

MEGHNAD SAHA: THE FIRST INDIAN WHO DREAMT OF 'BIG SCIENCE' IN INDIA

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ABSTRACT

Meghnad Saha who discovered the 'Ionization Theory', was not only a greatest scientist of the twentieth century, but also a great thinker. Saha, who believed in 'Social function of Science', started co-operating with Nehru, Bose and other national leaders for the post-independence India in 1930s. He was the first Indian scientist who advocated the need of searching alternative sources of energy for the future national reconstruction and industrialization. He started a 'Cyclotron Laboratory' at Calcutta University by the help of Nehru and others. It was the first practical step towards the initiation of 'Big Science' in India. Saha was the first man of science, who aimed at starting 'Big Science' in India. But due to his differences with Nehru and Bhabha after 1945, he was sidelined from the atomic energy development programme of India, as well as, from the National Planning Commission.

KEYWORDS: Social Function of Science, Cyclotron, Big Science, Nehru, National Planning, Atomic Energy, Institute of Nuclear Physics & Atomic Energy Commission.

1. INTRODUCTION

Meghnad Saha, was one of the greatest pioneers India ever produced. This multitalented Scientist refused to live in the 'Ivory Tower' of science and dedicated his life for the reconstruction of post-independence India. His focus was on eradication of poverty, eradication of unemployment, obtaining self-sufficiency in food production and modern industrialization. He urged that modern science and technology must be adapted for India's progress. Meghnad Saha was one of those earlier thinkers in the world who believed in 'Social function of Science'. He was one of the leading forces behind the creation of 'National Planning Committee' in 1938¹. But, the tragedy is that he was excluded from the National Planning after independence.

2. NUCLEAR THEORY

Saha had shown his interest in the field of 'Nuclear Physics' since 1932, when James Chadwick² discovered 'neutron'. Saha realized that 'neutron' had no electric charge, so it could enter into the nucleus freely. Saha wanted to conduct experiments regarding the radioactivity of the neutron. He tried hard for getting 1 gram 'Radium' (Ra) for that. Saha wrote jointly with D. Kothari three short-length papers, i.e. 1) 'On the Beta-ray Activity of Radioactive Bodies' (*Bulletin of Academy of Science, Allahabad*, 5, 257, 1934) and 2) two papers on 'A suggested explanation of Beta-ray Activity' [a) *Nature*, 132, 747, 1933; b) *Nature*, 133, 99, 1934]. After that, Saha stopped his work in this subject. According to S. P. Pandya- "Why did he not pursue nuclear theory-which would have been so much easier? There were so many new developments –Yukawa's theory of nuclear forces, Bohr's work on nuclear reactions, beginnings of a shell model etc. Somehow, he remained aloof from all these developments."³ In the meantime, Enrico Fermi got 1 gram of Radium from the Italian Government and conducted the experiment. He had discovered the neutron-induced radioactivity and published

his results in the Italian journal 'La Ricerca Scientifica' on 25 March, 1934.⁴ Saha faced obstruction due to the absence of infrastructure for such 'Big Science' in colonial India. No one was there in India, to supply him the expensive 'Radium' he badly needed for his experiment. After Fermi⁵ and Pauling's⁶ discoveries in that matter Saha and Kothari's work lost importance.

Patna University invited Saha for giving lecture on atomic physics. Here he delivered a series of lectures. Later those lectures were published as a monograph '*Six Lectures in Atomic Physics*' from the Allahabad University in 1935. He had presented the paper 'The Origin of Mass in Neutrons and Protons'⁷ before the Indian Physical Society (IPS) on 8 February 1936. Saha described a method of calculating the pole strength of magnetic monopoles from fundamental principles. Earlier P.A.M. Dirac⁸ had started work in the subject in 1931 and given a formula. However, the formula is now known as Dirac-Saha formula.

When Otto Hahn⁹ and Strassmann¹⁰ discovered the 'Nuclear Fission' in 1939, Saha immediately realized its tremendous possibilities. He wrote the article 'Uranium Fission' in 'Science & Culture' (Vol.6, p. 694, 1941). This paper discussed on the utilization of atomic energy for power-development, which was earliest in India, and one of the first in the whole world on such a field.

