Heisenberg in Bengal

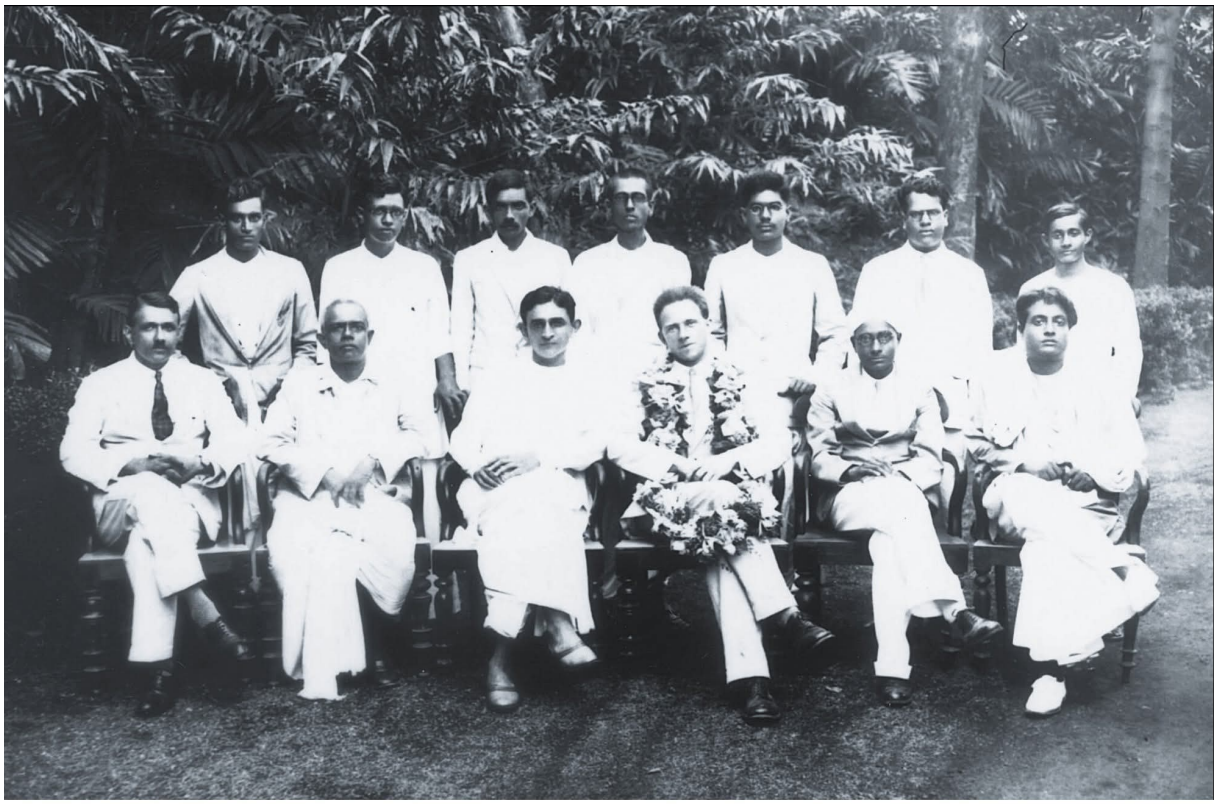
Amitabha Chakraborty

Department of Chemistry, Sri Ramkrishna Boys' High School
Nilkuthi, Cooch Behar, West Bengal 736 156, INDIA

It was October 1929, exactly two years had passed since the fifth Solvay conference. After that six-day historic conference, quantum physics has begun to gain a little recognition in the world of physics. This theory has developed by some young physicists like Werner Heisenberg, Erwin Schrödinger, Paul Dirac, Pascual Jordan, and others. Senior scientists like Niels Bohr and Max Born are very much excited about quantum physics. Various experimental observations can be explained by the perfect mathematical form of this theory. An unknown world of atoms and particles is about to be revealed to the researchers. Heisenberg found the principle of uncertainty. The question of uncertainty comes when one tries to measure certain properties of very small and dynamic particles. Although many contemporary researchers are satisfied, the great scientist Albert Einstein is yet to accept this theory. According to him, if the accuracy of scientific scales is questioned about, then completeness of that theory remains questionable.

