps some of the best lakes in the area are Hector Lake, Bow Lake, and best of all Peyto Lake. These lakes all have the same turquoise-effect that Lake Moraine and Lake Louise have. All of the lakes have their own touch to them. The road has many viewpoints, campgrounds, trailheads, and restrooms. Icefields Parkway takes place in both national parks, Jasper, and Banff. Just beyond the Jasper-Banff border, there is a huge glacier called Athabasca glacier, located in a place called the Columbia icefield. We have probably all seen a glacier or huge sheet of ice in a picture, but with the "Toe of the Athabasca glacier" trail, you can go walk, touch, and feel the chill of the glacier. When I went near and on top of the glacier, it felt like the temperature went down from eighty degrees Fahrenheit, to zero. The glacier is huge, with the end of the icefield out of sight. The ice is mostly rough, but there are small creeks of flowing water that find their way through the glacier. In these small creeks of water, there are sometimes pieces of ice flowing or on the bank of the creek. This means you can eventually hold some of the ice on the glacier. There are many tours that are more than two and a half hours long, which take a shuttle to the glacier, and then let you walk on the glacier, and

take you to the sky bridge, which comes back to the Columbia Icefield visitor center. Those tours are pricey, though.

Yoho national park is another part of the national parks of the Canadian Rockies. Yoho is west of Banff National Park, but also uses the Trans-Canada Highway as its main road. One of the more famous lakes, Lake O'hara is probably one of the best lakes in the whole of Canada, maybe even North America. But getting there is never easy. Just like Lake Louise, and Lake Moraine, they use a shuttle to get to the road, but they only send around 200 people per day. Even if you reserve a spot, sometimes they have lottery systems that eventually sometimes rule you out. That's why even locals of the area struggle to get there. Takakkaw falls is another tourist attraction in the park, which is located on the Takakkaw falls road, which goes up the mountain, eventually leading to Takakkaw Falls, Yoho Lake, and Angel's Staircase. The falls is one of the tallest I've ever seen. One of my favorite things to do in the park is finding the red chairs, which are pretty much in every park. One of the widest falls in the park is Wapta Falls. The hike to Wapta falls is around 3 miles round trip out and back. Wapta falls flows through the mighty Kicking Horse River, which flows through another great place in Yoho National Park, the Kicking Horse Pass, which is almost near the Banff-Yoho border. 15 miles west beyond Kicking Horse pass, comes the town of Field. Field is a peaceful town across the bridge over the Kicking Horse River, which has many historical points, and a few places to eat. Another tourist attraction in the area is Emerald Lake, which really stands for its name. Emerald Lake is a beautiful lake, quite large, and the color of the water is even cooler; it's the color of Emerald, also caused by the way light reflects towards our eyes.

Just south of Banff national park, lies Kootenay National Park, which is personally one of my favorite parks in the Canadian Rockies. Just like the other parks, Kootenay is full of lakes. Just off the Trans-Canada Highway, Highway 93 south is the main road for Kootenay National Park. Just before the border between Kootenay and Banff lies the lakes, Boom Lake, Vista Lake, Arnica Lake, & the Twin Lakes. Boom lake is around a 6.5 mile out and back trail, and vista lake, which is probably my favorite, is a 1.5-2 mile out and back, with a viewpoint near the parking and trailhead. The lakes are also unique in color, and wildlife is seen sometimes. Although we did not see any wildlife, there have been a few sightings in the area from bears to elk and deer. Once you enter the park, one of the first places to go is Marble Canyon.



Marble Canyon is a very deep canyon that is abundant with marble, which also makes the creek that flows through the canyon white. At the last bridge of the canyon, there are two pretty fascinating falls, and near that, there are even red chairs. There is no doubt that area of Kootenay is really beautiful, and there are so many landmarks, I might end up missing some of them, but as we drive one hour down the highway towards the end of the park, we enter the town of Radium Hot springs, which is also a very popular spot in the park, which is where one of the famous hot springs are located, which are swimmable, and where Sinclair canyon are located. Although we did not go all the way down towards Radium Hot Springs, it is one of the best locations to see in the whole Kootenay National Park.

After seeing Wapta falls, going west for 30-40 minutes brings you to the valley town of Golden, British Columbia, Canada, where there are many places to stay in the town, along with many places to eat. One hour west of the park, we reach Glacier National Park of Canada, commonly confused with the one in Montana, there are many steep and hard hiking trails, many bears, (although we did not see any), and a nice visitor center, called Rogers Pass visitor center. The parks are not always crystal clear, though. Wildfires invade a lot of the parks, blurring and smoking the views up. The park is a great park, no doubt about that, though.

If you go even more west of Glacier National Park of Canada, Mount Revelstoke National Park, based upon the park's name Mount Revelstoke, has a summit road called Meadows in the Sky parkway, as which you can drive all the way up to the summit of the Mountain. On a very clear day, you might be able to see the Revelstoke Lake and dam from the top, but on the day that we came, we almost couldn't see anything. Along the trails there is a trail to Jade Lake, Miller Lake, and Eva Lake, which are very nice lakes, but the hikes are quite long and strenuous. Just 5 miles west of the entrance of Mount Revelstoke Summit, the town of Revelstoke lies. right along the Columbia river, where there are landmarks like the Revelstoke Dam, which has tours and a visitor center, where you can go to the top of the dam. The dam causes part of the Columbia river to become Revelstoke Lake, which on a very clear day, you can see from some of the viewpoints on the summit of Mount Revelstoke. The dam is very large, so seeing the dam from the top is not a rare catch at the summit, either.

Among the national parks of the Canadian Rocky Mountains, the largest national park is Jasper National Park, one of the most majestic mountains in the Rocky Mountains. Crossing the Banff-Jasper border in icefields Parkway, we come across the Athabasca Glacier, the huge icefield. Soon enough, Sunwapta Falls comes into sight. Sunwapta Falls is also part of

the great Athabasca River, which eventually leads to the larger Athabasca Falls, which has a lower canyon, and a quite large falls viewpoint. The falls are unique, but there is one mystery about the fish. There are many species of fish at the bottom of the falls, but once you reach the top only one species corresponds, the Bull trout, but how is this possible? Well, although it's a mystery, many are trying to figure out the response to this riddle. Now, down the same road of Athabasca Falls, we go all the way to Mount Edith Cavell, one of my favorite places, where you can go to the peak and explore the area, like Cavell Lake and Cavell Pond. Cavell pond has broken pieces of glacier that you can touch, which is really cool. Perhaps one of the more renowned sectors of the park, Maligne Lake, which is located at the end of Maligne Road, which has plenty of beautiful landmarks, just like Maligne Canyon, Medicine Lake, Moose Lake, Edith Lake, Medicine and of course, Maligne Lake. One of the first landmarks along the Maligne Lake road is Edith Lake and Maligne Canyon. Just like Marble Canyon, Maligne Canyon is a quite large canyon, like the size of Marble Canyon. The water in the creek is almost perfectly clear, and although the park definitely doesn't like people drinking the water, because it's not perfectly filtered, I believe it could be drinkable, but I suggest you don't try it. The canyon has plenty of trails to hike and walk. Going up the road, we reach the Medicine Lake viewpoint and trailhead, where you can see the view of the lake, and perhaps with binoculars, you might be able to see an eagle nest in the distance. Maligne Lake, one of the famous attractions, is a quiet large lake, and has a cruise to Spirit Island, one of the very scenic destinations of the lake. When I went to Maligne Lake, I heard a wolf in the distance, which, although I couldn't see it, there's a lot of wildlife in the area. Maligne Lake is also the trailhead too many beautiful hikes, like Bald Hills, the Opal Peak, Maligne Lake viewpoint, and more. After a long day, the town of Jasper is a great place to see, including Jasper national park's main information center. Behind the town, pyramid lake road, brings tourists to see the pyramid lake and pyramid island, with plenty of hiking trails around and beyond the area. The Rockies are full of amazing ranges, national parks, mountains, lakes, whatever you can ask from nature. Throughout the Canadian Rockies, wildfires and smoke have been a huge problem. On the day I went to Glacier & Mount Revelstoke National parks, smoke was a big problem, and although it wasn't a large threat to humans, it has been wiping out trees, along with plenty of viruses and illnesses in the trees, making them look burned and lose their leaves, but after a rainy day or two, smoke clears out, and the humidity rises again, stopping a lot of the wildfires. Visiting this area of the world is a treat though, no matter if there is smoke or not.

## Intermittent Fasting: An Emotional Journey

Koyel Bhattacharyya

**07:00 AM** I'm ready for this! My body is packed with calories. Did I *need* that third helping of goat curry? Did I *need* to round last night's meal off with a *sandesh*? A quick examination of Maslow's hierarchy of needs reminds us that there is more to life than nutrition, and an argument may be easily made that excess goat and *sandesh* supply a nonnegligible fraction of the "love and belonging" stage of the pyramid. Besides, I was at a *nemontonno* and it would've been rude to refuse them. But no, strictly speaking, my body did not need either of those things. So I'm going to make this right, calorically speaking. I'll fast until dinner time and let my body reset.

**07:03 AM** Wait, but I need coffee. I guess I could drink black coffee. No, that's gross. Does black coffee have any calories?

**07:04 AM** Ok, it has less than five calories per cup.

**07:05 AM** But what about the acidity? Adding milk to my coffee is pretty much a medical necessity. What's even the point of intermittent fasting?

**07:06 AM** Ok, Johns Hopkins says it'll prevent type 2 diabetes. I'm a Bong. I need every advantage I can get. But what. About. My. Milk.

**07:07 AM** Well, the Internet says that if I stay under 50 calories, I'll remain in a fasting state, and the Internet is always right. That's like half a cup of milk, right? Fine, I'll get out of bed.

**07:16 AM** Wait, what's the density of milk? Ok, I think 100 grams of milk should be fine. Anyway, nutrition is barely a science.

**07:17 AM** Ahhhhhh coffee. I'm not an addict. You're an addict.

**07:18 AM** No, I'm an addict.

**08:13 AM** I'm so hungry.

**08:15 AM** I AM SO HUNGRY.

**08:21 AM** Ok, I'm fine. I rarely eat breakfast anyway. It was all in my head.

**11:33 AM** I bet some of my coworkers are eating lunch right now. But I can just keep working because I am not a slave to my appetites! I am *so disciplined*. I'm pretty sure this makes me a better person than they are.

**11:41 AM** Ok, I'm hungry, though. I need to stop thinking about food if I'm going to get any work done.

**11:53 AM** Look at these suckers, having to stand in line at the cafeteria to *get food*. I am saving so much time by not eating. And money! Intermittent fasting is so great.

**11:58 AM** Do you think my coworkers can tell how much better I am than them?

**12:03 PM** I am so. Hungry.

**12:24 PM** My coworkers are so disrespectful. Look at them all, just...*eating*. Shoving food in their faces, like they don't know that I am *literally starving* over here. Can you imagine this kind of behavior?

**12:29 PM** I guess they don't actually know that I'm hungry. And I can't even tell them because they'll just tell me to eat. Noobs.

**12:41 PM** I'm so liberated! I am free from the tyranny of lunch!

**01:32 PM** No. Way. Pastries in the break room? They're doing this to me *on purpose*.

**01:33 PM** It's just a pastry. I can *buy* myself a pastry later in the week to make up for this.

**01:34 PM** FREE PASTRIES TASTE BETTER. I cannot believe I have to make a choice between diabetes and pastries. Ok, I hear the irony.

