



Nationalism, Science, and Women's Agency: Unsung Women Contributors of Science in India's Freedom Struggle

Dilshad Haque

Email: parishaque_2013@yahoo.com

Abstract: *Women's scientific and professional activities constituted forms of nationalist agency even when they did not take the form of direct revolutionary or political action. Although the history of India's freedom struggle has largely emphasised the contributions of revolutionaries, political leaders, and prominent male scientists who were directly involved in nation-building programmes during the colonial period, the contributions and experiences of Indian women in science have received relatively limited attention in discussions of social reform, nationalism, and nation-building. They made significant contributions through scientific work, education, social reform, labour welfare movements, and medical practice, thereby influencing broader social, political, and nation-building processes. This article explores their scientific and professional agency in relation to nationalism. It argues that, beyond their professional and social roles, these women constructed distinctive voices and spaces for themselves within colonial society. They challenged the social restrictions and oppression imposed on women. Although they were not necessarily directly involved in revolutionary or political activities, their professional work, scientific practices, and active participation in social reform movements constituted significant forms of national agency. Their resistance to institutional discrimination and their cultivation of scientific consciousness created broader platforms for nation-building. Hence, the freedom struggle cannot be critically analysed solely through the lens of direct revolutionary and political activities. A broader perspective must also include the social, professional and scientific activities of Indian women, as well as their literary interventions through science, which contributed to the making of modern India.*

Keywords: *Scientists, Indian Freedom Movement, Nationalism, Gender, Science And Society, Colonial India.*

Introduction: The narratives of India's freedom movement have historically emphasised the role of revolutionaries, political leaders and distinguished male scientists, often overlooking and underexploring the role and contribution of women scientists, medical professionals, and science communicators. Despite their significant involvement in shaping the nationalist movement their contributions remains inadequately documented and analysed. Women contributors to science in India such as Anna Mani, Kadambini Ganguly, Chameli Basu, Kamala Sohonie, Lakshmi Sahgal, Prabhavati Dasgupta, Ashima Chatterjee, Bibha Chowdhuri and many more took significant steps not only for scientific advancement and nation-building but also challenged social inequality, gender discrimination and colonial domination through the anti-colonial activism, women's education, social reforms. Their active participation in the nationalist movement along with their scholarly scientific work reveals that how science and nationalism deeply interconnected in colonial period. This study seeks to reframe the historiography of Indian science by focusing on pivotal role

of female science contributors in advancing both scientific culture, knowledge and nationalist movement. (Patel, 2010; Harding, 1991; Abir-Am & Outram, 1987)

Scientific Excellence and Gandhian Nationalism: Here begins an extraordinary story of Professor Anna Mani (1918-2001) who was a Physicist and Meteorologist and played the role of one of the pioneers in the field of Science. She was one of the early India's feminist and got deeply influenced by Gandhian politics. When Gandhiji had visited her hometown she was a little girl. That had an immense impact in her thoughts and she started promoting for indigenous product by started wearing only khadi till the end of her life. (Sur, 2011). History has largely neglected the contributions of women science workers towards the freedom struggle. The patriotic fervour exhibited by them in imperial India added to the spirit of the nationalist movement. Few extra ordinary women like Chameli Basu, Abala Basu, Prabhavati Dasgupta, Swarna Kumari Devi, Kadambini Ganguli, Prof. Anna Mani, Kamala Sohoni served the society during our freedom struggle. They came to support the nation in various capacities. Those long and arduous years of freedom ignited the hearts and mind of female contributors of science too. These great women of science were warriors in their own right as they made a name for themselves by beating all odds during pre-independence era. (Aggarwal, 2008; Pandya, 2018)

Science Diplomacy and the Politics of Women's Emancipation: The first South Asian female Physician Dr. Kadambini Ganguly actively took part for women's emancipation and social movements to establish women's right and to improve the work conditions of female coal miners. She was also one of the delegates to the fifth session of Indian National Congress and organised Women's Conference in India. She contributed to Satyagraha and collected fund to assist the workers. (Sen, 2014) Throughout her life she worked for society, working first as a role model, then a dedicated worker of medical science and later as a reformer and freedom fighter. Her contribution to the nationalist movement was not through direct revolutionary activities but through engagement in labour welfare movement, women's empowerment and education, extending women's role in political and public domain and social reforms. She successfully integrated social reform and medicine, with nationalist thought. Like Ganguly, many other female contributors of science started making their presence felt way before India's struggle for independence. They served for society during our freedom struggle. The first Indian and Bengali woman first class first in M.Sc. (Physics) Prof. Chameli Basu who was a strong patron of Swadeshi movement used to wear Khaddar since her Post-graduate study to promote indigenous product among the common people. Not only that but also along with her higher studies she helped the freedom fighters in various capacities. She kept hidden some of Masterda Surya Sen's weapons and money in her possession so as to assist them as when needed. ("Prothom Mohila," Kolkatar Karcha) Chameli Basu was among the early women associated with the development of Physics teaching at Bethune College and became an important figure in the institution's scientific history also. (Bethune College, n.d.)