Earlier in 1936, he had visited Lawrence's Radiation Laboratory at Berkley, USA where accelerators were being used to speed up the particles. Such experiments involved huge expenditure. Since he attended the International Conference on Nuclear Physics at the Bohr Institute (Copenhagen), he was so much impressed with the potentials of Nuclear Physics that he dreamt to form a specialized institution in India for it.

Saha was aware of the huge cost involved in the research of Nuclear Physics. He knew well that the days of low-cost research were over. But, it was hard to convince the authorities for the sufficient grants. So, he followed a middle path. The atmosphere in pre-independent India was not conducive to the kind of research Saha had aimed.¹¹

Saha started his work with his assistance Dr. S.C. Sirkar. Dr. N.N. Dasgupta, who had just returned from England after his training, joined them. Research students like Kamalesh Ray and Paresh Chandra Bhattacharya were also available for the work. Research in cosmic rays was immediately started with Geiger-counters and equipments manufactured in the laboratory. Soon other post-graduate students came to assist them. But Saha wanted to proceed in a big way. He was determined to get a cyclotron (that he had seen in Berkley) for the research. But later, he faced great difficulties for the venture he started. The amount of money for such work was ridiculously inadequate. But, the people wanted immediate results and were disappointed when they were not forthcoming. They started raising serious doubts and questions regarding his abilities and these were used against him in high quarters.¹² Some of the policy makers had wrong opinions that Saha had no ideas about the huge financial involvement in the installation of a big machine like Cyclotron. Some others had the opinion that due to his poor lower class background, he had no practical experience of handling a large fund. But Saha was well aware of the problems of 'Cyclotron Project'. But he was against the thought that no 'Big Science' could ever be introduced in such a situation. But, in spite of all these criticisms Saha's solo initiative resulted the establishment of the Institute of Nuclear Physics (INS).

3. CYCLOTRON

In 1938, Saha had sent his student B.D. Nag Chowdhury to Lawrence's laboratory at Berkley to study and work under Lawrence and to learn how to build and operate Cyclotrons. He was informed by B.D. Nag Chawdhury regarding

Lawrence's plan of building a big Cyclotron at Berkley. He also informed Saha that Lawrence assured him to help him for building a 34 inch Cyclotron at Calcutta. Saha appointed Nag Chawdhury as 'Cyclotron Officer' in 1940.

Saha knew that building of a Cyclotron would cost Rs. 1.5 lakhs and annual expenditure of running the Cyclotron would cost Rs. 24000.

During his work for the National Planning Committee (NPC) at Bombay, between 1939 to 1941, an intimacy developed between Prof. Saha and Pandit Nehru. They had often discussed regarding the great potentials of Nuclear Energy. Impressed by the views of Saha, Pandit Nehru requested the Messers Tata & Sons for a grant of Rs. 60000 for the construction of a Cyclotron at Calcutta University (CU). But, CU denied accepting the grant. The university showed the reason that grant was not sufficient, and the university would have to shoulder the full responsibility of the project, which was beyond its capacity.¹³ Nehru arranged another grant for the project from Krisnarpan Charity Trust Fund.

After some hesitations, the CU accepted the grant and asked Prof. Saha to carry on his project. Nehru had to intervene at that stage. Dr. Shyama Prasad Mukherjee and Doctor Bidhan Chandra Ray, at his request convinced the Senate of CU, and the Senate accepted the grant made by the Tatas in 1940.

Saha received the following funds for the Cyclotron Laboratory:

- Rs. 60000 from Sir Dorabji Tata Trust in 1941,
- Rs. 60000 from CU in 1942,
- Rs. 12000 from G.D. Birla: Krishnarpan Charity Trust (recurring five years) in 1943,
- Rs. 6000 from Sir Dorabji Tata Trust in 1944.

Saha was well aware that this grant was inadequate for the purpose. But he hoped that after starting his project for Cyclotron, he would get further grants from the CU and the Government of India.

In August, 1941 order was placed in U.S.A. through Nag Chawdhury. But, the Second World War created problems regarding the delivery of Cyclotron. Nag Chawdhury returned in 1941. Some instruments (mainly for making the magnet, weighted 50 tons) received in 1941 as Saha informed Nehru in his letter to Nehru on 14 November, 1941.¹⁴ Saha also faced problem regarding the place for 'Cyclotron Research Project'. The Palit Laboratory was inadequate for this research. The CU made available a piece of land within the University College of Science Campus in Rajabazar at 92 Upper Circular Road (now known as Acharya Prafulla Chandra Road) for erecting a building for the Cyclotron. So, he built a hut behind the Palit Laboratory, before the equipments reached to him. Later in 1942, a single-storied building was built at the expense of Rs. 30000 in that place.