**01:39 PM** I mean, really, what is the appeal of a free pastry? How much could it possibly cost, \$6? I have a job. I make money.

**01:42 PM** Eventually, other people will eat all the pastries and I can stop thinking about them.

**01:47 PM** Four pastries left! It's been 15 minutes and there are still four pastries left. Is this fate? Is this a sign?

**01:59 PM** Oh thank goodness, all the pastries are gone. I'm not sure how much longer I could've held off.

**02:02 PM** Wow, I am really amazing. I focused on my goals and didn't stray from my mission of fasting even for a free pastry!

**04:13 PM** Sure, of course today is the day Anne comes by and asks if I want to go out for some boba. No, *Anne*, I won't go with you, because I don't want to watch you guzzling down your delicious boba tea while I have to sit back and salivate. Rude.

**05:01 PM** When is too early to eat dinner?

**05:09 PM** You know what, I'm just going to go home. I don't need to stay in the office watching people eat snacks. I have too much self-respect.

**05:41 PM** Ok, is it still too early to eat dinner?

**06:03 PM** I can't take this anymore! The refrigerator is *mere feet* from me! It's after six anyway. Tons of white people eat at six. So what if I'm a Bong?

**06:10 PM** Wow, could the microwave work any slower?

**06:14 PM** Ahhhhhhhh finally! Bhat! Begun pora! Chickener jhol!

**06:32 PM** Ok, maybe I ate too much too quickly.

**06:37 PM** I'm so full. Good thing I ate dinner so early.

**06:41 PM** Ohhhh why did I eat so much?

**07:14 PM** I feel great! Intermittent fasting is easy. I should do this again in a few days!

## Science and Society: The Yin and Yang

Ranjan Gupta

For a greater part of human history, science had remained in the realm of a few, who delved into intellectual pursuits and questioned the ways of the natural world. In ancient times, people who pursued science were also those who pondered over philosophical ideas. Thus, in India astronomy was linked to astrology; the Greek mathematician Pythagoras, famous for his theorems, also propounded the notion of transmigration of the soul. Scientific and mathematical ideas were communicated first through oral traditions and later through books and treatises, generally read by few who shared similar interests. Apart from its applications in areas like architecture, agriculture, alchemy, metallurgy or warfare, the impact of science on society was not as apparent beyond everyday use in clocks, compasses, calendars, or almanacs. In the west, public exposure to science was limited, punctuated by occasional demonstrations to record a discovery, much to the awe of spectators. Examples include Galileo's experiments on falling bodies from the leaning tower of Pisa (ca. 1591), Otto Von Guericke's experiments with the Magdeburg hemispheres (1654) and the first hot air balloon flight by the Montgolfier brothers at Versailles (1783). Scientific curiosity of the lay public was also stoked through magic and freak shows and through exhibits at museums (hence also called "Jadu ghar" in Bengali). Scientists mostly worked in their own space and seldom clashed with society unless their radical hypotheses challenged the doctrines of religion. Two great examples of such conflict between science and society are (1) the ideas of Copernicus and Galileo in astronomy that contested the belief that the earth is the center of our solar system and the universe and (2) the Darwinian theory of evolution that affronted the Biblical story of creation. Western science, as we know today, evolved in around the 19<sup>th</sup> century with a clear path for experimentation, observation and inference, and science communication began through journals and presentations at professional society meetings.

By contrast, science in the 21<sup>st</sup> century has entered a world of globalization where technology is in the hands of most people, for better or for worse. Gone are the days when scientists worked in isolation, their findings reported only in specialized scientific journals and only understood by their peers. Thanks to open access on the internet and social media,

average people on the street, often with no formal training in the scientific methods, can now participate in the process of science. On the one hand, such participation of average citizens in the implementation of science, often termed "citizen science," is helping scientists to collect a wide range of data. For example, by the simple click of their mobile phone cameras, audio-video recording and apps, average citizens can help scientists to collect evidence for the impact of climate change, record and catalogue local flora and fauna, animal migrations, specific geographical, geological, or astronomical events. People can also monitor their health and observe medical compliance through m-health technologies. On the other hand, the influence of such citizens on every scientific matter without proper knowledge and understanding of science is creating a world of confusion and anarchy, as we have witnessed at the time of COVID-19. Simple issues, such as whether to wear a mask or to take a vaccine during a pandemic, are now debated by the lay people, who seem to be weighing in on matters of critical importance, further politicized by politicians who depend on populus vote. Science, which was once the vehicle of progress for society, is now at peril in the hands of a few who have little knowledge but can do a lot of harm. However, even without such interference, it is clear that the scientific enterprise can no longer function from an ivory tower but remains accountable to its stakeholders - various segments of society and its instruments that drive governance, frame public policy, provide goods and services. It is remarkable how various segments of science impact and intersect with every aspect of society, from national security, health and food security, trade, commerce, and international diplomacy. Given below is a text-book example that may illustrate the point.

### Genetically modified organisms (GMOs)

In the early 2000s the ag-biotech industry in the United States had finally taken off the ground. Years of research in recombinant DNA technology were finally paying dividends. Thanks to the breakthrough patent case of "Diamond vs. Chakraborty" (1981), genetically engineered / modified organisms were now patentable in the United States and could be commercialized. The seminal case pertained to an invention in the 1970s by Prof. Ananda Mohan

Chakrabarty (a Calcutta University alumnus) – a genetically engineered new species of oil-eating bacteria (now called *Pseudomonas putida*) that could degrade hydrocarbons from crude oil spills.

U.S. seed companies, like Monsanto in St. Louis, MO, could now infiltrate the global market promising improved agricultural products with added nutritional value, resistance to plant disease and pest, etc. Two key GM products of Monsanto were roundup-ready crops and Bt cotton – the former contained genes that conferred tolerance to glyphosate, an active ingredient in Roundup® brand agricultural herbicides; the latter contained a toxin-producing gene from *Bacillus thuringiensis* that protected cotton from insects like boll worms.

Several countries in Western Europe raised alarm against GMOs. The concerns were multifold. The immediate concern was safety i.e., whether such “engineered” products were safe for human consumption. Another concern was the impact of GM crops on the environment. For example, could such crops become invasive species and drive indigenous species to extinction? More importantly, what would be the environmental impact if the resistance genes got laterally transferred to other plants in nature? Europe embraced the “Precautionary Principle” whereby member states of the European Union (EU) could “adopt precautionary measures when scientific evidence about an environmental or human health hazard was uncertain and the stakes were high.” Scientists in the United States argued that genetically engineered crops were no different from genetic cultivars produced by conventional breeding and selection practices. For commercial interests, U.S. stakeholders felt that the debate was really about European farmers losing market shares in competition with commercial U.S. agricultural companies. Not only did European countries initially restrict the entry of U.S. GM crops but also the EU warned African countries that importation of produce from their farms might be restricted if they cultivated US-derived GM crops. The debate lasted over several years, which several American experts considered delay tactics by Europeans to catch up on their own GM technology. Today, GM produce are allowable in most countries, provided they are appropriately labeled for the consumer.



An entirely different set of controversy surrounding GM crops arose in India. Due to the prevalence of boll worms in cotton-producing states like Maharashtra and Karnataka, Monsanto started field trials in the late 1990s and commercially sold over a million packets of BT cotton in the early 2000s. Apart from concerns from environmentalists, Indian farmers found that the seeds from BT cotton were not reproductively viable. Traditionally, farmers save seeds from one year’s crop to replant the next year. The Monsanto GM cotton produced sterile “suicide” seeds (engineered through a “terminator” technology), creating the need for farmers to buy seeds from the company, each year at set costs. While the perspective of Monsanto was to protect its investments and recurring sales, the heated debate and protests from environmentalists and agriculturists in India and elsewhere spilled over to the World Trade Organization, where such scientific practices were challenged and brought under scrutiny.

Yielding to global pressures and accusations regarding monopolizing world food trade, Monsanto eventually renounced its terminator technology, and the Indian government banned the use of such “Genetic use restriction technology (GURT).”

Today, almost every aspect of science and technology interfaces with society and with the advent of new technologies such as artificial intelligence, the boundaries between science and society are getting even more blurry. Unless well-thought policies and regulations are put in place fast, human civilization is at risk. As the power to access, afford and use scientific applications becomes universal, certain dual-use technologies can become a boon or a bane. According to Greek mythology, Prometheus (etymology “forethought”) stole (Vedic, pra math = steal, rob) fire from the Gods to provide its technology to humans; consequently, leading to his own suffering. Likewise, in the quest for knowledge if humans do not have adequate foresight, misuse of science and technology in the hands of society can lead to our own demise. In absence of societal checks and balances, unfettered science could have dangerous consequences. Conversely, too much societal interference could jeopardize scientific freedom and creativity. Like the Chinese yin and yang, a harmonious balance between science and society can benefit mankind.



## On the Question of Access in the Age of Digital Technologies

Shweta Sen

In 1936, Walter Benjamin, the Jewish German philosopher, literary critic, and essayist, in his article, "The Work of Art in the Age of Mechanical Reproduction," claimed that films had revolutionized the common audience's reception of art presented in this new form. He argued that a movie audience was empowered by this medium itself to receive the film critically. The very equipment with which a movie was made, namely camera, lighting, crew, and machinery as well as the techniques employed in the making of the movie such as close-ups, slow motion, editing of scenes, mixing of sounds and so on facilitate the processes of audience enjoyment as well as their critique of the movie. Benjamin stated, "Mechanical reproduction of art changes the reaction of masses toward art. The reactionary attitude toward a Picasso painting changes into the progressive reaction toward a Chaplin movie". Essentially, he claimed that film had an intrinsic potential to afford to the audience the role of a critic, thus placing them in an unprecedented position of power. Before the advent of film, art was accessible to common viewers only in churches and monasteries, palaces and courts, and subsequently in museums, salons, and art galleries where "a collective reception of paintings did not occur simultaneously, but by graduated and hierarchized mediation". Films, on the other hand, he said altered the relationship of the masses with art and democratized mass access to art. In this context, access, to Benjamin, did not simply mean physical access but intellectual and aesthetic access as well. He wrote: "The progressive reaction is characterized by the direct, intimate fusion of visual and emotional enjoyment with the orientation of the expert. Such fusion is of great social significance." Benjamin here assumed that film, freed from the constraints of wealth, power, and patronage by which art had always been bound, could automatically equip its audience with the critical faculty of an expert. The medium of film, he maintained, had an inherent capacity to turn passive consumers into critical thinkers and even film critics.