Science not only contributed to the freedom movement of India but also defined its various contours. Science diplomacy was very much part of the freedom struggle and after independence, which shaped the Indian Science and Technology in a major way.. (Ramasubban, 2001; Borthwick, 1984)

Many female scientists and science contributors of that period while India was fighting for its freedom were not confined to their laboratories, although much of their contribution remains little known. India still fails to acknowledge its women of science seventy five years after independence. We forget to recall the name of another female scientist is Kamala Sohoni who started protest in Satyagraha style when Prof. C.V. Raman, the first Indian Director of India Institute of Science, Bangalore refused her application of a research fellowship simply because she was a woman. Satyagraha may be understood metaphorically as a form of silent biological warfare against aggression and Mahatma Gandhi was strong practitioner of this scientific strategies. Professor Raman was the Director of India Institute of Science, Bangalore from 1933 to 1937 and was averse to the idea having women students in this institute. He famously refused to admit Kamala

Sohonie into the India Institute of Science, Bangalore (Present- day Bengaluru, Karnataka) when she applied for P.G. course there in 1933. Swami Vivekananda played an important role in setting up Institute of Science, Bangalore (Present-day Bengaluru, Karnataka) where she was a victim of gender discrimination. Finally C.V. Raman gave her a chance on one year probation with certain humiliating terms that were firstly she must work during night so as to not disrupt the atmosphere of the campus and secondly, she must conduct herself honourably. He eventually took her on as a research associate but only after she personally convinced him of her exceptionalism. She was eventually admitted under a probationary arrangement and later pursued doctoral research at Cambridge, completing her PhD in 1939 and became a renowned Biochemist. (Institute of Science, Mumbai, n.d.; Dhuru, 2008) After coming back to India from Cambridge Kamala took part in Indian freedom struggle. Later Prof. Raman changed his views about female students and their merits even admitting three female students in his own research group – Lalita Chandrasekharan, Anna Mani and Sunanada Bai and all of three went abroad for pursuing doctoral research. However, the way Kamala protested against gender inequality at institutional level is exemplary and a stepping stone for the freedom struggle of education for women also. Kamala Sohonie broke the institutional barrier of Institute of Science, Bangalore (Present- day Bengaluru, Karnataka) which was typically discriminating in nature by adopting a Satyagraha-inspired peaceful protest and paved the way for women to participate largely in scientific research programme and higher education. Her determination and struggle for securing equal gender- neutral right for science and society gave a socio-political shape of nationalist movement of colonial India. To access science education, Kamala's peaceful, non-violent assertion may be understood as resonating with the broader socio- political culture of protest and civic resistance during the colonial period. (Abir-Am & Outram, 1987; Women in Science Panel, 2006)

Science, Nationalism and Gender roles in Colonial India: Perhaps, Acharya Jagadish Chandra Bose was the first Indian Scientist who protested against the British Government by not taking the reduced unequal salary for first three years after joining Presidency college in 1885 and did Satyagraha for his right before Government, later British Government fulfilled his demand partially (Mukherjee, 2020). Hence, A.J.C. Bose as an Indian nationalist Scientist is often described by historian and writers as the first Satyagrahi. His refusal to accept discriminatory remuneration became an important instance of resistance to racial inequality within colonial scientific institutions. Metaphorically, he became the first Satyagrahi almost 21 years ahead of Champaran Satyagraha of Gandhiji. He pioneered the use of the weapon of 'Satyagraha' against the British almost two decades ahead Mahatma Gandhi who coined the term 'Satyagraha' in 1906. Bose was multifaceted Scientist and was may ahead of his time. Bose's Scientific Capabilities are extra ordinarily superb but his use of 'Satyagraha'(an early form of non-cooperation) was a ground breaking step against British rule. According to Vigyan Bharati, Prof. Bose was the first Indian Scientist of Modern era who profoundly exposed the excellent Indian intellectual capabilities to the world. On the other hand as patriot, he did the first 'Satyagraha' upon his return to India from England (1884). (Bose, J. C., 1927; Geddes, 1920; Vigyan Bharati, 2022)

After completing his studies in Physics scoring distinction marks Bose was willing to teach his subject Physics and here he found injustice and racial discrimination imposed by British authority. British rule actually initiated two distinct services in education sector based on racial ground. It showed two racial camps – Imperial Service for British and provincial Service for Indians – having the very same duties and responsibilities but with much lower pay. After entering into duties, Prof. Bose noticed that he was allowed only two third of normal pay and which was to be further reduced by one-half. Since his appointment was only officiating Acharya J.C. Bose strongly opposed this discriminating pay rule and showed his protest by initiating a struggle with a weapon of Satyagraha. Kamala Sohonie was also driven by the same nationalistic spirit and used the non-violent tool to protest against gender discrimination. (Bose, J. C., 1927; Chakrabarti, 2004)