America's entry to the war created the situation hard for the project. The ship carrying the next batch of equipments (mainly the vacuum pumps) was sunk by the Japanese torpedo attack. It was a major setback for the project.

America had banded exports of scientific equipments, particularly vacuum equipment, which could be used for atomic research. This ban made the situation worse for Saha's project. Saha, immediately asked the CSIR for help in this project. He wrote to Professor Shanti Swarup Bhatnagar asking for grant for the manufacturing of mechanical and diffusion pumps. The grant was released for the project. Saha entrusted the work of manufacturing these pumps to his student Kamaleh Ray in the workshop of the University College of Science. Ray, successfully executed the work. But those pumps turned out to be inadequate for a large cyclotron chamber. It was beyond the capacity of the workshop to

produce larger pumps. The work came to a standstill in 1944. The Cyclotron started function after Saha's demise.

4. CYCLOTRON LABORATORY TO THE INSTITUTE OF NUCLEAR PHYSICS

After attending the International Rutherford Memorial Meeting at Paris in 1947, Saha was determined to establish a nuclear research institute in India. In 1940, Saha's introduced 'Nuclear Physics' in CU syllabus. The Introduction of a course of elementary and special training for the M.Sc. degree in Nuclear Physics created a trained group of a good number of brilliant young men in the methods of nuclear research. So, the trained personnel for this field were available to him. Now, it was the time for culmination of his dreamt institute. The foundation stone of the Institute of Nuclear Physics (INP) was laid by Dr. S.P. Mukherjee, then Minister of Industry and Supply, Government of India, in 21 April 1948.

Dr. S.P. Mukherjee had supported Saha strongly in his effort. Dr. Pramathanath Banerjee (13 March, 1946-23 September, 1949), the then Vice-Chancellor of CU helped Saha a lot to secure fund for the purpose, presided over the function. The V.C. had earlier arranged a loan of Rs. 2 lakhs¹⁵ from the 'Sur Trust'. The Government of India had granted Rs. 3.5 lakhs. Another Rs. 70000 was received as capital grant through Nehru. Saha had raised Rs. 620000 in 1947.¹⁶ Saha got another grant of Rs. 120000 from Bhabha and Atomic Energy Commission(AEC). With this amount, a three-storied building was constructed, providing approximately 3000 square meters for the laboratory and the office. The building was formally opened by Madame Irene Joliot-Curie¹⁷ in 11 January 1950 at the presence of J.D. Bernal¹⁸, Lady R. Robinson, Sir Robert Robinson, Frederick Joliot-Curie¹⁹. The Governor of Bengal and the Chancellor of CU H.E. Sri Kailash Nath Katju presided over the ceremony.

But the creation of AEC increased Saha's difficulties. The INP was formed with the clear objective of 'Training personnel' and carrying out fundamental researches. But, the AEC had not included 'Training of Personnel' as one of its objectives. So, it was difficult for Saha to procure funds from the GOI. Saha's poor relations with the AECI and the slow-functioning of the Syndicate of CU also obstructed Saha to secure regular funding.²⁰

Another great difficulty Saha faced regarding the administration of the institute. The administration of INP was running by the slow-moving body- the Syndicate of CU. Saha wanted to earn autonomy for the INP. He knew that individual donations or university resources could not afford such activities. Only the GOI could afford the expense of big science.

In this point, Pandit Nehru intervened and personally communicated with the V.C. of CU Mr. Sambhunath Banerjee, M.Sc., LL.B., Bar-at-Law (11 May, 1950- 11 April, 1954), the V.C. of CU revealed in his speech to the Senate²¹ that he had personally corresponded with Pandit Nehru near the end of 1950, and got his advice to form the INP.²² The GOI agreed to finance the INP regularly with a condition that the INP must transform to an 'all India character'. It means that the INP must be opened, the employment and admission for training of students coming from outside West Bengal.

The Senate opposed the creation of a semi-autonomous institution within the territory of the Science College of CU. The CU wanted full control on the lands, governance, admissions and employments in the INP. The CU wanted to secure the right of the Calcutta and West Bengal against the Central Government. But Dr. S.P. Mukherjee helped Saha to overcome the problem.