What is intriguing is that not for once throughout the entire article did Benjamin, influenced as he was by Marx's materialist conception of history, question if the public's "progressive reaction" to a Chaplin movie was to its progressive content or to the farcical

elements on which the Chaplin movies are replete with. *Modern Times*, Chaplin's celebrated satire on mechanization and industrialization, opens with the words, "Moderns Times. A story of industry, of individual enterprise—humanity crusading in the pursuit of happiness" against the backdrop of a clock face with its seconds hand ticking away followed by the scene of a herd of sheep, with a black one caught in the middle, juxtaposed with that of factory workers marching to the rhythm of clock time in order to mass produce goods for the market and its consumers. The implication is that these workers are marching onward to sacrifice themselves on the altar of the American god of happiness deified by the *Declaration of Independence*. Chaplin's left-wing sympathies expressed in this film ring loud and clear to those who are familiar with the socio-economic and ideological contexts surrounding the movie with its allusions to industrial mass production, crass consumerism, labor movements, the spiritual ennui of industrial laborers, the indignities that they had to suffer on a factory floor, and the exhortations of the *Communist Manifesto*. But the question is when the contemporary masses reacted to the comic scenes in *Modern Times*, were they all reacting to the implicit imagery and symbolism of the film or simply to the hilarious ordeal of a factory worker trying to screw nuts on an ever-accelerating assembly line? If a viewer, let's say, does not possess the contextual knowledge of the disparities in wealth and living conditions and the social complexities brought about by the Industrial Revolution, does the medium of film possess an inherent ability to fill in those gaps for the audience? Could the movie, with its direct references to class antagonism, itself be a substitute for the *Communist Manifesto*? Without having read Marx's outline of the evolution of the bourgeoisie in the *Manifesto*, without being familiar with his assertion that "free development of each is the condition for the free development of all," would Chaplin's contemporary audience have ready access to the message that he was trying to convey? If, according to Benjamin, the viewers, while being entertained, also became "experts" on Chaplin's movie, what constituted that expertise? In other words, when lay viewers gained access to this art form through film, as Benjamin claimed, did they also, simultaneously, gain access to its content and meaning? Yes, it can be argued that their understanding of *Modern Times* would stem

from their own involvement in the system, but if that understanding remained tethered to their own experiences only, then its scope would be very limited. A deeper insight could only happen if the viewing of the film could be supplemented by the knowledge of the historical and socio-economic contexts surrounding the movie.

Benjamin's euphoric discussion of the inherent accessibility of films comes to my mind every time I hear the word "access" mentioned alongside the term, "digital technology." I am left wondering about the complexities that are lost in that association. It has become commonplace in secondary and postsecondary education to link student access, engagement, motivation, and success to digital technology. The idea is that, as Benjamin had claimed about movies in his 1936 article, integrating digital technology in the classroom would automatically empower and motivate students and engage them in the learning process. Some of the common assertions made by the apologists are that teenagers and youth, with the help of digital technology, are "radically changing the face of literacy," that multimodal composition can "offer students multiple ways to understand, analyze critique and respond emotionally" to texts, that "education is undergoing fundamental changes as a result of innovation in technologies." A significant number of these enthusiasts bemoan the fact that conservative educators are not harnessing the potential of digital technology to engage and motivate students to learn. Instead, they go on a reactive mode against its intensive use in the classroom. Implicit in these assertions is the belief that technology is all powerful, that it is the answer to a lot of the issues plaguing secondary and post-secondary education, that to provide students with technology is to equip them with knowledge—a very reductive approach to the complex processes of teaching content and acquiring literacy, that, more dangerously, deemphasizes the need to teach our youth the means to protect themselves from manipulation by political and powerful corporate entities.

Digital technology has the capability to accumulate immense quantity of data, organize it, and generate algorithms that can be used by the institutions of power. In order to prevent being manipulated first by the technology and then the individuals and entities behind it, students have to be able to contextualize the information that they retrieve with the help of digital technology, assess its validity and veracity, ponder the questions that emerge in the process of this inquiry, and draw informed conclusions. And most

importantly, they have to be able to communicate their findings, analyses, and reflections in coherent and meaningful ways. This is the process of becoming literate, and every group in an organized society has a role to play in this process. That role cannot simply be outsourced to technology. To lose control over our own learning and literacy is to lose control over our own growth and individuality. Unfortunately, often the discourse surrounding digital technology in secondary and post-secondary education forgoes that discussion and launches upon unqualified encomiums of the technology itself just as Benjamin waxed eloquent on the democratization of art through the form of film.

The language used to extoll the virtues of these "cool tools" in popular as well as academic publications is particularly noteworthy. In one such article, the authors claim that students are "ensured of discussion, collaboration, critical thinking, and creativity when offered assignments that rely on social media for completion." They wonder why educators struggle over student engagement when the "cool tools" are available in such a profusion, when a tool like Fakebook can help with "deep investigation of a subject," when a platform like the Google Classroom can keep students motivated throughout the day, when a tool like Educreations can "empower students to take ownership of their learning." Champions of digital technology offer happy lists of useful apps like Kahoot!, Remind, G Suite Apps, Padlet, Seesaw, VoiceThread to name a few. They assert that these tools give students agency over their own learning. A vast majority of these articles make unqualified assertions about the utility of these tools in the classroom and make promises that cannot be met if the processes of technology integration, content mastery, and distraction management are not thoughtfully and seamlessly woven into the fabric of the whole classroom experience. While many of these articles offer inspiring ideas and explore the possibilities of these tools, very rarely do any of these arguments extend the conversation further to include a discussion of the attendant complexities. Education does not have to be dry and boring. On the contrary, it needs to be fun and captivating. But after the fun, comes the gritty part, namely, converting soft skills into hard and tangible ones, and that is where matters get more complicated. Recording student responses to narrative texts in sound files and scanning images to represent literary characters can be fun, but turning them into a coherent and fully-formed composition is challenging. Selecting Google images of the Civil

War and composing a pictorial story with the images can be engaging, but fitting them into a larger historical schema necessitates careful guidance on the part of the instructor. Thus, the dual process of content instruction and technology integration has to be thought out and implemented carefully. Unfortunately, only too often, the administrative need for speed, innovation, and implementation trumps the more real and felt needs of students as well as educators, that is the needs of those who are actually in the classroom.

Further complicating the situation to no end is the monster of distraction. Adam Gazzaley and Larry D. Rosen in their book *The Distracted Mind: Ancient Brains in a High-Tech World* cite a study done by Dr. Rosen's lab that observed "students—ranging from middle-school to college age—studying for fifteen minutes in an area where they normally study. Shockingly, students could not focus for more than three to five minutes *even when they were told to study something very important.*" Gazzaley and Rosen note that "Today's college students own an average of seven high-tech devices, and most students have at least three—smartphone, laptop, and tablet—in the classroom...In the classroom, these devices provide a ready source of interruption that has been validated in many studies. For example, one study found that nine in ten students used their laptop computers for nonacademic reasons during class time, while another 91 percent of students reported texting during class." While technology and the nifty "cool tools" may allow students to be creative and have fun while learning with their peers, the tools themselves do not have an inherent capability to plunge the students headlong into a deep intellectual inquiry, nor to help them self-manage. The devices may come with in-built self-monitoring chips, but the desire to use them will come only when we are in touch with other humans and our inner selves, not simply with the Wi-Fi.

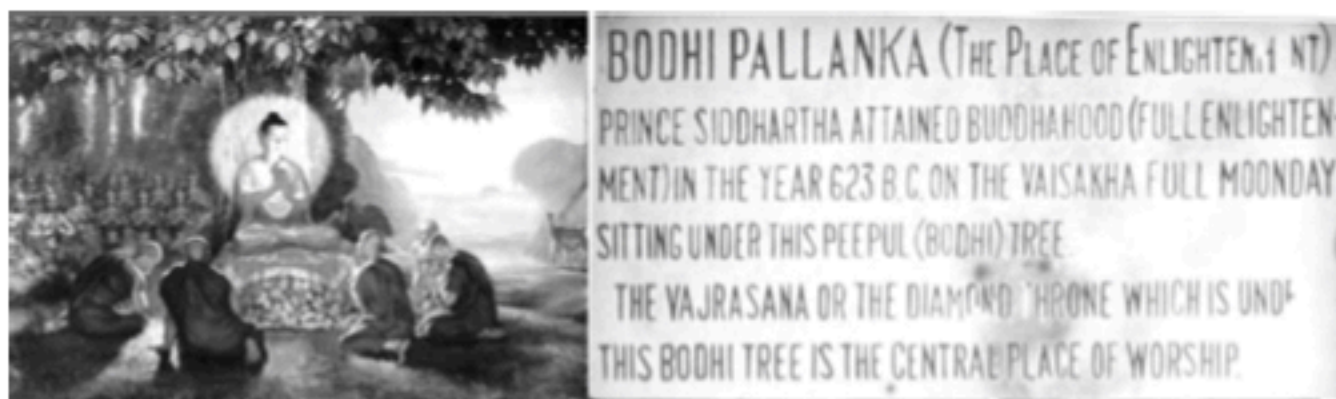
Moreover, technology has advanced, but reading and mathematics scores have not. According to the "NAEP Report Card: Reading," "In 2019, average reading scores were lower for both fourth- and eighth-grade students compared to 2017: scores were lower by 1 point at fourth grade and lower by 3 points at eighth grade." In 2022, for both fourth and eighth grade students, the scores dipped even further by 3 points. According to "NAEP Report Card: 2019 Mathematics Assessment," "In 2019, at both grades [4 and 8], the percentages of students performing at or above *NAEP Proficient* were not significantly

different than in 2017". In both math and reading in 2019, only 34 percent of students in grade 8 scored at or above the NAEP proficiency level; in reading, this reflects a 2% decrease in 2019 from 2017. The 2022 report shows a further decline in the mathematics scores of the fourth graders by 5 points and that of the eighth graders by 8 points. "Disruptive technology" has indeed truly disrupted learning.

The question of access, thus, is not being readily resolved with the ever-increasing integration of technology in the classroom, but rather it is becoming more and more complex. Access is not going to happen simply by using more technology, but through a very conscious process that considers a host of variables—social, economic, psychological, and personal. Where the situation is so disconcerting, it is naive to assume that simply instituting newest technologies in the classroom would grant students "access" that would in turn lead to greater student success. Readiness for a digitally driven world seems to be the prime emphasis of secondary and post-secondary curricula these days. From distance education to massive open online courses (MOOC) to open educational resources (OER), to the newly popular AI chatbots like ChatGPT, technology continues to offer us numerous means and media of instruction in order to help our students prepare for a techno-centric world, but in our euphoria over the fast-evolving technologies, we often forget that digital technologies can only supplement learning but cannot take charge of it as we often expect it to do. Every new technological innovation brings about a capital-fueled administrative rush to urge educators to embrace it. Some innovations stay for a longer time only to be eventually replaced by new ones. Others peter out as abruptly as they appear. In this ever-morphing technological landscape, the elemental need that persists stubbornly, unflinchingly is that of teaching our students how to read, write, and think critically, effectively, and creatively, so that they become competent professionals, family members, and citizens. As elemental and simple-sounding as this need may appear to business-owners, corporate executives, and institutional administrators, it cannot be outsourced to technology. Even Benjamin, who unreservedly extolled the virtues and potentialities of film, stated that "technology has not been sufficiently developed to cope with the elemental forces of society," and it holds true still, eighty-seven years after the article was published. Access, in this context, means access into the deeper nature of things, not a click on a keyboard or a touch on a screen.

## Teachings Under the Tree Canopy from Buddha, Hippocrates and Tagore from 400 BC: Connecting Threads via the Cultured Tree Saplings

Mrinal Kanti Dewanjee



Enlightenment of Buddha and his mentoring under the fig (*Ficus religiosa*) tree and its associated plaque

Learning under the open sky with an open mind and communicating with nature directly, has a unique appeal. Brilliant, noble and dedicated minds bubbling with ideas are tuned to mentor the bright hungry minds of the ancient, civilized societies. Without any teaching tools, e.g., a walled room, a book or a chalkboard, this rudimentary method served the purpose of oration. A few of the ancient mentors were honored, while Socrates was poisoned to death with Hemlock juice for teaching the Greek youths. Siddhartha Goutam Buddha, the Nepalese prince attained enlightenment at Bodh Gaya, Bihar, India after 49 days of meditation under the Mahabodhi Tree around 500 BC; over millennia the Mahabodhi temple with the sacred fig tree and the bench, has been reconstructed, restored, and remodeled with assistance from Burma, Thailand, Japan, Korea, and Vietnam. An existing Mahabodhi Tree is often cited as the direct descendant of the original tree. This tree, planted around 250 BC, is a frequent destination for pilgrims, being the most important of the four main Buddhist pilgrimage sites.