Lot of research papers have been written on this new theory. Meanwhile, Heisenberg and Dirac are on a lecture-tour in the United States. The two have long lectured at various universities and research institutions in the US about this new branch of physics. The friendship between the two has deepened when they come here. There is no British-German cynicism in the world of science. It was the same as two decades ago, when an astronomical experiment proved the truth of German physicist Einstein's theory of relativity under the supervision of British scientist Arthur Eddington. This theory of relativity shattered the Newtonian concept of traditional physics. In the world of particle physics, quantum mechanics have come up with a similarly revolutionary way. Werner Heisenberg, a twenty-eight-year-old young physicist, is one of the important contributors of this new scientific theory.

After spending a long time in America he comes to Asia. His destination of India was via Japan and Singapore. His teacher Arnold Sommerfeld has visited India just in the previous year. Researchers from this English-ruled country have also started contributing significantly to the modern physics arena. Senior scientist Jagadish Chandra Bose is there, even European scientists are excited about the work of several young researchers. Albert Einstein himself praised the research of a young professor



Werner Heisenberg inmitten seiner indischen Freunde, untere Reihe von links nach rechts: R. Rao, Dey, D.M. Bose, W. Heisenberg, K.S.Krishnan – Mitentdecker des Raman-Effekts –, S. Nath Bose – Erfinder der Bose-Statistik, Calcutta 1929

at Dhaka University named Satyendra Nath Bose. He translated Bose's paper into German and arranged it to be published in the famous journal Zeitschrift für Physik. But Calcutta is now at the headline of physics research. It is the city where C.V. Raman and his assistant K.S. Krishnan have found special light scattering in the laboratory of the Indian Association for the Cultivation of Science. Recently, several research articles in Europe have termed this phenomenon as ‘Raman Effect’.

On October 4, 1929, Heisenberg landed in Calcutta by ship. Incidentally, Satyendra Nath Bose was also in Calcutta. Satyendra Nath, K. S. Krishnan, D. M. Bose, R. Rao and other physics professors and teachers were surprised by his sudden arrival at Calcutta University. A felicitation was organized immediately in the presence of students. Professor Devendra Mohan Bose (D. M. Bose) helped Werner a lot. During the First World War Devendra Mohan had been in Germany for research and he was stuck there for a long time. He is a former acquaintance to Werner.

Another reason for coming to Calcutta is of course the Indian poet Rabindranath Tagore. For the first time Werner heard about Tagore three years ago from Professor Max Born's wife, Hedwig. Born was a teacher of Heisenberg at The University of Göttingen. The Indian poet was then lecturing in various cities of Germany. Tagore’s novel ‘At Home and Outside’ was highly appreciated by the professor’s wife. Heisenberg went to Munich to listen to Tagore’s speech with his parents. After

returning home his righteous mother said, “This Indian poet looks like God Jesus!” Nobel Prize winner and looking like a divine, this man was literally a sage of the East. Heisenberg himself has seen how frenzy the peoples were in Germany about the poet’s speeches or translated poems! It was all about romanticism as well as spiritual idealism. Sometimes there were disturbances by the people outside the auditorium who were not able to enter the lecture room. What an unfailing skill the poet had to impress the audience with his shady voice! Since then, Werner has developed an interest in Indian philosophy. And for him it would have been nice to talk to and meet the man directly once. Finally, that opportunity comes through Devendra Mohan Bose. Devendra Mohan, the nephew of Acharya Jagdish Chandra Bose, has been close to the Tagore family for a long time. He is one of poet’s favourite guys. After lunch, he arrived at Tagore’s house in Jorasanko with Heisenberg.