After a great deal of negotiations between GOI and CU, the INP assumed the status of autonomy. 40 percent seats were reserved for the students outside of West Bengal. The Senate of CU in its meeting of 12 May, 1951 granted autonomy

to INP with its own constitution and a governing body to function within the framework of CU. It was decided that the governing body would be constituted with 9 members (4 nominated by CU, 4 by GOI and 1 by Inter-University Board). The financial grant would mainly come from the GOI. Though the financial help received by INP from CU was nominal, but the V.C. of CU was made the ex-officio Chairman. It was decided that Prof. Saha, would be the life-member and Honorary Director, and in that capacity Vice-Chairman of the Governing Body. The 'Draft Constitution' was debated in the Senate of CU, where Dr. S.P. Mukherjee and Sambhunath Banerjee supported Prof. Saha.

Saha placed the resolution for the adoption of the new constitution before the Senate and remarked:

The importance of the subject of nuclear science is well-known to you. The nucleus of the atom locks up tremendous amount of energy, and scientists have found out methods for unlocking it and use it for the benefit of mankind. It is agreed that this may bring about a greater Technological Revolution than any previous scientific discovery of fire or of the steam engine. The reasons are:-

- *It places in the hands of man a source of power limitless in quantity, transportable to every region of the world and usable for every need of mankind. As prosperity of man depends on per capita use of energy, this discovery promises to relieve mankind of poverty and drudgery which are responsible for the most of the social evils.*
- *It places in the hands of man new weapons for control and treatment of diseases.*
- *It gives a new and very powerful means of studying plant and animal growth and it is hoped that it will open the new way for better food production.*²³

The constitution was evolved after a long correspondence in between the GOI and the CU.

5. CU VICE-CHANCELLOR ON ATOMIC ENERGY

The V.C. of CU, Sambhunath Banerjee declaring the INP as the fruit of Prof. Saha's 'genius and industry' remarked that, -
*"Atomic research is a subject of great importance. If we can release the energy and utilize it for the commercial purposes, it will very largely help humanity. The incredible amounts of energy that can not only destroy, but can also create. Our whole object of research should be to direct the energy in the creative channel. It is gratifying to note that raw materials for atomic energy development are available in India in large quantities. But we have got to train the personnel who can handle these materials properly."*²⁴ He also mentioned that the availability of money for that purpose in India though little, but he hoped for a better future.

The first meeting of the autonomous governing body was held on 22 June, 1951. Saha had been drawn in a national system whether he liked it or not.²⁵

Foundation stone of a Students' Hall was laid by K.D. Malavya in 19 January, 1956. At that ceremony Prof. Saha described the areas in which he wanted to extend the work of INP²⁶: 1) Particle Accelerator with a Cyclotron: under Prof. B.D. Nag Chawdhury, 2) Nuclear Physics with alpha, beta and gamma spectroscopy: under Dr. A.K. Saha, c) Instrumentation with Electronics and Radio: B.M. Banerjee, d) Nuclear Chemistry- B.C. Purakayastha., e) Theoretical Nuclear Science, f) Neutron Physics, g) Post-M.sc teaching and h) Biophysics.

Saha also realized the great promise of 'Radio Astronomy' and attempted to open a specialized school. But he was not succeeded in this project. He was the first Indian to realized the importance of 'Geophysics' and inspired the study of

radio-activity of rocks and minerals. Due to the lack of fund and apparatuses this project became standstill.

In 1945 Prof. Saha initiated an 'Electron Microscope Laboratory' for Biophysics research. He was greatly helped in this work by Dr. N.N. Das Gupta. Prof. Saha had collected funds from the Messrs. Birla Bros., Sri R.P. Saha and B.C. Law for this purpose. He had organized the Biophysics Department of CU. He had trained a group of workers and placed that group under Dr. N.N. Das Gupta after the establishment of INP. In 1948 the First Electron Microscope of India was installed in INP. Prof. Saha managed to secure a grant of Rs. 60000 from Rajkumari Amrit Kaur, Health Minister of GOI. The same amount was given by Dr. B.C. Ray, Chief Minister of West Bengal. These funds helped the installation of second Electron Microscope. Under the leadership of Dr. Das Gupta valuable researches were done here. In India, this group first used nuclear medicines like I^{131} , P^{32} , Au^{198} for the treatment of hyperthyroid and leukemia.