Considering the worldwide ongoing conflicts, India could take the advantage, and lead and set up a Peace Invocation Center at Bodh Gaya for resolving the war conflicts in collaboration with the United Nations Organization. We must invite the power grabbing, testosterone-loaded male warmongers like, Min Aung Hlaing, of Myanmar, Xi Jinping of PR China, Vladimir Putin of Russia, and Bashar Al-Assad of Syria for re-enlightenment in the practice of renouncement, like former Chinese pilgrims, Fahian, Xuan Zang, Yijing, etc. visiting and living at the Nalanda Mahavihara as the greatest center of Buddhist learning.

The Tagore tradition of teaching on cemented circular benches in the Viswa-Bharati University (established in 1922 in Santi Niketan, Bolpur, West Bengal), originated from the Gautam Buddha (500 BC) tradition of teaching under fig tree and his contemporary, Hippocrates II (mentor, physician, Father of Medicine) style of teaching under the shade of *Platanus Orientalis* (like the current Sycamore tree) in COS island, Greece around 400 BC (1).

Medical graduates, worldwide, take the Hippocratic Oath "Do no harm" during their graduation ceremony. We were delighted to visit the Greek remnants of Asclepius symbol at COS Island in 2008 during the Turkey-Greece tour, organized by the Gateway Travel. Hippocrates appeared to have traveled widely in Greece and Asia Minor practicing his art and teaching his pupils in many disciplines, e.g. epidemics, diagnosis of disease, bone fracture and wound-healing. He presumably taught at the medical school at Kos/Cos quite frequently. Much of his thoughts and writings seem wise and correct. Unfortunately, there are large areas where much is unknown, since he did not leave any written records.

As I was rushing to go to my favorite NIH Library in Building 10 via the north side entrance, I was surprised to see this unique tree (see picture above) at the NIH Campus and took an iPhone picture of this memorable cultured tree. The plaque was installed in 2014. This tree was donated by the Greek Ambassador, A. Liatus in 1961 to the National Library of Medicine with a cutting from the celebrated tree of Cos Island for the opening of a new building at the NIH campus. The staff of the Archangel Tree Archive successfully cloned the historic tree. I also saw a cloned sandalwood tree in

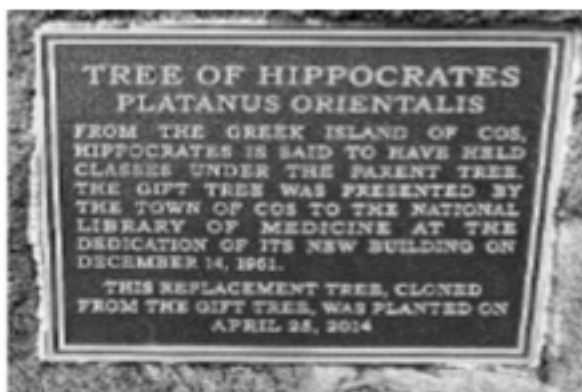
front of the Biochemistry Building, Indian Institute of Science at Bangalore, while attending the Indo-American Society of Nuclear Medicine Seminar at Taj Hotel in 1984.

Xuan Zang wrote that at the Visva-Bharati University, after every destruction of a tree, a new tree of the same species was planted in the same place. Maintaining the tradition, the classes are still held in the open environment under the shade of huge mango trees, and students and tutors alike still travel by bicycles to keep pollution at bay. The old buildings made up of mud walls and thatched roofs, are still intact in the main campus. I made a deeper connection with my beloved poet, Rabindranath Tagore, when serving at the University of Illinois@Urbana-Champaign (UIUC) (1996-2000), where Tagore stayed for a few weeks and wrote many

poems. Now, the current Bengali residents celebrate the Annual Tagore Day in his memory at the Unitarian Universalist Church, now a Community Center, where Guruji delivered a series of lectures on spiritual thoughts in 1913, including The Upanishads (November 17), religions in ancient India (November 23) and Hindu thought as well as the problem of evil (November 27). In 1913, when Tagore was awarded the Nobel Prize for Literature, his son, Rathindranath also received his master's degree in agriculture from UIUC, where many novel agricultural methods, specifically the "Crop rotation for enhanced fertility at the Morrow Plot" were taught. He practiced those principles as a horticulturist at Sriniketan and planted many exotic plants and trees from other lands along with the skills of training in multiple handicrafts for local residents (2-4).

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Memorialization of the Threads of Tradition of Teachings under the Tree Canopy. Hippocrates (left), the original Tree of Hippocrates sapling, planted on the NIH campus in Bethesda 1962 and the bronze plaque on a stone slab underneath the tree.



## অসমাপ্ত অমৃত

নবাকৰণ চক্ৰবৰ্তী

স্বাক্ষৰাৰে গোখুলি সমাপন। কুরুপতিগণ আগামি ত্ৰয়োদশ  
দিবসেৰে রণনীতি নিৰ্ধাৰণে রত।

স্কন্ধ, বড় স্কন্ধ আজ দুৰ্যোধন। চিৰশক্ৰ বৃকোদৰ ভীমকে তার  
চাই না। চাই না গাণ্ডীবধন্য অৰ্জুন। কুরুরাজতিলকেৰে কাতৰ  
আবেদন সেনাপতি দ্ৰোণাচাৰ্য্যৰে প্ৰতি-

- শুধুমাত্ৰ যুধিষ্ঠিৰকে হস্তগত কৰুন। সে প্ৰথম পাণ্ডব। রাজ  
চক্ৰবৰ্তী। সে নিহত বা হস্তগত হলেই এ যুদ্ধেৰে সমাপ্তি।

আচাৰ্য্য দ্ৰোণ, মহামতি কৃপ, অঙ্গৰাজ কৰ্ণ, মদ্ৰৰাজ শল্য,  
সিন্ধুৰাজ জয়োদ্ৰথ, মহাধনুৰ্ধৰ অশ্বত্থমা, কুরুপুঙ্গব দুঃশাসন,  
পুত্ৰ লক্ষ্যণ, তোমাদেৰে সন্মিলিত প্ৰচেষ্টাও কি অসমৰ্থ হ'বে এ  
লক্ষ্যভেদ কৰতে?

কুরুপতিৰে হাছতাশ কষ্টকিত কৰল রাজিৰ প্ৰথম যামকে।

- কিন্তু অৰ্জুন? আৰু তার কপিঞ্চজ রথচালক কৃষ্ণ?

বৃদ্ধ দ্ৰোণেৰে স্কন্ধকুটি কুটিল সংশয় রয়ে যায়।

-পাৰবে কুরুক্ষেত্ৰ প্ৰাঙ্গণ থেকে সরিয়ে নিয়ে যেতে, ওই  
শ্বেতবাহন রথকে? এক দিনেৰে জন্য?

কুরুবৃদ্ধেৰে প্ৰতিপ্ৰশ্নে মথিত হল সভাগৃহ।

-সম্ভব! যদি নাৰায়নী সেনা আৰু সংশ্লগত বাহিনী একত্ৰে কৰে  
চেষ্টা।

রাধেয় কৰ্ণেৰে কৌশলী আবেদন দুই সেনাবাহিনীৰে প্ৰতি।

যদুবংশীয় এই নাৰায়নী সেনাকে সমৃদ্ধ কৰে কৃষ্ণপুত্ৰ শাম্ব সহ  
সঙ অতিৰথী। আৰু ত্ৰিগৰ্তবাসী সংশ্লগত তাৰে চিৰকালীন  
প্ৰতিদ্বন্দ্বী। কুরুছত্ৰছায়াতে আজ দুই প্ৰতিপক্ষ একত্ৰে সমররত,  
আৰু এই মুহূৰ্তে তারা সম্মত হল একত্ৰে প্ৰলুক্ক কৰতে,  
অৰ্জুনকে। নিয়ে যাৰে তাকে যুধিষ্ঠিৰেৰে থেকে দূৰে। আৰু সেই  
সুযোগে গুরু দ্ৰোণেৰে হাতে পতিত হ'বেৰে প্ৰথম কৌশ্লেয়।

তবু রয়ে যায় এক শেষ সংকট।

- কে হ'বে এই দুই বাহিনীৰে মধ্যপদী কৰ্ণধাৰ? কে হ'বে সেই  
ব্যক্তি, যে নাৰায়নী সেনা আৰু সংশ্লগত বাহিনীৰে মাখে দাঁড়িয়ে  
অৰ্জুনকে দেবে যুদ্ধাঙ্গান? মুক্তা আপাতঃ নিশ্চিত জেনেও, কে  
যাবে সম্মুখসমৰে?

দুৰ্যোধনেৰে আবেদন শেষ হ'বাৰ পূৰ্বেই এগিয়ে আসে এক  
নাতিপ্ৰৌঢ় আঙুলুক। মনে হল যেন সে এত দিন অপেক্ষাতে  
ছিল, শুধুমাত্ৰ এই মুক্তা আঙ্গানেৰে জন্য।

- কে তুমি বীৰ?

দ্ৰোণেৰে প্ৰশ্ন ভেসে আসে বৎসৰে প্ৰাচীন এক মঞ্জুভূমি থেকে।  
তবে, সেই দিন এই প্ৰশ্ন কৰা হ'য়েছিল এক বৃষস্কন্ধ নবীন  
যুবাকে, যাৰ শালপ্ৰাংগ মহাভুজে ধৰা ছিল এক প্ৰচল্ল ধনুৰ্বান।  
সময় সম্মুখগামী।

সেই যুবক আজ দ্ৰোণেৰে পাশে উপবিষ্ট রাধেয় কৰ্ণ। আৰু  
আজকেৰে চিত্ৰও বড় বিপ্ৰতীপ। আজকেৰে আঙুলুক এক  
বৃন্দাবনবাসী যাদব, ইষং শিখিল মুষ্টিবদ্ধ তাঁৰে ধনুৰ্বান। অৰ্জুন  
এই যাদবকে প্ৰহাৰ কৰবে নিছক অবহেলায়, ভাবলেন শিষ্যগৰ্বে  
গৰ্বিত দ্ৰোণ। তবে অজ্ঞগুরু অভিজ্ঞ চোখে দেখতে পেলেন এক  
ভীষন প্ৰতিহিংসা, এই আঙুলুকেৰে দুই চোখে।

না কি, এক প্ৰাচীন বিদ্বেষ? কাৰ প্ৰতি?

