

Women who Made a Difference in Science in India.

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Abstract: The careers of Women in Science, particularly in developing countries like India are fraught with great challenges due to societal and cultural norms. Historically many women were not encouraged to study and female literacy was 1.8 percent in 1991.¹ Child marriages, multiple pregnancies, a restricted social standing and later discrimination at work were prevalent. In this environment the achievement of these women doctors and scientists is exemplary and a role model for people who wish to follow in their path. As women continue to be underrepresented in scientific careers and continue to not reach topmost positions in their chosen careers, the stories of these women who have overcome biases and hardships enables us to believe that circumstances can be overcome and progress can be made in having greater representation of women in science. These women have changed the course of history and done much for the benefit of mankind.

ANANDIBAI JOSHEE 'THE FIRST FEMALE PHYSICIAN OF WESTERN MEDICINE FROM INDIA'



Fig 1:
Anandibai Joshi
(1865-1887)

Anandibai Joshee (sometimes spelled Joshi) (Fig 1) was born in Kalyan, Maharashtra and graduated from the Woman's Medical College of Pennsylvania in 1886. She was the first Indian woman to obtain a medical degree and the first Indian woman to receive an education abroad. She faced great social odds to achieve her goals including marriage at age of 9 to a widower 20 years her senior and an orthodox societal mindset which did not encourage education among women. After the death of her newborn son whom she delivered at the age of 14, Anandibai decided to pursue medicine so that she could provide medical care to Indian women specially in obstetrics since women might hesitate taking treatment from male doctors for themselves and their children due to the existing cultural norms. Anandibai faced strong opposition from the Hindu community due to her decision to study medicine in U.S.A which she dispelled by addressing them and explaining the need of female physicians in India. Her thesis during her M.D

studies was on "Obstetrics among the Aryan Hindoos".² Her correspondence with Mrs. Carpenter, a lady from New Jersey, U.S.A who helped her during her stay in U.S.A shows great insight about issues faced by women at that time. In these letters she wrote about the effect of child marriages and early pregnancy on women's health and need for legislative reforms to abolish the practice of child marriages. On her return from United States in 1886 she was appointed as the physician-in-charge of the female ward of the local Albert Edward Hospital in the princely state of Kolhapur. She died of tuberculosis at the age of 21 on February 26, 1887.

IDA SCUDDER: A MISSIONARY AND PIONEER OF CHRISTIAN MEDICAL COLLEGE, VELLORE



Fig 2:
Ida Scudder
(1870-1960)

Dr. Ida Sophia Scudder (Fig 2) born on December 9, 1870 in Ranipet, India graduated from Cornell Medical College, New York City in 1899, as part of the first class at that school that accepted women as medical students. She came from a family of Christian missionaries who worked in India. In spite of her initial reluctance to become a medical missionary she decided to pursue a medical education after witnessing the death of three women because there had been no woman doctor to treat them. After arriving back in India she started roadside dispensaries for patients who could not travel to Vellore that expanded throughout the years to treat thousands each week, developing finally into Vellore's Rural Unit for Health and Social Affairs. She also started a training program for nurses besides starting clinics and dispensaries. To train female physicians she started a medical school for girls which has eventually grown into Christian Medical College, Vellore. She received the Elizabeth Blackwell Citation from the New York

Eye and Ear Infirmary, as one of 1952's five outstanding women doctors.³ She died in Vellore in 1960 after seeing the medical college she started grown into a leading medical institution.

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KAMAL RANADIVE 'STARTED THE FIRST TISSUE CULTURE LAB'



Fig 3:
Kamal Ranadive
(1917-2001)

Kamal Samarth nee Randive (Fig 3) was born in Pune in 1917, worked on the cytogenetics of annoneaceae for her Master's degree and obtained her Ph.D. degree from the University of Bombay under Dr. V.R Khanolkar, a pathologist, who was the founder of the Indian Cancer Research Centre. After completing her post doctoral education under George Gey at Johns Hopkins University Hospital, Kamal Ranadive returned to India and established the first tissue culture laboratory at the Indian Cancer Research centre. She was among the first to recognize the connection between cancer susceptibility and in reaction between hormones and tumor virus. The Indian Cancer Research Institute (ICRC) mouse studied by her group turned out to be an excellent model for work on leukemia, breast cancer and cancer of esophagus. In addition to this she continued her work on leprosy bacteria, which eventually led to the preparation of a leprosy vaccine. She was known for her work in studying the links between cancers and viruses. She was one of the founders of the Indian Women Scientists' Association and was awarded the Padma Bhushan in 1982 and the Watumal Foundation Award for her work with leprosy patients.⁴

KAMALA SOHONIE 'THE SCIENTIST LADY'



Fig 4:
Kamala Sohoni
(1912-1998)

Kamala Sohoni (Fig 4) was born in 1912, and she was the first Indian woman to earn a Ph.D in any scientific discipline (biochemistry in her case). Kamala Sohoni received the President's Award for her pioneering work on the nutritional value of Neera which caused significant improvement in the overall health of tribal malnourished adolescent children and pregnant women.