Saha was the pioneer in starting Post-M.Sc. course in Nuclear Science for creating trained personnel in this field. Among the 20 seats, 10 were reserved for students outside of Bengal to maintain the all-India character of NIS. This one-year course was coined to help the students to qualify for: a) undertaking research work in any branch of Nuclear Physics, b) absorption in the different projects of the Department of Atomic Energy, GOI, 3) teaching Nuclear Science in different universities and technical colleges; and d) utilizing Nuclear Science as a tool of research in medicine, biology, chemistry and other sciences.²⁷ Though the need of this course was felt in 1948, but GOI permitted to start this course in 1953. It was started under Dr. Santimay Chatterjee.

A meeting²⁸ held on late 1954, between INP and AEC (DAE) and Finance Ministry GOI. The meeting reviewed the progress of the INP. Saha had explained the causes behind slowness of some projects. Jyan Ghosh urged complete support of DAE for INP. C.S. Menon, Secretary of the Ministry of Finance, told that he had no problem if DAE decided on special projects and the UGC decided on general education in INP. Saha had found a platform for making some specific requests. Sir Marcus Oliphant was also present in the meeting as Bhabha's guest. Saha had played a regardful role because he knew well that he needed the funding. The presence of Oliphant²⁹ might have influenced Bhabh's decision of granting fund to the INP. Because, he knew well that Saha might had brought the charge of betrayal against the DAE.³⁰ But above all these, funding was allotted due to Nehru's intervention in the issue. Nehru showed solidarity with Saha because he had faith on his ability.³¹

Saha requested for the allotment of three more posts in INP. Bhabha agreed for that. Bhabah told the number of academic posts would be fixed but could be circulated or allocated to different departments according to the need. Anderson observed correctly, "*Bhabha did not contest the idea of a fixed number of posts though it was not the way he felt his institute should develop.*"³² It was decided that the annual budget of all the divisions must be submitted by the heads of the divisions in December 1955 and finalized after discussion by the director. It was decided that the INP would receive Rs. 50 lakhs for the duration of Second Five-Year Plan. The most pleasing fact is that if any personal difference between the two giants had, did not come in the way of a larger cause.³³

In the Five-Years Plan (1954-59) of INP, Saha wanted to increase the activities and facilities in: 1) Particle Accelerators: in addition to the Cyclotron he wished to install an Electron Synchrotron, 2) Nuclear Physics: dealing with alpha, beta and gamma spectroscopy, nuclear induction technique and microwave spectroscopy, 3) Electronics and Radio (Instrumentation), 4) Nuclear Chemistry, 5) Neutron Physics 6) Post-M.Sc. teaching.³⁴

This plan was approved in a sniped form. The cost of a 50 MeV Electron Synchrotron was included in the proposal and posts were created for that purpose. Though Dr. D.N. Kundu joined as Professor and Dr. A.P. Patro as Reader but Prof. Saha's wish of installation of the Electron Synchrotron was not fulfilled. But this attempt later resulted in the installation of Variable Energy Cyclotron, built by BARC, at INP in collaboration with Tata Institute of Fundamental Research(TIFR) and public sectors. Department of Atomic Energy (DAE) had not approved Saha's idea of building Neutron Physics Section around a university-type swimming-pool reactor. Saha's wish of starting an Institute of Medical Physics with the Biophysics Division also not fulfilled. The GOI failed to utilize Saha's organizational capability and wisdom properly, for the reconstruction of post-independence India. India, thus had been deprived of the opportunity. Saha could play more vital role for his motherland.

Before giving those ongoing activities proper a shape, Prof. Saha's died in 16, February, 1956. Dr. B. D. Nag Chowdhury succeeded him as full-time Director (1956-68). The INP was renamed as the Saha Institute of Nuclear Physics (SINP) in 1958.

The activities of the SINP expanded with time ongoing. Two new campuses were added at Belgachia and Salt Lake. In 1956, the Government of West Bengal donated seven acres of land in Bidhannagar-Salt Lake for sifting SINP from the Science College, CU. After a tripartite agreement between DAE, CU and the Government of West Bengal new SINP building was constructed at Bidhannagar-Salt Lake with the financial grants received from the DAE. The SINP shifted to the new building by the 1990. The constitution of the institute was modified in 1992. The building of NIS at Science College campus along with the Cyclotron was donated to the CU. The Biophysics division was earlier shifted to Belgachia.