দ্ৰোণ সামনেৰে ধনুৰ্ধাৰীকে আৰু প্ৰশ্ন কৰেন না।

কৰ্ণ তাঁকে শিখিয়েছে। পুরুষকাৰ, বীৰত্ব এ'সবই জাতি-বৰ্ণ  
নিৰপেক্ষ। অজ্ঞগুরু জানেন, অৰ্জুনেৰে কাছে এই যোদ্ধাৰ পতন  
অবশ্যম্ভাবি। তবৎসত্ত্বেও এই প্ৰতিহিংসা যদি কিয়ৎ পলেৰে জন্য  
গড়ে তোলে স্কন্ধ এক প্ৰতিৰোধ, সে'টুকুই হ'বে দ্ৰোণাচাৰ্য্যৰে জন্য  
অমূল্য সময়। তিনি গড়ে নেবেন তাঁৰে চক্ৰবৃহা।

বৃদ্ধ সেনাপতি দিলেন মৌন সম্মতি।

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কুরুক্ষেত্ৰে যুদ্ধেৰে প্ৰাৰম্ভিক পাঞ্চজন্যৰে সূৰ্ণকাৰ তখনও মিলিয়ে  
যায় নি।

কৃষ্ণৰে দিকনিৰ্দেশনায়, অৰ্জুনেৰে পঞ্চবান বিদ্ধ কৰল নাৰায়নী  
সেনা আৰু সংশ্লগতকেৰে মধ্যপদী কৰ্ণধাৰকে। কুরুসেনাপতিকে  
নিরাশ কৰে শরসন্ধানেৰে পূৰ্বেই নিহত হলেন বৃন্দাবনবাসী,  
আয়ন ধোষ।

শ্ৰীৰাধিকা বিধবা হলেন।

কুরুক্ষেত্ৰেৰে ত্ৰয়োদশ দিবসেৰে যুদ্ধ স্মৰণীয় হ'য়ে আছে এক  
বালকেৰে বীৰগাথায়। যুধিষ্ঠিৰ-রক্ষাৰ্থে, চক্ৰবৃহে প্ৰাণ দিলেন  
অভিমন্যু, যখন যমুনাৰে অপর তীৰে অৰ্জুন ব্যস্ত ছিল নাৰায়ণী  
সেনা আৰু সংশ্লগত বাহিনীকে প্ৰহাৰ কৰতে। মহাভাৰতেৰে  
নিবন্ধকাৰে সেই সন্ধ্যাকে সিন্ধু কৰেছেন সদ্যবিধবা উত্তৰাৰ  
অশ্ৰুতে। শ্ৰীৰাধিকাৰে কৃষ্ণবিরহ যখন পেল বৈগ্ৰহিক মাত্ৰা, তাঁৰে  
বৈধব্য রয়ে গেল অব্যক্ত। উহা রইল আয়নেৰে বৰ্ষব্যাপী নিষ্ফল  
যত্ননা।

বনমালী ভূমি, পৰজায়ে হ'য়ো আয়ন।



## অপেক্ষায় মা সুস্থিতা বেরা করণ

ও ঠাকুমা — ঠাকুমা —আরে কোথায় যাবে বলো, স্টপেজ তো চলেই যাচ্ছে! কি গো - চা বেচার সরঞ্জাম কাঁধে এক ছেলে জোরে চিৎকার করে বলে ওঠে।

তুলুনি চোখে হাঁটুতে মুখ গুঁজে বসেছিলো এক বছর সন্তরের বুড়ি। মুখে একরাশ বলিরেখা,জীর্ণ শরীর ,পরনে একটা সাদা শাড়ি। টিকিট নেই বলে ছেলে বাথরুমের সামনে বসিয়ে দিয়ে গেছে।

-হু বাবা উঠবো, ছেলে আসুক,এশুনি এসে পড়বে ও।

-অনেকক্ষণ ধরে তো বলে যাচ্ছে,কই ছেলে কে তো দেখি না।  
তা যাবে কোথায়?

-বোম্বাই যাবো বাবা, ছেলে ওখানে কাজ করে,ওর কাছে যাচ্ছি থাকতে।

-বোম্বাই? কি বলছো গো এই ট্রেন তো জলপাইগুড়ি যাচ্ছে!  
অবাক চোখে বলে ওঠে ছেলেটা।

বন বন করে মাথাটা একপাক ঘুরে গেলো, এটা আবার কি বলে ছেলেটা! ধুর, ও কিছু জানে না। ছেলে হাত ধরে এখানেই তো বসিয়ে দিয়ে গেলো আর বললো কোন কামরায় নাকি কি একটা কাজ আছে, চলে আসবে তাড়াতাড়ি। মনের মধ্যে কথাগুলো বলে চুপ করে রইলো সেই কিমিয়ে ধাকা বুড়ি। ঝাপসা চোখে ট্রেনের খোলা দরজায় তাকায় সে। কিক কিক করে ট্রেন ছুটছে। গ্রাম, মাঠ, খাল-বিল সব পেরিয়ে ছুটছে। চোখে ঘুম আর ক্লান্তি, চারিদিকে তাকিয়ে আবার হাঁটুতে মুখ গুঁজলো সে।

বিশাল এক দালান বাড়ি, বড়ো দরজা দিয়ে চুকেই ডান দিকের ঘর হলো বাড়ির সেজো ছেলের। বাবা মারা যাওয়ার পর ভাগ বাটোয়ারায় সবাই দুটো করে ঘর পেয়েছে,তার সাথে জমি পুকুর তো আছেই। পূর্ব মেদিনীপুরের এক নাম না জানা গ্রাম। কয়েকশো বাড়ি নিয়ে গ্রাম আর তার মধ্যে এই দালান বাড়িটি সবচেয়ে বড়ো। সেই সেজো ছেলের স্ত্রী বৃন্দা গোসাঁই আর তার বছর তেরোর ছেলে, নাম সত্যেন্দ্র। স্বামী জমি জমা দেখেন আর ছোটো খাটো ব্যবসার কাজ করেন। বাড়িতে কিরতে কিরতে তেনার অনেক রাত হয়ে যায়। বাড়ির অন্যান্য লোকজন বলতে তিন জা আর তাদের ছেলে মেয়ে। বৃন্দা দেবী সংসারের কাজ করতে করতে মুখে বলিরেখা কবে আঁকিবুকি কেটেছে বুঝতেই পারেননি। যৌবন কোথায় যেন মুখ লুকিয়েছে কাজের ভারে।

গ্রামের মেয়ে,পড়াশুনা নেই তাই মুখ বুজে সংসারের ঘানি টেনে যেতে হই-এই তো সংসারের নিয়ম। ছেলে পড়াশুনা করে, কিন্তু মন তার উড়ু উড়ু। একদিন পরীক্ষার আগে ছুটতে ছুটতে এসে বললো "মা বড়ো শহরে যাবো কাজ করতে,পড়াশুনা আর করবো না"। তার মেজাজের ওপর কেউ আর কিছু বলতে পারলো না।

ছেলে চলে গেলো বোম্বাই। সত্তাহে একটা করে ফোন আসতো এখন, তাও বাবার সাথে কথা, টাকাপয়সার অভাব হলেই আর কি। এখন সেটা মাসে একটা হয়েছে। ধীরে ধীরে দালান বাড়ির বয়সও বাড়তে লাগলো,তার সঙ্গে তার পরিবারের। স্বামীর বুকের ব্যথা বেড়েই চলেছিলো। সংসার, স্বামীর সেবা — নিজেই যততুকু পারতেন করতেন বৃন্দা দেবী। একদিন সেই মানুষটিও চলে গেলেন ওপারে। কালের দোষে বিশাল বাড়ির এক কোণে তিনি হয়ে গেলেন একা।

সেদিন খুব মেঘলা ছিলো, চারদিকে কেমন থমথমে ভাব। শরীরেও আজ জোর নেই বৃন্দা দেবীর। কোমর যন্ত্রণায় নুয়ে পড়েছেন প্রায়। হঠাৎ ভাসুরের ছেলেরা এসে বললো সিঁড়ির কোণায় কয়েকদিন থাকতে যতদিন না সব ঘর মেরামত হয়। সেই মেরামত মনে হয় আজও হয়ে যাচ্ছে...

দেখতে দেখতে প্রায় বছর পনেরো কেটে গেলো। মধ্যবয়স্কা বৃন্দা দেবীর ঠিকানা কিন্তু সেই সিঁড়ির তলা। হাঁটুতে বাত, দুবেলা খাওয়াও জোটে কি জোটে না! লোকজনও কমে গেছে এ বাড়িতে,সব ঘরে নতুন সব জাড়াটিয়া পরিবার। লোকের বাড়ি বাড়ি চেয়ে খেয়ে কোনোমতে দিন চলে। বৃন্দা দেবীর বুক একটাই আশা — ছেলের ফোন আসবে একদিন। সেই ফোন যে আর আসে না... সে দিন গোলো,ক্ষণ গোলো, আরো অপেক্ষা করে দিনের পর দিন, বছরের পর বছর - এ অপেক্ষা বড়ো বেদনার, বড়োই অসহায়তার!

আজও সমাজে পুরুষের আধিপত্য, এখনো গ্রাম গঞ্জে পুরুষের মৃত্যুর পর তার স্ত্রীকে ছেলে বা মেয়ের ওপর নির্ভর করে থাকতে হয়। তাদের ঘর থাকে না,তাদের ভাত থাকে না, তাদের অর্থ থাকে না — থাকে শুধু অসহায়তা,আর বুক থাকে একখানা বড়ো পাথর। পুরোনো সব স্মৃতিগুলোর পাতা

ওন্টানোই তাদের সারাদিনের কাজ। মা তো তারা! ..এটুকু কষ্ট সহ্য করতেই হবে তাদের। বৃন্দা দেবীও ঠিক তাইই করছিলেন। ট্রেনের কাঁকুনিতে বুড়িটার আবার ঘুম ভেঙে গেলো। দূরের কামরায় কেউ একজন বাউল গান গাইছে। ঠিক সেই গ্রামের গাজনের মেলাতে যেমন হতো। সেই সবাই মিলে হইহই করতে করতে মেলা যাওয়ার কথা- পাত পেড়ে বাবা ভোলানাথের প্রসাদ খেতে বসা- রাত জেগে যাত্রা দেখার কথা--!

সত্যেন্দ্রের জ্বর এসেছিলো সেবার, ভীষণ রকম অসুস্থ, ডাক্তার পাওয়া যাচ্ছিলো না গ্রামে। নিঃশব্দ ভাবে ঠাকুরকে ডাকছিলো বৃন্দা। কত জরি-বুটির পর বৃন্দা দেবীর বানানো পাঁচন খেয়েই শেষমেশ জ্বর কমলো। তারপর ছেলের মা কে জড়িয়ে কি আনন্দ! সারা ঘর নেচে নেচে দৌড়াচ্ছিলো সত্যেন্দ্র। বৃন্দা সেদিনই একটু শান্তির ঘুম ঘুমিয়েছিলো একটু।

ঘুমের মধ্যেই কি যেন বিড়বিড়িয়ে বলে উঠলো বুড়িটা। চোখ খুলে দেখলো ট্রেন ছুটছেই। এখনো ছেলে আসেনি, মনে হয় কিছু কাজ পড়ে গেছে। ছেলে কতবছর পর এসে কত যত্ন করে নিয়ে যাচ্ছে শহরে - এর থেকে আনন্দের কি আর হতে পারে। জীবনের এই প্রথম গ্রামের বাইরে যাচ্ছে সে। ঠাকুর এবার মুখ তুলে চেয়েছেন। কিন্তু আজ শরীরটা এতো কষ্ট দিচ্ছে কেন, গাটা যেন পুড়ে যাচ্ছে, আর হাঁটুতে খুব যন্ত্রণা। খিদেতেও বেশ গা গোলাচ্ছে। হাতে একটাও টাকা নেই -ভীষণ অস্থির লাগছে যে!