Bose continued to perform his teaching work with same vigour but did not encash the cheque received by him monthly as his salary and continued this for consecutive three years. With his strong self-esteem and loyalty he was able to get a new notion of protest and hold it with unprecedented definiteness and pertinacity. Finally, British administration yielded before this non-violent but strong resistance. Throughout his career Prof. Bose tried to raise the status of Indian Professors socially and economically with all his intellectual power. British Government Constantly put stumbling blocks in his research career during his early years as a teacher but Bose completely ignored them and fought for justice. Like Bose, Sohanie also rebelled in her own Satyagrahi fashion and brought the renowned Scientist Prof. C.V. Raman to accept her demand for gender equality. Kamala's story serves to illustrate how 'Indianisation' of science has historically contributed to nation building.. (Bose, J. C., 1927; Geddes, 1920)

In the year 1920 the Scottish Biologist and Sociologist Sir Patrick Geddes documented this fact of Prof. Bose's Satyagraha in his book *An Indian Pioneer of Science: The life and work of Sir Jagadish C. Bose* and clearly stated that Indian Professor's income, even if in the imperial service, was two-thirds that of a European's but Prof. Bose won the war of inequality later in getting this inequality abolished. (Geddes, 1920)

One must remember that the freedom struggle was not merely a symbol of political struggle. It signified also the rise of intellectual, educational, and scientific awareness for colonial society. Several Indian women entered the fields of medicine, physics, chemistry, botany, and public health during that time and played a crucial role in shaping rational thinking, knowledge, intellectual progress to make an enlightened and informed reformed modern society. Their achievements challenged colonial stereotypes and contributed to India's nationalist and scientific self-assertion.(Sangwan, 1991; Chakrabarti, 2004; Visvanathan, 1985)

Women Science Contributors and Nationalist Awakening: There were many women contributors to science who gave their strong advocacy for the freedom struggle and nationalism during pre-independence era but still it has not gained wide currency. We often forget to address the unsung genius nationalist female contributors to science who played significant role through both direct or indirect forms of engagement to fighting for independence. They were hidden jewels to whom a relook is necessary after India completed 75 years of independence. Prof. Chameli Basu's Swadeshi fashion of wearing Khaddar only or Kamala Sohanie's Satyagrahi Style were hidden jewel among the annals of how the female contributors of science sacrifice for their nation and society. But while speaking on patriots, freedom movement of India, nationalism and science we highlight specifically on "Forgotten Heroes" not on Heroines. Each of them dedicated significant portions of their lives for nation building movement of their homeland.(Patel, 2010; Basu, 1995; Women in Science Panel, 2006)

Hundred years back a medical - education pioneer, feminist and social reformer moreover an advocate of science education, institutional development and women's access to scientific learning Lady Abala Bose laid the foundation of this modern view to reach at a mass level and tried to emancipate the Bengali women in all aspect. In 1919 she established Nari Siksha Samiti and this organisation also had extended it's hand to promote women's education, vocational training and economic self reliance by giving financial support to widows and promote women in STEM. In 1922 Lady Bose established the 'Vidyasagar Bani Bhawan' as home for widows; a teacher -training programme was initiated there in 1925 and it was formally developed as the Vidyasagar Bani Bhawan Training School in 1935 which provided both Teachers' Training as well as education to widow and distressed women. Lady Bose was the first Bengali woman who setup the Mahila Shilpa Bhawan in Kolkata and Jhargram. Here she encouraged vocational education, entrepreneurship and financial independence of distressed women. She decided to take up medicine as a career and follow the footsteps of Kadambini Ganguly. Abala Bose might be famously known as the daughter of Brahmo reformer Durga Mohan Das and wife of eminent Scientist Sir Jagadish Chandra Bose but she made her own identity as a fierce feminist. At a time when educating women was not the usual norm Abala did her schooling from

Bangla Maha Vidyalaya and from the celebrated Bethune School she passed her entrance examination with scholarship in 1881. With immense support from her father the Brahmo reformer Durga Mohan Das she decided to pursue for higher education in medicine and secured admission at Madras University on a Bengal Government scholarship. Although Abala cleared her final examination, but had to give up her practice and return to Kolkata owing to her poor health. (Borthwick, 1984; Bose, A., 1927; Nari Siksha Samiti, n.d.; Vidyasagar Bani Bhawan Primary Teachers' Training Institute, n.d.)