At present, the SINP is one of the most important research institutes in India with many divisions, conducting researches on Nuclear Physics (with the Variable Energy Cyclotron), Plasma Physics, Super-Conductivity, Atomic-Collision Physics, Nuclear Chemistry, Biophysics, Molecular Biology, and some other branches of Physical Science.

In the field of Nuclear Physics and Atomic Energy in India Prof. Saha played an important role. He was the first Indian to realize the potential of Nuclear Energy. He felt the need of starting researches in Nuclear Physics. He was the pioneer of introducing 'Big Science' in India, with the installation of 4MeV Cyclotron at Calcutta. Prof. Saha, the first Indian scientist, who explained the great potentiality of atomic energy and necessity of its utilization for peaceful purposes in a series of articles published in 'Science and Culture' during 1947 to 1954.

6. HILL'S VISIT AND THE GOOD WILL MISSION

As per Prof. A.V. Hill's advice, the 'Goodwill Mission' led by Prof. Bhatnagar left India in October, 1944 to visit the various research facilities in England, USA and Canada. Saha was an eminent member of this Mission.

When the mission reached USA, the Manhattan Project was going on under strict secrecy and guard. Nobody was allowed to talk about the atomic energy. Unaware of all this Saha made enquiries about the research on atomic energy, but could not get much information in this regard. One of his American Friend hinted him about the problem he might be faced due to his enquiry. At once, the Federal Bureau of Investigation of America (FBI) was on the alert and kept a close watch on the Indian scientific Mission (ISM). Two FBI agents interrogated Saha on the day before he left Washington, and then followed the group throughout the tour. They were shocked to find that the Indian scientist knew much about atomic energy and had written original papers on it. But, they were also finding that he had not obtained any information about the

project of making the Atom Bomb by USA under strict secrecy.

7. SAHA-NEHRU DIFFERENCE

When the atomic energy programme started under Homi J. Bhabha, Saha was sidelined from the core. The man who first dreamt to start nuclear research in India now placed in the periphery. Nehru-Saha difference was one of the major reasons for this displacement. Saha, from the 1940s was a highly visible scientist, politician and social reformer. He and his progressive 'Science & Culture' group were constantly criticizing the 'elite power structure in Indian politics and science'.³⁵

Since 1935 Nehru and Saha had cooperated in many fields of their common interests. A good relationship and intimacy had developed between Nehru and Saha during their work in NPC. Nehru and Saha's line of thinking regarding industrialization and planning had similarity. These two had dreamt a future along identical lines but circumstances threw them apart. When Nehru had started the 'First Five-Year Plan' in 1951-52 the most powerful advocator of planning, Prof. Meghnad Saha had no place in the planning.

Saha was unhappy with the interim report (1952) of the Planning Commission's and sharply criticized the reports with constructive ideas. To him, the periods in between 1947 to 1950 were the years of 'confusion'. He had suggested methods for successful planning to GOI. These were presented to the leaders as a pamphlet 'Re-thinking our Future'.

Saha also criticized the Bombay Plan³⁶ produced by the Bombay industrialists. This plan tried to secure the interests of the big industrialists. According to Saha, - "*Real planning must recognize that no such special interests can be allowed to come in the way of any scheme designed to further the well-being of the community as a whole.*"³⁷ Even Nehru also had found many lacunas in this plan.

In the Lok Sabha, he had exposed the Government Policy of 'Mixed Economy', which was copied from the British Conservative Party's manifesto of 1945.³⁸ Saha had criticized severely the First Five-Year Plan and Government's efforts of industrialization and failure to guarantee food security. He told the house that in the present plan, "there is no plan for industrialization." He had called the plan 'a Bovine Plan'.³⁹

Saha objected that, sufficient attention had not been given to the roles of scientists, engineers and other experts in the Planning Commission.

He had pleaded to the GOI for the establishment of large scale industries in the Parliament⁴⁰ and in his articles.

Saha's continued sharp criticisms and his opposite stand to the establishment made the difference of opinion between Nehru and Saha deeper.

In 1953, the Planning Commission submitted its Industrial programme. It was different for the original one. This plan protected very well the interests of the privileged class but not hinted a well-defined social theory, or the plan for the creation of a classless society. Saha criticized it, severely.