-ও ঠাকুমা এটাই যে লাস্ট স্টপ গো - জলপাইগুড়ি চলে এসেছি আমরা। এবার পা ঝাঁকিয়ে চা দোকানি ছেলেটা বলে উঠলো।

-এটা? ঘুম চোখে বোঝার চেষ্টা করলো বুড়িটা। জলপাইগুড়ি নামটা তো কোনোদিন শোনেনি! ছেলে তো বোম্বাই'র কথা বেশ কয়েকবার বললো আর সেখানেই তো যাবার কথা আজ।

-কই তোমার ছেলেকে দেখছি না তো? আবার জিজ্ঞেস করলো ছেলেটি।

-ঐ যে বললো কি একটা কাজ আছে অন্য কামরায়! কাজ শেষ হলেই চলে আসবে বললো। মিন মিন করে বলে উঠলো বুড়ি।

-হো হো হো বুড়িমা -তোমার ছেলে তোমাকে ফেলে পালিয়েছে গো - আর তুমি মিথ্যে আশায় বসে আছো!

বুকটা ধক করে উঠলো, চারপাশের সব কিছু মনে হলো ফাঁকা, শূন্য। ডুকরে কেঁদে ওঠারও শক্তি নেই আজ। শুকনো চোখের পাতার ফাঁকে একটু যেন জল চিক চিক করে উঠলো। মাথাটা তোলায় চেষ্টা করলো বুড়ি - কি একটা ভয় যেন পলার কাছে পাকিয়ে বসেছে। এদিকে স্টেশন মাস্টার, দুটো পুলিশ গার্ড

এসে পড়েছে কাছে। সব কি যেন বলাবলি করছে। ইসস ছি ছি কি লজ্জা, কি লজ্জা, এমন তো হওয়ার কথা ছিলো না!

-ঠাকুমা বাড়ি কোথায়?

-তোমার ছেলের নাম কি?

-কোথায় যাবে এখন?

এসব প্রশ্নের ভিড়ে বুড়িটার শরীর আরো খারাপ করতে লাগলো। ভয়, কষ্ট, অসহায়তা শরীরকে আরো নুইয়ে দিলো। তবু সে মুখ ফুটে কিছু বললো না। বলেনি সে ছেলের নাম। কি জানি পুলিশের খাতায় ছেলের নাম চুকে গেলে তার কাজ পেতে অসুবিধে যদি হয়!

সবাই তাকে ধরে বেঁধে স্টেশনের কোনে একটু খাবার দিয়ে বসিয়ে দিয়ে চলে গেলো-

এখন বুড়িটা একদম একা- তার কোনো আশা নেই, তার কাছ থেকেও কারোর কিছু পাওয়ারও নেই। আজ সে সত্যিকারের মুক্ত কিন্তু বুকের ভেতরটা চিন চিন করে ব্যথা করছে কেনো? -

সে হোক, এরকম ব্যথা সব মায়ের হয়, এরকম ভয় সব মেয়েদের হয়, এরকম অসহায় ..... সবাই কেউ কম কেউ বেশি।

কাল মহালয়া, দূরের থেকে কোনো এক মন্দিরের ঘন্টাধ্বনি শোনা যাচ্ছে। মা আসছেন! সব কষ্ট ঘুচে যাবে এবার, মহামায়া সব দুঃখ মুছে দেবেন। তার আগমনের কত আয়োজন

জগৎ জুড়ে -আর এদিকে স্টেশনের কোণে এক মা একাকী, তার জন্য এক মুঠো দানের খাবার আর একরাশ বিষমতা।

পাশে কেউ নেই, নিজের- পরের কেউ নেই। তবু বুড়িটা অপেক্ষা করবে ছেলের জন্য, একদিন ছেলে আসবেই তাকে নিতে, আজ হয়তো সত্যি কোনো দরকারি কাজ পড়ে গেছে!

লোকজন তো কত কথা বলবে কিন্তু তার পূর্ণ ভরসা আছে ছেলের ওপর, আসবে- ও ঠিক আসবে। গোপুলি আকাশের কোণে ভুবন সূর্যটিকে দেখতে দেখতে বুড়িটা কখন ঘুমিয়ে পড়েছে। সেই সূর্যের মলিন আলো তার কপালে এসে পড়েছে,

মুখে প্রশান্তির ছায়ায় বুড়িটাকে আজ ঠিক যেন কোনো এক দেবী মা লাগছে। হাতের এক জায়গায় ছোট্ট একটা উকি উকি মারছে- জ্বলজ্বল করছে একটি নাম- বৃন্দা গোসাঁই।

এরকম কত শত শত বৃন্দা গোসাঁই স্টেশনে, খোলা মাঠে, বাজারে, অলি-পলিতে আজও বাড়ির লোকের জন্য অপেক্ষা করে আছে। তারা দিন গানে, তারা স্বপ্নের জাল বোনে - তারা আজও একটা নিজের ছাদ খোঁজে। একটু যদি মাথা নামিয়ে

ওদের দিকে তাকান -দেখবেন তাদের মুখের সাথে ঠিক কোনো না কোনো দেবীর মুখের মিল পাবেন - পাবেনই- কথা দিলাম।।



## চেতনা লোক

### দেবাজ্ঞান বিশ্বাস

জুন মাসের ভর দুপুর। চার বন্ধু মিলে সায়েন্স কলেজের গেটের সামনে গ্যাম্পপোস্টের ধারে মাথা ঝুকিয়ে বসে আছি। দৃষ্টিভ্রম হাতের তালু ঠাণ্ডা হয়ে আসছে, জুতো মोजার মধ্যে পায়ের পাঁজা শুকিয়ে কাঠ। আগামীকাল আমাদের অ্যাপ্লাইড কেমিস্ট্রি বিভাগের রিইউনিয়ন, আমি আগ বাড়িয়ে দায়িত্ব নিয়েছি ডিপার্টমেন্টাল অভিটোরিয়ামে নাটকের মঞ্চ বানিয়ে মঞ্চসজ্জা করে দেবার।

রবীন্দ্রনাথের “শেষের কবিতা” নাট্যরূপ দিয়ে অভিনীত হবে, মঞ্চ তদারকির দায়ও আমার ঘাড়ে। ডিপার্টমেন্টের প্রধান ফটক বন্ধ হয়ে যায় সন্ধ্যা সাতটায়, কিন্তু তার মধ্যে শিল্প পাহাড়ের ব্যাকড্রপ বানিয়ে, স্পট লাইট খাড়া করে, মঞ্চ প্রস্তুত করে দেওয়া আমাদের চারজনের পক্ষে বস্ত্তও অসম্ভব। এদিকে পরের দিনের জন্যে ফেলে রাখলেও চলবে না। সকালবেলা নাটক পরিচালক এসে যদি দেখেন যে মঞ্চ তৈরি হয় নি, পালের গোদা বলে আমারই কলার চেপে ধরবেন। বিভাগীয় প্রধানের কাছে দরবার করতে গিয়েছিলাম যে আমাদের যেন আজকে রাত অন্ততও দশটা এগারটা পর্যন্ত ডিপার্টমেন্টে থেকে কাজ করার অনুমতি দেওয়া হয়।

প্রোফেসর গুপ্ত টেবিলে কিল মেরে এক কথায় আমাদের দাবি নস্যৎ করে দিয়ে বললেন, “Impossible, the gate will be closed when it closes on every other day. তোমরা সারারাত এখানে বসে স্টেজ বানানোর নামে নষ্টামি করবে, তা হতে দেব না!”

এরকম বিরুদ্ধাচারণের পর মুখ চুন করে ফুটপাতে বসে পা দোলানো ছাড়া আর গত্যন্তর থাকে না। আচার্য প্রফুল্লচন্দ্র রোডের আকাশ বাতাস হাতড়ে পিঠ বাঁচানোর পথ খুঁজছি, কিন্তু রাখে হরি মারে কে?

হঠাৎ কানের কাছে শুনি এক পরিচিত গলার আওয়াজ, “কা ছ্যা বাবুয়া, কেই পেরবলেম বা?”

মুখ তুলে দেখি, আমাদের অ্যাপ্লাইড কেমিস্ট্রি বিভাগের দারোয়ান গয়াদা – হাতের জ্বলন্ত বিড়ির অতি ক্ষুদ্র শেষ অংশটা কায়দা করে দু’ আঙ্গুলে চেপে উৎসুক দৃষ্টিতে চেয়ে আছে আমাদের দিকে।

গয়াদার ভাল নাম গয়্যারাম পাণ্ডে, বাড়ি বিহারের ঝারভাঙ্গা জেলায় – সায়েন্স কলেজের অ্যাপ্লাইড কেমিস্ট্রি বিভাগে দারোয়ানের কাজ করছে বোধহয় আমার জন্মেরও আগে থেকে। চতুষ্কোণ অ্যাপ্লাইড কেমিস্ট্রি বিল্ডিংয়ের মাঝখানে একটা ছোট খোলা ঘাসের জমি আছে, যেন পুরনো দিনের জমিদারবাড়ির অন্তঃপুরের দরদালান। সেই ঘাস জমির এক কোনে একটা ছোট চালা ঘরে গয়াদার বাস। কতদিন দেখেছি সন্ধ্যাবেলা চারপাশ ফাঁকা হয়ে গেলে ডিপার্টমেন্টের বারান্দায় বসে দেওয়ালে পিঠ ঠেঁকিয়ে তুলসীদাসি রামায়ন পড়তে। গয়াদার মাথা জোড়া টাক, নাকের নিচে কাঁচা পাকা ফুপো গোঁফ, আর পেটের আয়তন শরীরের অন্য অংশের আয়তনের যোগফলের থেকে অনেকটাই বেশী।

ভুরু কুঁচকে আমাদের বিপন্নতার কথা শুনে বিড়িতে একটা শেষ টান মেরে গয়াদা মাথা ঘুরিয়ে বলে গেল, “দো খান্না রামজি লে কে আট বাজে আ যানা, ঘুসা দেঙ্গে বিল্ডিংমে।”

এ তো মেঘ না চাইতেই জল, আখ না চাইতেই আখের রস! সামান্য মাথা খাটিয়েই বোকা গেল যে রামজি বলতে গয়াদা মদের দোকানের রাম বুঝিয়েছে। এত সামান্য আয়োজনে এত কঠিন সমস্যার সমাধান হয়ে যাওয়াতে আমরা তো আনন্দে আত্মহারা। আর তাছাড়া রাত্তিরে গয়াদার পূজো শেষ হলে একটু চরণামৃত পাওয়া যাবে সে আশাও আছে। কিন্তু সমস্যা দেখা দিল মানিকতলা মোড়ে আবগারি দোকানে পৌঁছে। কোনও তরল বস্ত্তর পরিমাপের একক যে খান্না বলে কিছু হয়, তা তো আগে কখনও শুনি নি। তবে মদের দোকানের কর্মচারীটি বুঝিয়ে দিল যে ভোজপুরি হিন্দিতে ৩৭৫ মিলিলিটার মদের বোতলকে খান্না বলে। খুশির চোটে দু’য়ের জায়গায় তিন খান্না ওস্ত মন্ত রাম নিয়ে রাত আটটায় হাজির হলাম গয়্য-অভিসারে।