The poet’s son Rathindranath has arranged for tea in the first floor. Devendra Mohan left the room after a while, but Rabindranath spoke to Werner Heisenberg for a long time. The soft light of the afternoon has melted through the tree and entered the room through the window. A German young scholar and a senior Indian poet are talking about the real truth of science and philosophy. Rabindranath does not believe in any beauty and truth irrespective of human. He says,

– Through the disciplined processes of science, people overcome the personal limitations of their minds.

This is quite heartening for Heisenberg. His theory of uncertainty is also the product of this process! He replied,

– That’s true. The natural laws that we are constantly looking for in science are actually an understanding of humanity.

– Yes, an eternal humanity. The reality of the global nature that is spoken of in scientific ideas depends on our consciousness. There can be nothing that is not subject to human personality. Even the truth of the universe is actually the human truth.

– How?

– Let’s talk about inanimate substances made of electrons and protons. There are a lot of empty areas among them. This means that even if the void is aligned with electrons and protons, the substance seems to be solid. Similarly, mankind consists of individualities, including the interpersonal relationship.

– Then, in your opinion the world is a realization of humanity.

– Yes, indeed. The realization of an eternal humanity. This realization comes through our actions and emotions.

– We only want to understand the disciplined form of nature. Even if this discipline is ordered in a large-scale existence, it is not captured in our senses among the smallest particles.

– In fact, there is this dual contradiction in the face of existence. I find comparisons in our psychology. Our emotions and desires are disobedient, but our character brings them under their control and turns them into an integrated whole. ...

The poet spoke a lot more about the physical reality of inter-relationship, mortality, relativity, and many other points in respect of the Indian philosophy. He has set up an educational institution in a village outside Calcutta, named Shantiniketan. Students from all over India come here to study, but the heart of this international educational institution is very much Indian. Science is taught there along with literature, painting, music, etc. They also spoke about India's freedom movement and Gandhiji's role for that. This long conversation with Rabindranath seems to make a lot sense to the young physicist.

Heisenberg comes straight to the Sealdah railway station in the evening. He writes a letter to his parents informing them about his arrival in Calcutta and put it in the letterbox. Then he boards the Darjeeling Mail and takes seat in a first class compartment. This time his destination is the hill town Darjeeling. Even though Darjeeling is not exactly a town, it is the property of some of the country kings and landlords, but the British want to develop this hill area into a leisure location for their summer staying. In addition to tea plantations, churches, clubs, schools, community halls, bookstores, etc. are being built one by one. While walking on foot one may see iron railings towards the cliff on the road. Even on the slopes of the hill, within the 40 acres of land, they are trying to create a botanical garden called Lloyd's Botanical Garden.

Heisenberg got into the hotel. He sent a telegram to his parents in Germany informing about his arrival in Darjeeling. It's very foggy and cloudy today. The vision does not go far beyond the grey clouds. It's so cold. The light of day is fading. This stylish town is getting a little weird. The caretaker boy of the hotel brought him tea. He was a local Lepcha boy and can speak English quite well. As he lit a fire in the fireplace, Heisenberg asked,

– How far is Tiger Hill from here?

– Not far away. It takes an hour to go. Will you go? So, let's arrange for a horse?

– What's the need for a horse? I want to trek. But if it rains, everything will become unstuck!

– Sunrise can be seen at Tiger Hill only if luck favours you. I think the clouds will pass. Sir, you must go to bed early today, I'll call you around 2 pm. After taking early breakfast you should go out for trekking, otherwise it's not possible to reach the peak before 4.30.

Within this momentary conversation Heisenberg likes the boy. He says,

– Tell a guide to go to Tiger Hill with me.

– You won't think for, Sir. I'll tell the manager tonight.

The young professor wrapped the blanket on his bed. He has been leaving the country for nearly a year and missing his mother very much. He sat down to write a letter.

Darjeeling
October 5, 1929

Dear parents,

Two hours ago I sent you a telegram about my arrival in India. I am imagining you must be receiving it just now (it must be about noon there); you will probably be surprised that it is coming from Darjeeling and not from Calcutta. But as I mentioned in my last letter, I arrived in Calcutta two days early; in order not to alarm you, however, I wanted to wait for the designated day to send my telegram.