After establishing home for widow in 1925, she founded Bengal Women's Education League in 1928 and initiated Industrial Cooperative Training Centre for empowering young widows. With her great endeavour and financial support Nivedita Adult Education Fund and Sadhana Ashram was founded. She opened over 200 schools in rural areas of Bengal along with several child health care centre and maternity house in remote areas of Bengal. Along with her huge social activities she consistently accompanied and assisted her Physicist life partner for his scientific research. A great contributor to science education and social reformer Lady Abala Bose was an eminent personality of Bengal devoted herself to improve social status of women of Bengal. She worked and campaigned for remarriage of young widows, abolition of Sati Pratha, Child marriage, and empowerment of women through education and it was her prime consideration. Moreover, Bose strongly opposed social prejudice and misconception related to young widowhood. She made valuable contributions for socially distressed women of Bengal. A graceful journey of Bose began on 8 April 1864 (Chattopadhyay, 2018) at Barisal, East Bengal Dhaka (Now Bangladesh) and ends on 26 August, at the age of 87. Lady Abala Bose was a successful woman contributor of science who was one of the greatest social reformers, feminist and great educationist of Bengal, She never ceased to champion the course of women education and educational reforms. Lady Abala Bose contributed immensely to the movement of Women's suffrage (the right to vote) in India along with freedom fighter Sarojini Naidu, Margaret Cousins (Irish-Indian Educationist and Suffragist), Dorothy Jinarajadasa (English feminist) and Ramabai Ranade (Social worker and activist). She was part of the delegation that met Edwin Montagu in 1917, while he was visiting India to negotiate the Montagu chelmsford reforms. This led to Indian women's struggles to secure, political and civil rights. India, being first granted to vote in 1921 in Madras. Her drive for political and educational reforms tried to uplift the status of marginalized sections largely focused on changing the peripheral role women played in Indian society at that time. A nation builder Abala Bose never participated in militant nationalist politics but she contributed significantly to nation building during pre-independence era through her work for women's education, women's suffrage, widow rehabilitation and social reforms. She must be paid tribute as a true nation builder of India. In spite her monumental contributions, Lady Bose has been treated no differently in history. (Borthwick, 1984; Nari Siksha Samiti, n.d.)

A woman who was the leader of Bharat's first all-women regiment, was also a medical practitioner, a woman contributor to science, a Social Activist, Captain (Dr.) Lakshmi Sahgal is an inspiration for women of all generations. A true heroine of India's freedom struggle Dr. Sahgal studied at Queen Mary College, Chennai and later opted to study medicine and received an MBBS degree from Madras Medical College in 1938. A year later, she received a diploma in gynecology and obstetrics. She also worked as a doctor in the Kasturba Gandhi Government Hospital in Triplicane, Chennai Dr. Sahgal completed her study in 1940 by this time the second world war had broken out and there was a move to recruit all doctors into the British Indian Army but Sahgal did not want to work under British regiment. She gave up the offer and went to Singapore for starting her medical practice privately. Dr. Sahgal met Netaji Subhash Chandra Bose when they visited Singapore in 1943. At the time she was serving the injured people of war. She came from a political family whose mother was a social worker and freedom fighter so she was highly influenced by her background of family and took immense in the national movement. Hence Subhash Chandra Bose expressed his idea of starting a female regiment, she nominated herself and Netaji took her into his Indian National Army (INA) and gave the post of Commander of Rani of the Jhansi regiment. Along with Netaji's speeches and rallies Captain Sahgal devoted herself for door to door campaign to convince parents to allow their

daughter for joining the female regiment. Captain Sahgal's contribution to the freedom struggle of India was officially acknowledged and appreciated by the Government of India after 55 years of independence. She was awarded Padma Vibhushan in 1998. (Archives of Contemporary India, n.d.; Government of India, 1998) In 2010, she was granted an honorary doctorate by the University of Calicut. Dr. Sahgal contributed for society in many ways. During Bhopal Gas Tragedy and on refurbishing peach during the anti Sikh riots in 1984 she extended her helping hand for her nation. Even during Bangladesh crisis she assisted with her medical team for thousands of refugees from Bangladesh who took shelter at Kolkata. She still treated her patient at her Kanpur clinic every morning at the age of 92. Dr. Lakshmi Sahgal was the first woman who contested for presidential election in the year 2002 against another veteran Scientist A.P.J. Abdul Kalam. She always believed "The fight will go on". The great demise of Dr. Sahgal at the age of 97 i.e. 2012 was like the end of a century. Science must be thankful forever for this uncompromising and noble lady who served the science, society and nation throughout her life. (Vigyan Bharati, 2022; Vigyan Prasar, 2022; Indian National Science Academy, 2000 Government of India, 2021)

Captain Sahgal was unequivocally committed to the ideals of socialism, anti-imperialism, secularism, equality, social justice, women empowerment and adhered to them in her personal and professional life. Like Dr. Sahgal many female contributors of science of pre-independence era was fighting for its freedom were not confined to their institution and labs only. They were mentally aware of what was going within the country and the rest part of the world. But unfortunately, not much known is about these female contributors. They had a great scientific outlook. (Vigyan Bharati, 2022; Vigyan Prasar, 2022)