Nehru, not always had clear ideas about nuclear technicalities. His comment in his letter to C.D. Deshmukh⁴¹ about reactors is the evidence in this regard. Saha well aware of the limits of Nehru and most of his ministers in this subject had launched attacks on Government policies. Nehru, in time of debating on this issue in parliament, lacked his customary self-confidence and took immense pain to answering Saha's questions. Even Nehru once mentioned the presence of quite a

large number of fairly competent critics in parliament, those were not friendly enough.⁴²

Even Nehru in a debate in Parliament had attacked Saha and said: *"An eminent member of the other side, who used to be a great scientist, Prof. Meghnad Saha, but who drifted from the field of science and has no foothold elsewhere yet, told us many things, most of which I think are completely wrong. I have seldom come across a less scientific approach to a problem than that of Prof. Meghnad Saha, in fact, a less factual approach. I can only express my deep regret that such an eminent scientist should have fallen into such evil ways of thinking."*⁴³ Recognizing Prime Minister's personal attack Saha boldly replied: *"I may add that I have done very little in science, but my name would be remembered for some hundreds of years while some politicians here will go to unregretted oblivion in a few years."*⁴⁴

Saha, in his letter reminded Nehru that when Raman, Bhatnagar, Bhabha, Krishnan and other keep away themselves from Nehru that only He(Saha) had shown solidarity to Nehru and put Nehru's picture on the presidential table at science congress in 1943. In this letter, Saha complained: *"I have been put to one humiliation after another. I have been asked to take order from Bhatnagar, whom I consider a very poor scientist, and from Bhabha, who though a good scientist is 18 years my junior and the conferment of enormous power on him made him extremely bumptious."*⁴⁵ This letter is the proof of Saha's disappointment due to the humiliations he had faced. Nehru promptly replied Saha and shown his disagreement with Saha's view over industrial production statistics and his comparison of GOI with Chianh Kai-shek. Nehru wrote: *"...your criticism was not only unjustified but completely lacking in objectivity and therefore most unscientific. You were evidently angry and lost sense of perspective. If you attack the Government, surely you do not expect them to remain silent. I can hardly judge myself. If may be that you are a better judge of me than myself."*⁴⁶

Saha, though criticized the GOI in the Parliament, but it's an irony that he had to depend for his institute on the funding of Government of India, AEC and CSIR.

Santimoy Chatterjee and Jyotirmoy Gupta mentioning an interview with veteran parliamentarian Mrs. Renu Chakrabarty reveals that Though Nehru and Saha had seriously differed in the debate in Lok Sabha in many issues, but their personal relation was never bitter.⁴⁷

But, one cannot ignore that a strange relationship was between Nehru and Saha and the disagreement between them had risen long back. Nehru as a politician had some obstacles. So, he had chosen a path of coordination with the Gandhians in time of working with NPC. He had compromised in some points with the Gandhians.⁴⁸ But, Saha had not shown any mood of compromise with the Gandhian view. As a result differences occurred. In his letter to Krishna Kripalini, Nehru had revealed his disagreement with Saha: *"But when I read Professor Sah's letter to you, I find so many statements, which are incorrect that I cannot remain wholly silent lest misapprehensions might be caused. He has referred to me repeatedly and made various statements regarding me which are bound to convey an entirely wrong impression of what I said in the Planning Committee."*⁴⁹ He had told Kripalini that he might try to remove these misapprehensions from the mind of Saha and others⁵⁰.

Anderson thinks, though Nehru disliked the criticisms intensely but continued his relationship with Saha mostly for political reasons and partly for personal reasons.⁵¹ Anderson correctly identified some reasons behind Nehru's decision of continuing his relationship with Saha⁵²:

- Saha was a powerful force in Calcutta and West Bengal. He had many supporters there and had his wide influence outside elite circles.

- He was a stimulant for the Leftist forces in the Parliament, with who Nehru needed to maintain a working relationship.
- In 'Science & Culture' he had discussed on various topics (national and international politics, science, social problems, planning etc.) in a simple way and conveyed messages to common people and made them conscious. In that time it was unique effort and effected greatly in the minds of common people.
- After the Bandung Conference in 1952, Nehru knew about Khrushchev and Bulganin's visit to India. The Chairman of the organizing committee of the visit was Saha. Nehru feared of Calcutta's senior communists or leftists criticisms of him (Nehru) for failure to support a major institution in Bengal.
- Nehru some ways met his match in Saha.