As of noon today, I am sitting here in this mountain village in the foothills of the Himalayas (2200 meters altitude). It is strange to know that from my window I could see the gigantic mountains of the Himalayas with its glaciers, if only the weather were clear; for right now the rain is pouring, and a thick fog is barely allowing visibility of 100 meters. You can imagine that I am a little impatient; two days from now I will have to leave here again, and if it does not clear up till then, I should say that my entire trip to India was practically in vain. It is these mountains that are dearer to my heart than any old temples. But maybe I will be lucky again as I have been in similar cases often before. Actually, it is very beautiful here even with rain and fog; the air itself is quite different from down there in the heat of the Ganges basin, and makes you feel "at home"; it is so chilly that I had to wear my wool suit. Should the weather clear up, then I will attempt (like every tourist) to rise at 3:00am and climb a mountain named "Tiger Hill" which gives you a view of Mt. Everest; sunrise there is supposed to be so beautiful. There are here, as the name indicates, still tigers around in the forest (called jungle) but they never dare to come close to the travelled paths, but run away from humans for good reason, just like our deer in the woods do.

Yesterday in Calcutta, I spent time with the physicists and had a host of interesting experiences. In the afternoon I was a guest of the Indian poet Rabindranath Tagore. You may recall him from the lectures he gave a few years ago in Munich. Tagore is running a university or school, whatever you want to call it, where young Indians are taught in the arts and sciences, etc. This school is closely connected to the Indian freedom movement under Gandhi. Material power, of course, is with the English – will there ever be a triumph of spirit over might? I have encountered the English colonial economy only in its bad features. Hotels for Europeans, railroads, everything is very poor and very expensive. Obviously, all profits are pocketed by the English, do not stay in the country, and can therefore not be used for infrastructure improvements. For instance, even in the sleeping compartments of the first class one is not provided pillows and sheets, you have to bring those yourself, and any fourth class compartment in Germany is better than first class here. Yet everything is more expensive than at home. One can easily figure out where the money goes. Any decent person will deem the economy here scandalous. Of course, life in the lower classes here is also shocking for us; and yet the English have not improved this.

Some religious customs in this country appear to us quite terrible and inexplicable, and I have witnessed some things which I would rather wish I could forget. Meanwhile evening has descended, and the servant just started a jolly fire in the fireplace of my room, lest it get too cold. This reminds me a lot of life in our alpine hut. Outside it also, knock on wood, cleared up a little and everywhere there are glimmering lights from the village across the mountains. I hope it will clear up completely during the night.

He had finally gone to Tiger Hill. After, the sky became little brighter, and after about forty minutes, the eastern sky became clear with a pale light. In front of the canvas like blue sky, golden light spread on the six peaks of the snow-capped Himalayas. Within a few moments the snowflakes became white shiny. At first on Kangchenjanga, then the light spread to the other peaks one by one. Each mountain top could be seen separately on the cloud-free sky. The guide boy began to name the peaks to his foreign guest one by one. In front was Kangchenjanga. His pronunciation is ‘Kangchenjunga’. The peak behind the cloud line in the far distance was Mount Everest, the highest peak in the world. The glaciers, as well as many other rock-tops and hilly grooves were also clearly visible. Slowly, the sun came out with all its brightness to the Himalayas and also fell on Tiger Hill. Now it was time to go back with a lot of pleasure. Heisenberg started to go down with his guide through the forest road.

The young physicist returned to the hotel. He freshened up and finished breakfast. Today the weather was very clear; there was no trace of dirtiness anywhere. He sat down with a pen to write the rest portion of the letter.