Another pioneering female doctor, legislator, social activist and nation-builder of colonial period Dr. Muthulakshmi Reddy was not a frontline revolutionary but contributed significantly in national freedom movement through her strong advocacy for women's political participation by acquiring voting rights as she believed that except political right women's social and economic empowerment would remain incomplete. Dr. Reddy deeply motivated by the Gandhian philosophy and nationalist thought and worked with many prominent nationalist leaders including Mahatma Gandhi. Her strong advocacy for eradication of oppressive traditional customs of Devadasi, maternal and child health care issues, protection of women from social oppression and equal opportunity had immense impact on nation building and strong foundation of social wellbeing of common people. In 1927, Muthulakshmi Reddy became the first woman to enter the Madras Legislative Council, using her position to advocate for women's education, social reform and the rights of marginalised communities. (Ministry of Culture, Government of India, n.d.) Her social and political commitment was symbol of nationalist activism during colonial India and this legacy was continued post-independence era too. With her pioneering role in establishing the Cancer Institute (WIA) in 1954 which became later one of the premier cancer research and treatment center of India. Dr. Reddy strongly believed that freedom is required to initiate social transformation but without a good public health, science education, social equity and justice a strong, modern and advanced nation cannot be built. She strengthen the nationalist thought by integrating the ideals of nationalism with women's empowerment, public health care, progressive legislative and institutional reforms. (Women in Science Panel, 2006; Government of India, 2022a; Reddi, 1927; Cancer Institute (WIA), n.d.)

These women believed that science is not only for rationality but also for nationality, being a part of colonial era they took part in national movement through their pen and social activities. Earlier it is stated that Kamala Sohoni was the pioneering female researcher at Indian Institute of Science, Bangalore who challenged the gender barriers that restricted women's access to scientific research in colonial period later she became the first woman Director of the Institute of Science in Bombay. She joined Indian freedom struggle after completion of Ph.D. She came back from Cambridge University to her mother land only to take part in freedom movement. However, their patriotism, self-sacrifice do not come up in the theoretical discussion. The women Scientists and contributors of that era were deeply inspired by the nationalist

ideology. They involved themselves in various social movements for welfare of common people.(Patel, 2010; Sarkar, 2001; Sangwan, 1991)

Prabhabati Dasgupta was another warrior, woman of Science of subjugated India who gave up the practice of science for countryman. Prabhabati (Annamashi) Dasgupta was born in 1900 as the daughter of Tarak Chandra Das and Mohini Devi. Her mother was famous congress worker and the first Hindu female student of Victoria School. Prabhabati was awarded M.A. in Psychology from Calcutta University. She also got M.A. from Columbia University and Doctorate degree from Frankfurt University in Germany, 1923 in Psychology. Her academic trajectory illustrates the emergence of women in developing field of psychology during colonial period. (Gangopadhyay,2021, pp.57-58) Prabhabati was not connected with any political party but organised the class IV staff of Calcutta Corporation. She took successfully the historical jute workers strike in 1929. She was the President of Scavengers Workers Union and Bengal jute workers union. She was with her husband at the end of life in Hyderabad and took her last breath there at the age of 78. As a prominent leader of the 1920 Scavengers strike she was given the epithet Dhangarma (Mother of Scavengers). If psychology was considered a branch of Science at that time then a Bengali woman's name was could have been written in golden letters as the first Indian woman Doctorate in Science. Ignoring her bright research career, future prospect Prabhabati actively involved and devoted her life for the working class people of subjugated India. She joined the labour movement on her return to the country. Prabhabati left the world of science very easily for the sake of country and was associated with the labour movement of Bengal by the inspiration of Manabendranath Roy and never regretted for her decision. (Sen, 2002; Sen, S. N., 2003; Ahuja, 2013; Chattopadhyay, 1991)

Conclusion: Vigyan Prasar, an autonomous institution under the department of Science and Technology has drawn up an ambitious programme to celebrate the contributions of Indian Scientists, Science Communicators and Teachers during India's independence movement to mark the 75th anniversary of India's Independence in collaboration with Council of Scientific and Industrial Research, National Institute of Science Communication and Policy Research (CSIR-NISCP) and Science NGO, Vigyan Bharati (Vibha). On the occasion of 'Azadi Ka Amrit Mohotsav' an initiative has been taken to release a book called Vigyan Vidushi on Women Scientists and entrepreneurs from the time of Indian Independence. This portrays the valuable contributions of 75 Indian Women Scientists as the nation commemorated "AZADI KA AMRIT MOHOTSAV". (Vigyan Prasar, 2022; Vigyan Bharati, 2022)

But several unsung female Scientists, Science Communicators and contributors like Dr. Sahgal, Bibha Chowdhury, Anna Mani, Kamala Sohoni, Prabhabati Dasgupta, Chameli Bose were involved in the pursuit of science and nationalist ideology during the freedom movement of India. (See Table 1) They faced social challenges, negligence from their own society with profuse discrimination by the British authority. In spite of those unfavourable situations, they tried to keep on doing Science as well as communicating Science for development of nation and society. Here we need to remember the mission and vision of those female Scientists and Science Communicators who stood for their scientific thinking even during these adverse situations of colonial period. So, apart from Dr. Mahendralal Sircar, Acharya Prafulla Chandra Roy, Sir Jagadish Chandra Bose, Prof. C.V. Raman we need to recall the name of nationalist women contributors to science too those who were deeply connected with wider intellectual and socio- cultural milieu of country's nationalism but their stories covered with patriotism and nationalistic sentiments are not extensively documented discussed and disseminated even today.