কোলাপ্সিবেল গেট সামান্য ফাঁক করে গয়াদা সে রাতে ভিতরে ঢুকিয়ে নিয়েছিল আমাদের। রাত সাড়ে এগারোটা পর্যন্ত ট্রেজ খানিক দূর বানিয়ে বিধ্বস্ত আমরা কিঞ্চিৎ শক্তি সঞ্চয়ের আশায় জমা হলাম গয়াদার ছোট টালির চালের ঘরের মেঝেতে। সাথে দু’ প্যাকেট বাপি চানাচুরও এনেছিলাম মদ্যপানের অনুসঙ্গ হিসাবে। কিন্তু গয়াদা মাছি তাড়ানোর ভঙ্গিতে চানাচুরের প্যাকেটগুলকে সরিয়ে দিয়ে তার খাটের তলা থেকে টেনে বার

করল একটা আলুমিনিয়ামের খালায় সাঝানো ছোট ছোট টুকরো করে কাটা কিছু ফজলি আম।

চিকেন কাবাব থেকে শুরু করে পেঁয়াজ কুঁচানো, ছোলা ভাজা পর্যন্ত হরেক কিসিমের পান-অনুসঙ্গের সাথে আমাদের পরিচয় ছিল, কিন্তু ফল সহযোগে এমন তরল পানের আয়োজন আগে কখনও দেখি নি। মনের বিশ্বয় চেপে রেখে নিজেদের গ্লাস তুলে চিয়ার্স বলার আগেই দেখি গয়াদা একটা বোতলের ছিপি খুলে নিজেরা সেই তরল বড় দুই জোঁপ গুমে নিয়ে ঠোঁট বিকৃত করে কয়েক টুকরো আম মুখে দিয়ে পরিতৃপ্তির একটা বড় নিঃশ্বাস ফেলল।

কিন্তু গয়াদার দেখানো পথে চলা সোজা কাজ নয়। ফল সহযোগে নিজের গ্লাসে একটা ছোট চুমুক মেরেই বুকলাম যে টক মিষ্টি ফজলি আম এই কড়া স্বাদের রামের সাথে জগা খিচুড়ি পাকিয়ে আমার জিভকে যেন নরক দর্শন করিয়ে দিল।

দাঁত খিচিয়ে বলে উঠেছিলাম, “কোথা থেকে আম দিয়ে মদ খাওয়ার এই উদ্ভট কায়দাটা শিখেছ বল তো?”

নির্মল হেসে গয়াদার সরল স্বীকারোক্তি, “ফল ফুরুট সে লিভার আচ্ছা রহতা হায়”।

এবার একেবারে জলের মত পরিষ্কার হয়ে গেল ব্যাপারটা, মদ খেয়ে লিভারের বারোটা বাজা রোধ করার জন্যেই গয়াদার সংযোজন এই liver-friendly ফল ফুরুট। দাখহীন ভাবে গয়াদা জানিয়েছিল যে গরমকালে আম দিয়ে রামজি আর শীতের রাতে আনারস দিয়ে ভদকা খাওয়ার মত সুখ নাকি আর কিছুতে নেই।

আমার পাশে বসা জয়ন্ত বেমজা জিজ্ঞাসা করেছিল, “আচ্ছা গয়াদা, তুমি ভদকাকে ত ভদকাজি বল না, তবে রাম-কে পাগলের মত রামজি বল কেন?”



এই বারে তেলে বেগুনে জ্বলে দাঁত খিচিয়ে উঠেছিল গয়াদা, “থোড়া লিখাপড়ি কড়কে শালা ভ্রষ্ট হো গেয়ে তুম লোগ। রামজি কা নাম হামেশা ইজ্জত সে লে না চাহিয়ে”।

সেই রাতে টালির চালের ঘরের টিমটিমে আলোর নিচে বসে বুকতে পেরেছিলাম যে অল্প শিক্ষিত, মাতাল গয়াদার মানসলোকে ধর্মসাহিত্যের পরম পুরুষ আর নেশার রশদ - নামের গুনে মিলেমিশে এক হয়ে গেছে।

মনে পড়ল সকালবেলা ঠাকুমার ঘরে রেডিওতে বাজছিল পান্ডালাল ভট্টাচার্যর কণ্ঠে পাওয়া শ্যামা সঙ্গীত “আমার চেতনা চৈতন্য করে দে মা চৈতন্যময়ী”। আমার ভক্তি চেতনা চৈতন্যলোকে উত্তীর্ণ হতে যে এখনো অনেক দেরী, সেই অভাববোধের উপলক্ষিতে নির্বাক হয়ে বসে ছিলাম আমি।

এই বন্ধবান্দর  
রাত নেই,  
নেই চুপচাপ,  
তারা আঁড়ানোর  
ঘুম কাঁড়ানোয়  
ভরা মরা রাত



ছন্দের উৎসব

বঙ্গ লোক  
গৌরীশঙ্কর মুখার্জী

তপনের আলোকে,  
দীঘির সলিলে,  
প্রাকৃতিক অমুজে,  
নরম মাটির সবুজ ঘাসে,  
ফলে ফলে শস্যে,  
নবরূপ রবির কিরণে,  
খোলা বিশাল আকাশের নীচে,  
আমাদের মনোরঞ্জন আসবে ফিরে:  
মায়ের পূজার আয়োজনে  
সন্ধ্যার ঘণ্টার ধ্বনিতে,  
মৃদু মিষ্টি বাতাসে,  
মন্দিরের চাতালে বসে,  
কথা বলে মধুর হেসে;

রাতের আঁধারে জ্বলবে আলো মাটির দীপকে,  
আকাশে শুভেন্দু সপ্তর্ষি, ধ্রুবতারা দেখে,  
সময় কাটবে সবার সাথে গল্প করে,  
বা কোন আলোচনা মনন চিন্তনে |

আছে খোলা আকাশ, সিন্ধু বাতাস -  
তবু মিছে মোরা হারাই বিশ্বাস,  
কেন হই মোরা বিব্রত;  
আমাদের সাথে আছে রনধীর, সুমন, সুব্রত .... ,  
করবো মোরা আরো উন্নত -  
বঙ্গে ও বহিরবঙ্গে সকলের সঙ্গে,  
সোহিনী সুন্দর, নন্দিনী সংস্কৃতির তালেতাল ঠুকে,  
ভালো কাজে সবার সাথে থাকব মোরা সবার মাথে,  
জীবন চলবে আপন আপন স্পন্দনে,  
সকলের সাথে ছন্দ মিলিয়ে,  
সকলে থাকবে আনন্দে |



দর্পণ

প্রণব কুমার সাধুখাঁ

সমতল দর্পণ

দেখা যায় কিন্তু ধরা যায় না  
মনের দর্পণে

ধরা যায় কিন্তু দেখা যায় না  
জীবন দর্পণ

অনেক অনেক কথা বলে  
অনেকের সাথে আলাপ করিয়ে  
সহজভাবে ওদের সাথে চলে।

দর্পণের সার্থকতা,

তার নিজের মধ্যেই নিহিত

যখন তাকে ব্যবহার করা যায়

তখন থেকে শুরু হয় তার সফলতা ॥

মন

শুভ্রা গাঙ্গুলি

#

খবরে বলা হচ্ছে দক্ষিণের হাওয়ায়  
এবার মেঘ নামবে বাদলের আঁচলে-  
চকমকি পাথর উড়ছে ঘূর্ণাবর্তের চক্রান্তে  
মন কেমন করা বিকেল-  
উদাসী অথবা চনমনে বা কিছুটা ধীর

একটি আঁধাপোড়া সিগারেটের ধোঁয়া  
নিকোটিন বেয়ে সমস্ত সিলিং জুড়ে  
হয়ে উঠেছে শূণ্যতায় মেঘ

তাহলে মনপোড়া মনই কি নামবে এবার-  
ড্বিজলিং বা বৃষ্টি হয়ো!?

#

উঠোনময় ছড়ানো ছিটানো বরফকুঁচি-  
গড়িয়ে যায় পঞ্চধারা সপ্তসুরে  
নিষাদ কোমলে রাগ খাম্বাজ  
আর গমকে শাস্ত্রবিজয়িনী-  
লহরের পর লহরে মনসোহিনী  
তবলার তেহাই ফসল ফলায় মাঠে

অপার বিশ্বয়ে বরফ ও উষ্ণতা পাশাপাশি ...!

#

ভাকবাজের কোনাকোনিতে একটি হলদে চিঠি  
সম্পর্কের রেখারেখিতে  
কি ছিল আর কতটা নেই-  
বলা কওয়ায় তিজক্তার হিসেব নিকেশ

সর্বোচ্চ আদালত যে রায়ই দিক না কেন-

ভুবুরী জানে পরিমান মত অক্সিজেন নিলেও  
মহাসাগরের ফাঁটলে পৌছানো যায় না, কখনও!



## কোভিড-১৯

নন্দিতা দাশগুপ্ত

শিরোনামে শুধু মৃত মানুষের ভিড়  
দুদিনের জ্বর, তারপরই সব শেষ।  
চারিপাশে তার নেই কোনো চেনামুখ  
হাতখানি ধরা সেবিকার -- নেই ক্রেশ!

সেবিকার চোখ ভেসে যায় ধারা-জলে  
এ বাঁধন কোন ফেলে আসা জনমেরা  
ইতিমধ্যেই আবার বেজেছে বাঁশী  
ডাক পড়েছে যে অন্ প্রকোষ্ঠের।

চোখ মুছে নার্স মুখে সঁটে নেয় মাস্ক।  
শশব্যস্তে ফের লেগে যায় কাজে।  
সাত নম্বর ঘরেতে এসেছে রোগী  
তাই তো আবার সেজে নেয় রণসাজে।

সেখানেও বুঝি নামবে বিদায়বেলা  
সেখানেও বুঝি তুলে নিতে হবে হাত।  
যখন রোগীর জীবনপ্রদীপ নেভে  
মৃতের রাজ্যে আরেকটি বাজীমাং।

মারণব্যাদির সম্মুখ এ সমরেতে  
মৃত্যুর সাথে প্রত্যহ গলাগলি।  
নার্স-সেবিকারা প্রথম সারিতে লড়ে  
এস কবি, আজ তাদের কথাই বলি।

## মুখোশ

নন্দিতা দাশগুপ্ত

অতিমারীর সংক্রমণে  
মুখোশ তুলে নিয়েছি  
রং বেরঙের মুখোশ পরে  
আড়াল করে দিয়েছি --  
বাইরে আছে জীবাপু যত,  
মারণ ব্যাধি করোনার।  
বাঁচতে চাই, বাঁচাতে চাই,  
জীবন দামী সবাকার।

ভুখোও তুমি,  
মুখোশটা কী?  
কাপড়, নাকি?  
পরত কটা দিয়েছ?  
মাঝে মাঝে সরিয়ে দিয়ে  
বুক ভরে শ্বাস নিয়েছো?