October, 6
Sunday morning

In the meantime I have had quite a stroke of good luck, more than I had dared hope for at all. When I woke up once at 1:00 am, it was again completely foggy and I really gave up any hope. But already at 2:00 am the servant was knocking at my door: it was clearing up, and did I want some tea? At 2:30, all done getting dressed and having a bite for breakfast, off I went with a Tibetan guide. (The mountain inhabitants here are of Mongolian origin and hail from the north). The sky was now partially lit with stars; especially Orion was spectacularly bright above our trail. At first there was a gentle incline up to a neighbouring village where only a few lights were still on, then up through a thick forest; I was glad to have the guide along, otherwise I might have gotten lost. While we were ascending, the sky was getting visibly clearer and as we reached the summit at 4:30, only a few bands of clouds were up in the sky, and the view all around was totally unobstructed. But it still was all dark, just this wonderful starry sky. We used the time till sunrise to brew some coffee on a wood fire. We were the only people on the summit, since everyone else didn't believe in the change in weather. Then at about a quarter past five, it started getting light in the east, and out of the transparent blue sky, there emerged the snowy mass of the Himalayas, with their whitish gray color, so familiar to me from our own mountains. Directly in front of us (that is: still 50-70 km away) there was the range of the Kanchendjanga completely cloudless, every summit sharply edged. The main summit is 8000m high, -and at such heights mountains are simply gigantic even at a distance of 50 km. Mt Everest, however, is much farther from here – I think about 150km, and thus is appearing less grand. Also it was always a little under cover of clouds, allowing only occasional glimpses of the summits. Between both ranges and east of the Kanchendjanga there stretches a long chain of lower peaks and glaciers, probably all of them still over 6000m high. Particularly towards the east this view bore a lot of similarity with the one from the Bruennstein towards the range of the Tauern Mountains. (You probably still remember it?) Long before the sun reached our hill, the tallest mountain peaks began to glow, first the Kanchendjanga and Mt. Everest, then the lower summits. But you already know what such a sunrise looks like. We remained up there for a long time, till the mountains were gleaming white and the sun was warming us.

Now we are once more sitting under clouds and fog, but that of course doesn't faze us anymore.

But I don't want to begin a new page. Therefore many warm greetings,

Yours Werner

On the next morning, Heisenberg boarded the train to come down from the mountain. He had to catch the ship from Calcutta again. On his return journey by train, he wrote a letter to his friend Paul Dirac about his experience of travelling Darjeeling.

Heisenberg came to Madras from Calcutta. K. S. Krishnan had already arrived at Madras Presidency College to welcome him. The responsibility of accompanying this foreign guest falls on Chandra, a final year student of the science department. His full name is Subrahmanyan Chandrashekhar. A few months ago, Heisenberg's teacher Arnold Sommerfeld came to this institution. Chandra also met him. It was from Sommerfeld he had first heard of Schrödinger's wave mechanics and the progress of the particle physics by Heisenberg, Dirac, Pauli, and other young fellows. As a result, Heisenberg's company is like a dream to him. He hires a car and shows the German physicist various temples of Kanchipuram and Mahabalipuram throughout the day. Heisenberg is very impressed when he looks at his inquisitive eyes and his knowledge of science. Chandra hears about the physics institute of Niels Bohr in Copenhagen. Heisenberg says that, with Bohr's philosophy of science, teaching, and kindness that institution is a dream place for himself. Hearing these magical words, Chandrasekhar becomes more and more determined in his dream of doing research in physics. After the evening, they sat on the beach, and the discussion of physics continued. Chandra also spoke about his recent research article. Next day, he wrote a letter to his father saying, "I spent the whole of Monday with him till he left for Colombo by boat mail. I discussed with him my papers also. In one day by merely talking to him I could learn a world of physics."

From Madras port the ship pushed along for Colombo. In this capital city of the island nation Sri Lanka, the influence of Buddhism is more pronounced and there are countless of monasteries. Heisenberg also visited an ancient Buddhist temple surrounded by coconut trees in Rangoon before coming to India. In a letter to his parents, he wrote, "In these temples, one has to leave shoes outside and enter barefoot." He visited the port-city by foot and visit the Gangaramaiah temple. In this city, far away from European culture, the people are very sincere. After waiting for two days, his big suitcase finally arrived here from Singapore. In due course, the Japanese ship 'Haruna Maru' left Colombo port. He was on his way to Europe. While crossing the Suez Canal the young physicist was really feeling the attraction to his fatherland.

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