References

- Abir-Am, P. G., & Outram, D. (Eds.). (1987). *Uneasy careers and intimate lives: Women in science, 1789–1979*. Rutgers University Press.

- Aggarwal, A. (2008). Forensic scientist Anna Mani: A biography. National Book Trust.
- Anandabazar Patrika. (n.d.). Kolkatar karcha—Pratham mohila (কলকাতার কার্চা—প্রথম মহিলা). Anandabazar Patrika archive.
- Anna Mani: The woman who measured India's weather. BBC News. bbc.com
- Asiatic Society, Kolkata. (2024). Jagadish Chandra Bose—Pioneer of physics in India. Bulletin of the Asiatic Society, August 2024.
- Basu, A. (1995). The challenge of local feminisms: Women's movements in global perspective. Westview Press.
- Bethune College. (n.d.). Department of Physics. Government of West Bengal.
- Borthwick, M. (1984). The changing role of women in Bengal, 1849–1905. Princeton University Press.
- Bose, A. (1927, March). The present state of primary education in Bengal. Modern Review.
- Bose, J. C. (1927). The collected physical papers of Jagadis Chunder Bose. Longmans, Green and Co.
- Chakrabarti, P. (2004). Western science in modern India: Metropolitan methods, colonial practices. Permanent Black.
- Chattopadhyay, A. (2018). Women scientists in India: Lives, struggles and achievements. National Book Trust, India.
- Chakravarti, U. (1989). Whatever happened to the Vedic dāsī? Orientalism, nationalism and a script for the past. In K. Sangari & S. Vaid (Eds.), Recasting women: Essays in Indian colonial history (pp. 27–87). Kali for Women.
- Chatterjee, P. (1993). The nation and its fragments: Colonial and postcolonial histories. Princeton University Press.
- Chowdhury, B. (2019). Remembering Bibha Chowdhuri: India's pioneering woman physicist. Current Science, 116(5), 721–724.
- Department of Science and Technology. (2022). Celebrating women in Indian science. Government of India.
- Department of Science & Technology, Government of India. (2026). Indian Association for the Cultivation of Science (IACS): [Commemorative publication/profile of Jagadish Chandra Bose]. Government of India.
- Dhuru, S. (2008). Kamala Sohoni. In S. Godbole & R. Ramaswamy (Eds.), Lilavati's daughters: The women scientists of India. Indian Academy of Sciences.
- Forbes, G. (1996). Women in modern India. Cambridge University Press.
- Gangopadhyay, G. (2021). বিজ্ঞানে স্নো অস্নো নারী [Women in Science: Known and Unknown Women]. Sahitya Samsad.
- Geddes, P. (1920). The life and work of Sir Jagadis C. Bose. Longmans, Green and Co.

- Government of India. (1998). The Gazette of India: Padma Awards, 1998. Ministry of Home Affairs.
- Government of India. (1919). Report on Indian constitutional reforms (Montagu–Chelmsford Report). Government of India.
- Government of India. (2021). Jhansi Regiment case in Army (1940). Azadi Ka Amrit Mahotsav. <https://cmsadmin.amritmahotsav.nic.in/freedom-movement-detail.htm?13=>
- Government of India. (2021). Rani Jhansi Regiment and Azad Hind of INA (1943–45). Azadi Ka Amrit Mahotsav. <https://amritmahotsav.nic.in/freedom-movement-detail.htm?14%2Frani-jhansi-regiment-and-azad-hind-of=>
- Government of India. (2022). Vigyan Vidushi: Indian women in science and technology. Department of Science and Technology.
- Harding, S. (1986). The science question in feminism. Cornell University Press.
- Harding, S. (1991). Whose science? Whose knowledge? Thinking from women's lives. Cornell University Press.
- Institute of Science, Mumbai. (n.d.). Dr. Kamala Sohonie. Institute of Science, Mumbai.
- India Science, Technology & Innovation. (n.d.). Vigyan Vidushi. Government of India. <https://www.indiascienceandtechnology.gov.in/listingpage/vigyan-vidushi>
- Indian National Science Academy. (2000). Scientists of modern India. INSA Publications.
- Jayawardena, K. (1986). Feminism and nationalism in the Third World. Zed Books.
- Karlekar, M. (1991). Voices from within: Early personal narratives of Bengali women. Oxford University Press.
- Keller, E. F. (1985). Reflections on gender and science. Yale University Press.
- Koshy, J. (2022, August 23). Anna Mani, India's 'Weather Woman' who laid the ground for country's renewable energy push. The Hindu. [thehindu.com](https://www.thehindu.com)
- Kumar, D. (1995). Science and the Raj, 1857–1905. Oxford University Press.
- Kumar, R. (1993). The history of doing. Kali for Women.
- Mani, A. (1980). Handbook of solar radiation data for India. Allied Publishers.
- Mani, A. (1981). Wind energy resource survey in India. Allied Publishers.
- Merton, R. K. (1973). The sociology of science. University of Chicago Press.
- Minault, G. (1982). Secluded scholars. Oxford University Press.
- Ministry of Culture, Government of India. (n.d.). Dr. Muthulakshmi Reddy. Azadi Ka Amrit Mahotsav.
- Mukherjee, S. (2020). American racism and the lost legacy of Sir Jagadis Chandra Bose, the father of plant neurobiology. Journal of Biosciences, 45, Article 139.
- Narayana, A. (Ed.). (2001). Anna Mani: A biographical memoir. Indian National Science Academy.