8. CONCLUSIONS

Though Nehru had frightened with Saha's criticisms and a strange relationship created between them in later years, but both of them had mutual respects for each other. Nehru at the core of his heart knew well about Saha's abilities. His letter to K.D. Malaviya is important in this regard. Nehru had instructed the Minister for Scientific Research K.D. Malaviya to arrange appropriate funding for Saha's institute from the AEC budget inspite the fact that Bhabha wanted that fund be found elsewhere. Nehru wrote to Malaviya: *"The real fact of matter is that Saha has been very causal in his demands. They come at odd times, there is no planning and no one knows exactly how much he will require and when. This upsets our budget and our calculations. Also I might inform you for your private ear that some of our colleagues here do not think too highly for his Nuclear Institute. The private report of Sir Alfred Egerton Committee was not very much in favour of it. Nevertheless I want this Institute to continue. It can undoubtedly do good work."*⁵³ Nehru and some of his advisers were well aware of the values of Saha's criticisms. Bhatnagar letter is the proof in this regard. Bhatnagar wrote: *"Prof. Saha is a veteran nationalist. Some people consider him to possess a very critical faculty but his criticisms are usually actuated by a desire to get more help for scientists and scientific institutions in every field and not against personalities."*⁵⁴

Saha, on numerous occasions was misunderstood due to his straight forward approach and intolerance of hypocrisy and pretense. He loved truth and work. But, he seldom won popularity.

Many of his contemporaries had yielded to the authority for their personal interests. But, Saha had never bowed down to any authority for his personal benefits. Abha Sur pointed out an interesting reason behind Saha's humiliations. As per Sur, it was the caste prejudice of the higher class Indians that was the reason behind Saha's humiliation from the early days, and we the successors of this ill mentality never called the father of 'Ionization Theory' Meghnad Saha as 'Acharya'.⁵⁵

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2. ²Sir James Chadwick, CH, FRS was an eminent British physicist who was awarded 1935 Nobel Prize in Physics for his discovery of neutron in 1932.
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4. ⁴Mukhopadhyay, Atri (2012). *Abinash Meghnad Saha*, Kolkata: Anustup, p.82.
5. ⁵Enrico Fermi (29 September 1901 to 28 November 1954), was an Italian and naturalized-American physicist. He was the creator of the world first nuclear reactor (Chicago Pile-1). He is known as the 'architect of the nuclear age' and the 'architect of the atomic bomb'. He was both a theoretical physicist and an experimental physicist. He was awarded the 1938 Nobel Prize in Physics for his work on induced radioactivity by nuclear bombardment and for the discovery of transuranium elements.
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14. ¹²Sen, S. N., Ed.(1954), *Professor MeghnadSaha: His Life, Work and Philosophy*, Calcutta: MeghnadSaha Sixtieth Birthday Committee, p.56.
15. ¹³Karmahapatra, S. B. (1997). *Meghnad Saha*, New Delhi:Publications Division, p.74.
16. ¹⁴Cited in, Mukhopadhyay, Atri (2012). p.173.
17. ¹⁵According to Promod V. Naik, this Rs.2 lakhs was granted by the CU for the new building of INP. But in reality it was collected as a loan from the Sur Trust.
18. Naik (2017). p.111.

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19. ¹⁶Anderson, R. S. (2010). *Nucleus and Nation: Scientists, International Networks and Power in India*, Chicago & London: The University of Chicago Press, p.136.
 20. Naik (2017). p.110.
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 22. ¹⁷According to Anderson it was opened by Frederic Joliot-Curie, head of the French AEC. *ibid.*, p.137.
 23. But the biographies of Saha stated that it was opened by Madame Irene Joliot-Curie.
 24. ¹⁸This famous Irish scientist (10 May 1901-15 September 1971) pioneered the use of X-ray crystallography in molecular biology. His work on history of science is till significant. He was the central figure among those who preached the ‘Social Function of Science’ theory.
 25. ¹⁹French physicist Jean Frédéric Joliot-Curie (19 March 1900- 14 August 1958) won the 1935 Nobel Prize in Chemistry with her wife Irène Joliot-Curie for their discovery of artificial radioactivity.
 26. ²⁰Anderson, *ibid.*, p.137.
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