বলি, আজকে এত প্রশ্ন কেন,  
গতকাল তো করোনি  
কালকেও তো মুখোশ ছিল,  
ধরতে বুঝি পারোনি।

সেই মুখোশের অন্তরালে  
মনের মুকুর ঢেকেছি  
মনের কথায়, মনের বাথায়  
পর্দা ফেলে রেখেছি  
যতটুকু দেখাতে চাই,  
সেটুকুই তো দেখো সবাই  
আর যা কিছু --  
লজ্জা, ঘৃণা,  
বুকজোড়া সব ক্ষত!  
গাল ভরা এক হাসি  
সেখায় প্রহরী অবিরত।

More than 3,600 US health workers died in  
COVID's 1st year

'None of us signed up to die': Filipino  
American nurses disproportionately  
impacted by COVID-19

IGN says 115,000 healthcare  
worker deaths from COVID-19

The Toll of COVID-19 on Health Care Workers Remains  
Unknown


সম্পর্ক  
জয়শ্রী বসু

সম্পর্কের চেহারা খুব বিচিত্র  
তার দড়িটা যতই থাকে শক্ত  
বাঁধন ততই হয় আলপা।  
ভালবাসার দৃঢ় মায়াজালে  
আবদ্ধ দুই নরনারীর ঘটে  
বিদ্যুৎপাতের মত চির বিরহ।  
সন্তানের প্রতি অকুণ্ঠ মেহও  
রোধ করতে পারেনা বাবা মায়ের  
নির্ভরতার অনিবার্য পতন কে।  
সহোদর প্রীতির আজন্ম বন্ধন  
দোদুল্যমান নৌকায় ভাসে অহরহ।  
জীবনের পাঠ যদি বা পূর্ণ হয়  
জীবনের শিক্ষা অসমাপ্তই থাকে  
মানুষ শুধু প্রশ্ন করে আর উত্তর খোঁজে।  
সম্পর্কের পরীক্ষার খাতায় থাকে অসংখ্য ভুল  
কোন অঙ্ক মেলে না,  
পাতা জুড়ে শুধু কাটাকাটি।  
পরীক্ষা শেষে হেঁট মুখে হয়তো  
পালিয়ে যায় কেউ  
জীবনের মহা রঙ্গমঞ্চ ছেড়ে,  
শুধু অভিমানের আর অবিশ্বাসের  
বোঝা কাঁধে নিয়ে।  
যা হবার থাকে তা হয় না।  
কিন্তু হয়তো হলে হতে পারতো।

কোপাই নদীর ধারে  
জয়শ্রী বসু

সূর্যের পশ্চিম আভা  
কোপাই এর তীরে  
বসেছিল কোপাই এর হাট  
সারি সারি মানুষের ভীড়ে।  
দূর দূরান্তর মানুষের  
কেনা বেচার মেলা  
পথচারীর পায়ে ঘোরে  
ধূলো বাড়ের খেলা।  
হঠাৎ ডুবে যায় আকাশ  
গভীর অন্ধকারে  
কেনা বেচা হারা জেতা  
নিমেঘে যায় দূরে।  
হারিয়ে যায় মানুষগুলি  
শুধু আর্ত রবে  
প্রিয়জনের জন্য কাঁদে  
হাত জড়িয়ে সবে।  
কোপাই নদীর তীরে  
বসেছিল যেই হাট  
নিকষ কালো অন্ধকারে  
ভাঙ্গলো তার পাট।  
সূর্য ডোবার শেষে সেদিন  
ভুবল যে সেই হাট  
ধূপোর গন্ধ বুকে নিয়ে  
পেরিয়ে এলাম মাঠ।  
এবার শুধু বাড়ি ফেরা  
পথটা চিনে চিনে  
সওদার ঝুলি পূর্ণ করে  
নিজের আপন স্থানে।।

অনেক দূরে,  
অনেক দেশের পর  
মোদের আপন ঘর



**We thank our donors**

**Amrita Mukherjee & Sandip Bhattacharya**

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**Sumitra Reddy**

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**Urmila and Mrinal Dewanjee**

**And**

**Anonymous Well-wishers**





**Greetings  
from  
June & Rajan  
Guha**




**Greetings  
from  
Tannisha,  
Tanusree &  
Neelkantha Sen**



**Greetings  
from  
Sikha & Tarak Bhar**



**Greetings  
from  
Shuvojit Banerjee**



**Wishing all the best to our Alma Mater  
on her 166th year of successful journey!**



**Utpal and Nandita Dasgupta**





# PRADIP AND KUMKUM GHOSH FAMILY FOUNDATION

We serve people with Compassion, Innovation and Excellence

Pradip and Kumkum Ghosh Family Foundation, a 501c3 non-profit organization, founded in the year 1986 and headed by Dr. Pradip K Ghosh. It is a family trust working for the past 35 years in numerous philanthropic activities.

Dr. Pradip K. Ghosh who is settled in Maryland, USA for the past 50 years, has been instrumental in various social services and contributed plenty for the operation of charitable hospital, maintaining more than 2500 orphan children, destitute and handicapped women, funding libraries, schools and athletic facilities and many community development projects, both in USA and West Bengal.

Pradip and Kumkum Ghosh Family Foundation is trying to further the vision and is constructing two more buildings encompassing than 500,000 square feet to develop the first international public health University in India, to be named as International University of Public Health and Technology. The foundation has erected the Washington K&E Temple, a true Indian Temple representing every regions of India, built on nine acres of pristine ashram. The Foundation originated with an objective to create a sustainable and healthy society, where the Urban and Rural populace live a symbiotic life and mobilize to be a support system in their own growth.

The Foundation has made its presence felt with an extensive contribution in the field of operating charitable hospitals, maintaining and facilitating orphans, destitute and physically disabled women. The foundation has worked remarkably well towards funding libraries, schools and athletic facilities and numerous community development sectors both in the USA and West Bengal, India. The Foundation has serious intent and aims to facilitate and uplift the education and public health scenario of India and especially West Bengal with the best possible efforts.

With a vision to highlight India's strength and talents and elevate knowledge and learning, Pradip and Kumkum Ghosh Family Foundation has taken the initiative. The foundation also owns and operates 12 Montessori schools, 01 International Baccalaureate/STEM School in USA and 01 CBSE, STEM & Proposed International Baccalaureate school in Kolkata, India. The foundation also has two large assisted living facilities in Maryland, USA.

Public Health is one of the crucial factors that is responsible for the holistic development of a community, but unfortunately, due to lack of awareness in the developing countries and negligence towards health perspectives, Public Health and overall community development takes a backseat. In this regard and with the commitment to create a change in the paradigm of Public Health, the Foundation has introduced and initiated new Public Health oriented wings and facilities under its wing. The new initiatives on research, diagnostics, translational outcome, epidemiological, genomic and proteomics research coupled with state-of-the-art instrumentation facilities is positively going to create an impact on the whole.

With these ideologies in mind- a research institute- International Institute of Innovation and Technology (IIT) began its journey and have now spread its wing nationally and internationally through various reputed collaborations. IIT Advanced Diagnostic Center, IIT synthetic Lab facility, IIT Biocubation Center, IIT -distrumed Biorepository- all are part of this endeavor to cater to public health, economic growth, community outreach and definitely translational scientific breakthroughs in a concerted and multi-pronged approach. International University of Public Health and Technology- the first of its kind in India and South-East Asia thereby envisions to integrate academia and research to create excellent healthcare transformations that might lead to stronger voices for public health advocacy and implementation- in both national and global stages.

Upcoming facilities of IIT Mental Health Center, PKG Medical and Nursing College, PKG multispecialty hospitals are all platforms created to aid in breaking the barriers of accession to basic and advanced health facilities. Irrespective of financial status- every individual will be provided with the best of the treatment procedures to aid in making a better and healthier future healthcare.



IIT



IUPHT



PKG MULTISPECIALTY  
HOSPITAL



PKG MEDICAL & NURSING  
COLLEGE



IIT MENTAL  
HEALTH CENTER

## OTHER VERTICALS:



COMMUNITY  
OUTREACH



RESEARCH AND  
DIAGNOSTICS



I3T-INDIVUMED  
BIOREPOSITORY



I3T-BIO-  
INCUBATION  
CENTER



I3T-ANIMAL  
HOUSE  
FACILITY



I3T-SYNTHETIC  
CHEMISTRY  
FACILITY



INTERNATIONAL  
INSTITUTE OF  
INNOVATION AND  
TECHNOLOGY

## MORE INFORMATION:



+91- 6292152210



<https://pradipandkumkumghoshfamilyfoundation.org/>



DH-6/24, Street No: 0317, Action Area- ID, Newtown,  
Kolkata- 700 156.



PKG MEDICAL  
COLLEGE AND  
HOSPITAL

# INTERNATIONAL INSTITUTE OF INNOVATION AND TECHNOLOGY AND INTERNATIONAL UNIVERSITY OF PUBLIC HEALTH AND TECHNOLOGY (UPCOMING)

**FOUNDER-CHAIRMAN: DR. PRADIP K. GHOSH, COLUMBIA, MARYLAND**



**ADDRESS: DH-6/24, STREET : 0317, ACTION AREA- ID, NEWTOWN, KOLKATA- 700156.**

**WEBSITE: [www.i3tk.org](http://www.i3tk.org)**

**Phone: +91- 6292152210**

## INTERNATIONAL INSTITUTE OF INNOVATION AND TECHNOLOGY

**MISSION:** To improve public health in India by integrating research, education and health-related services that deliver innovative solutions to real problems impacting the society by creating and exploring the frontiers of research and education platforms.



## PROGRAMS AT I3T:

1. JOHNS HOPKINS UNIVERSITY INDIA CENTER FOR MATERNAL AND CHILD HEALTH
2. INTERNATIONAL VACCINE ACCESS CENTER- VACCINE RESEARCH
3. INTERNATIONAL UNIVERSITY OF PUBLIC HEALTH AND TECHNOLOGIES
4. IIT ADVANCED DIAGNOSTIC CENTER
5. MARYLAND INTERNATIONAL STEM SCHOOL
6. RESEARCH DOMAINS:

• EPIDEMIOLOGY	• STEM CELL	• DIABETES
• BIOINFORMATICS	• MALARIA AND DENGUE	• BIOCHEMISTRY & MOLECULAR BIOLOGY
• BIostatISTICS		
• BIG DATA	• HEPATITIS	• IMMUNOLOGY
• MICROBIOLOGY	• TYPHOID	
• GENOMICS	• CANCER	• VIROLOGY

7. CENTER FOR MENTAL HEALTH
8. CENTER FOR ENTREPRENEURSHIP MANAGEMENT
9. CENTER FOR SOCIAL JUSTICE AND WOMEN EMPOWERMENT
10. BREAST CANCER RESEARCH CENTER
11. ENVIRONMENTAL HEALTH AND ENGINEERING CENTER
12. DEPARTMENT OF POPULATION, FAMILY AND REPRODUCTIVE HEALTH
13. RENEWABLE ENERGY RESEARCH CENTER

## I3T LAB FACILITIES



**INSTRUMENTATIONS:** GENEXUS ION TORRENT, S5 PLUS (NEXT GEN SEQ.), FACS, HPLC, LC-MS/MS, FPLC AND OTHER ADVANCED EQUIPMENT FACILITIES

**UPCOMING:**

**I3T- MULTISPECIALITY HOSPITAL & I3T MEDICAL COLLEGE**

## INTERNATIONAL UNIVERSITY OF PUBLIC HEALTH AND TECHNOLOGY (UPCOMING)

**LOCATED ON 6.2 ACRES OF LAND IN NEWTOWN  
(800,000 SQ.FT. FLOOR SPACE CAMPUS- IN  
8 SEPARATE BUILDINGS)**



## CENTER FOR SOCIAL JUSTICE, WOMEN EMPOWERMENT & OUTREACH



**DONATED 350 OXYGEN CONCENTRATOR DISTRIBUTION DURING COVID-19, SAVED NUMEROUS LIVES**



**FOOD DISTRIBUTION DRIVE AND WOMEN EMPOWERMENT**



**HEALTH CAMP AT I3T ADVANCED DIAGNOSTIC CENTER**

**PUBLIC HEALTH / HEALTH SCIENCES/ TECHNOLOGY  
AN INITIATIVE OF PRADIP AND KUMKUM GHOSH FAMILY FOUNDATION**