- Nari Siksha Samiti. (n.d.). About / history of Nari Siksha Samiti. <https://abalabosenss.org.in/about.html>
- Narlikar, J. V. (2018). *Scientific edge: The Indian scientist from Vedic to modern times*. Penguin Random House India.
- National Institute of Science Communication and Policy Research. (2022). *Science and freedom movement in India*. CSIR-NIScPR.
- Nehru, J. (1946). *The discovery of India*. Oxford University Press.
- Palit, D. K., & Bandyopadhyay, M. (Eds.). (1996). *Science and society in India*. Indian National Science Academy.
- Pandya, S. (2018). Anna Mani and the making of meteorological science in India. *Indian Journal of History of Science*, 53(3), 345–358.
- Parthasarathi, A. (2007). *Technology and innovation in India*. Sage.
- Patel, S. (2010). Gender, science and nationalism in colonial India. *Social Scientist*, 38(3/4), 37–58.
- Patel, V. (2020). Kamala Sohoni: The first Indian woman biochemist. *Current Science*, 118(4), 533–536.
- Raina, D., & Habib, S. I. (2004). *Domesticating modern science*. Tulika Books.
- Raman, C. V. (1954). *Lectures on physical optics*. Indian Academy of Sciences.
- Ramanna, R. (1991). *Years of pilgrimage*. Viking.
- Ramasubban, R. (2001). Kadambini Ganguly and the condition of women in colonial India. *Indian Journal of Gender Studies*, 8(2), 211–228.
- Ray, B. (Ed.). (1990). *From the seclusion to the public arena: Social reform and women in Bengal*. Oxford University Press.
- Ray, P. C. (1902). *A history of Hindu chemistry (Vol. 1)*. Williams and Norgate.
- Ray, P. C. (1909). *A history of Hindu chemistry (Vol. 2)*. Williams and Norgate.
- Reddi, S. Muthulakshmi. (1927). *Why should the Devadasi institution in the Hindu temples be abolished?* Central Co-operative Printing Works Ltd.
- Reddi, S. Muthulakshmi. (1927). *Why should the Devadasi institution in the Hindu temples be abolished?* Central Co-operative Printing Works Ltd.
- Roy, M. N. (1922). *India in transition*. Renaissance Publishers.
- Roy, M. N. (1964). *Memoirs*. Allied Publishers.
- Sangari, K., & Vaid, S. (Eds.). (1989). *Recasting women: Essays in Indian colonial history*. Kali for Women.
- Sangwan, S. (1991). Science, education and nationalism in India. *Economic and Political Weekly*, 26(17), 965–972.
- Sarkar, T. (2001). *Hindu wife, Hindu nation: Community, religion, and cultural nationalism*. Permanent Black.

- Sen, B. K. (2014). Female graduate of British Empire: Kadambini Ganguly. *Science Reporter*, 51(7), 53–55.
- Sen, M. (2024). *Archivist's Corner Part V: Memories on Glass—Prabhabati Dasgupta*. West Bengal State Archives, Photo Archives Wing.
- Sen, S. (2002). Women and labour movements in colonial Bengal. *Social Scientist*, 30(3/4), 45–62.
- Sen, S. N. (2003). *Women and labour in late colonial India*. Cambridge University Press.
- Shah, N. (1998). *The issues at stake. Kali for Women*.
- Sharma, V. (2019). Kamala Sohonie: Pioneer woman biochemist of India. *Current Science*, 117(8), 1301–1304.
- Subbarayappa, B. V. (2001). *The roots of ancient Indian science*. University of Hyderabad.
- Sur, A.(2011). *Dispersed radiance: Caste, gender and modern science in India*. Navanya.
- Thapar, R. (2002). *Early India*. University of California Press.
- Vidyasagar Bani Bhawan Primary Teachers' Training Institute. (n.d.). About us. <https://vidyasagarbanibhawan.wbptti.in/about-us/>
- Vigyan Bharati. (2022). *Scientists and India's freedom movement*. Vijnana Bharati Publications.
- Vigyan Bharati. (2022). *Vigyan Vidushi: Indian women scientists and entrepreneurs*. Vigyan Bharati.
- Vigyan Prasar. (2022). *Indian scientists and freedom movement*. Department of Science and Technology.
- Visvanathan, S. (1985). Organizing for science. *Economic and Political Weekly*, 20(12), 511–520.
- Wajcman, J. (1991). *Feminism confronts technology*. Pennsylvania State University Press.
- Wajcman, J. (1998). *Managing like a man*. Polity Press.
- Women in Science Panel. (2006). *Women scientists in India*. Indian National Science Academy.
- Zachariah, B. (2004). *Developing India*. Oxford University Press.

Table 1. Notable Women of Science as Nation-Builders

Source: Compiled from the sources listed in the reference list and the supplied manuscript.

Table 1. Notable Women of Science as Nation-Builders

Name	Field	Contribution	Relation to Freedom/National Awakening	State
Kadambini Ganguly (1861-1923)	Medicine	One of the first South Asian women doctors	Participated in Indian National Congress and promoted women's education. Advocacy for Women's Right	Bengal Present –day West Bengal

			Work for Labour Welfare- investigated the worse working condition of female coal miners and campaign for betterment of their working environment. Strong advocacy for Swadeshi and Nationalist consciousness protesting colonial Inequality. Involvement in raising fund for national and social cause. Encouraged political and social awareness among women.	
Abala Bose (1865-1951)	Associat ed with Medical educatio n primarily	Social reform, women's education and public welfare	Not a frontline political activist during colonial period but had significant contribution in making nation through empowering women and social reforms.	Bengal Present –day West Bengal
Anandibai Joshi (1865-1887)	Medicin e	Among the first Indian women trained in Western medicine	Symbol of women's educationand empowermentunder colonialrule. Serious advocacy for promoting scientific knowledge, advancement of women's healthcare, social progress in making an inclusive society.	Maharashtra
Muthulakshmi Reddy (1886-1968)	Medicin e & Social Reform	Doctor and legislator	Worked against social oppression and promoted women's rights. Actively involved in Women's suffrage. First female member of the Madras Legislative Council in 1927 and also resigned from the council in protest against the British rule owing to arrest of Mahatma Gandhi during Civil Disobedience Movement Campaign against the Devdasi System.	Tamilnadu
Janaki Ammal (1897-1984)	Botany	Internationally known Botanist and Cytogeneticist	Challenged colonial and gender barriers in science.	Kerala
Prabhabati	Psycholo	Bengali intellectual	Labour Activism, and Nation	Bengal

Dasgupta (1905-1975)	gy, Labour Activism , and Nation Building	Social activist	Building. Strengthen the social and political foundations of nationalist movement through strong campaigning for women's political engagement, civic responsibility, social reforms and consciousness.	Present –day West Bengal
Chameli Basu (1911-1992)	Physics	First Indian woman to earn a Master degree in Physics from University of Calcutta in 1933 and taught physics at Bethun College, Kolkata from 1938-1970	Swadeshi Ideology, and Scientific Nationalism.	Bengal Present –day West Bengal
Kamala Sohoni (1912-1998)	Biochem istry	Indian woman to earn Ph.D in scientific discipline from Cambridge University in 1939	Contribution to Public welfare with her research work on Biochemistry, Nutrition and Food Science. Revolutionary achievement – dismantled the gender based institutional barrier of IISc demonstrating protest influenced by principle of Satyagraha. Pivotal role in promoting scientific research and advancement for Indian women. Strong advocacy for women's active participation in scientific research and scholarly activities.	Madhya Pradesh
Bibha Chowdhuri (1913-1991)	Physics	Pioneer in cosmic ray and particle physics	Symbolized the emergence of Indian women in advanced science during colonial India	Bengal Present –day West Bengal
Lakshmi Sahgal (1914-2012)	Medicine	Doctor and INA Officer	Led Rani Jhansi Regiment in Indian National Army Worked for war displaced, poor, refugees and marginalized sector. Lifelong devotion for humanitarian service, social reforms, improved public health care and collective welfare of	Tamil Nadu

			nation.	
Asima Chatterjee (1917-2006)	Chemistry	Pioneer of medicinal chemistry and phytomedicine. First indian women to earn distinction in scientific research	Represented scientific self-reliance and nationalist scientific identity. Pioneer in advancement of indigenous scientific research and greater participation of women in science and higher education to enhance intellectual capabilities.	Bengal Present –day West Bengal
Anna Mani (1918-2001)	Physics & Meteorology	Meteorological instrumentation scientist	Contributed to post-independence scientific self-reliance.	Kerala

Source: Compiled from the sources listed in the reference list and the supplied manuscript.

Citation: Haque. D., (2026) “Nationalism, Science, and Women’s Agency: Unsung Women Contributors of Science in India’s Freedom Struggle”, *Bharati International Journal of Multidisciplinary Research & Development (BIJMRD)*, Vol-4, Issue-09, September-2026.