She was denied the opportunity to conduct research in the Indian Institute of Science under the directorship of Prof C.V Raman inspite of being the university topper for her B.Sc studies in physics and chemistry from Bombay University because women were considered incompetent to pursue research. She later went on to complete her M.Sc studies at the same institute after being admitted on probation for a year in 1933 during which she demonstrated great sincerity and skill in her work. As a result of her perseverance, women scientists were henceforth admitted in

the institute. During her M.Sc studies under Shri Sreenivasayya – she worked on proteins in milk, pulses and legumes, which had important implications for malnourished India. In 1936, as a graduate student, she was the first person to work on pulse proteins.

During her Ph.D under Dr. Derik Richter and then Dr. Robin Hill her original research led to the discovery of the cellular enzyme cytochrome c⁵ which was involved in the oxidation of every plant cell, Kamala sent a short thesis describing her finding of 'cytochrome C' in respiration of plant tissue, to Cambridge University for her PhD degree. Her entire PhD – research and writing took only 14 months and consisted of just 40 typed pages. She was the first Indian woman to get a PhD in a science discipline. She joined the Royal Institute of Science in Bombay as the professor of biochemistry department where she worked on the nutritional aspect of legumes. Kamala along with her students some of them who later went on to be eminent scientists in their own right carried out detailed biochemical studies on three major groups of food items consumed by the rural poor and thus established their nutritive values⁵. She started her pioneering work on 'Neera' to meet the nutritional requirements of the poorest of the poor.

MARY VERGHESE: THE ‘WHEELCHAIR DOCTOR’



Fig 5:
Mary Verghese
(1925-1986)

Mary Puthisseril Verghese (Fig 5) born on 21 May 1925 completed her graduate training in medicine at the Christian Medical College, Vellore between 1946 and 1952. While working towards her aspirations to specialize in gynecology she met with a car accident in 1954 that resulted in a complete spinal cord injury. After treatment from Dr Paul Brand who was also her mentor and taught her surgical skills related to leprosy rehabilitation she United States as both a patient and physician-in-training at the renowned Institute of Rehabilitation Medicine, located in New York City. She returned to India to head the department of physical medicine and rehabilitation at Christian Medical College. Since hand surgeries could be performed while sitting in a wheelchair Dr Verghese retrained herself and worked with leprosy patients with hand and face disfigurements.⁶ She was instrumental in the setting up of a rehabilitation institute at CMC, Vellore and the trust set up by her continues to provide

vocational training and care of the physically disadvantaged.

MUTHULAKSHMI REDDY: AN EMINENT DOCTOR, SOCIAL REFORMER AND WRITER.



Fig 6:
Muthulakshmi
Reddy
(1886-1968)

Shri R. Venkataraman, Vice President of India in 1985, said that Dr. Muthulakshmi Reddy can be said to have broken the time barrier for women of India. She telescoped into her lifespan a sequence of endeavour and achievements that would have ordinarily taken generations.

Dr. Muthulakshmi Reddy (Fig 6) born in 1886 graduated in 1912 from madras medical college and became house surgeon in the Government Hospital for Women and Children in Chennai. In spite of her applications being initially denied for admission to colleges after her matriculation and being home schooled after primary school due to her gender she was able to secure admission to a medical college. She had several firsts to her credit: she was the first girl student to be admitted into a Men's College, one of the first woman doctors of the country (1912), first woman House Surgeon in the Government Maternity and Ophthalmic Hospital, the first woman member of the Madras Legislative Council, the first woman to be elected as its Deputy Chairperson, the first president of the Women's

India Association (WIA), and the first woman to be elected as alderman of the Madras (now Chennai) Corporation. She was an active member in the freedom struggle.

After her sister died in an untimely manner due to misdiagnosed case of cancer of the rectum, she pursued further training in oncology at Royal Marsden Hospital, London and established the Adyar Cancer Institute which was only the second of its kind in India after Tata Memorial Hospital. It comprises a 450-bed hospital, a Research Division, the Dr. Muthulakshmi College of Oncologic Sciences (the first one in the country), and a division of Preventive Oncology and the first centre in India to introduce Medical Oncology as a specialty, 1972 and the first institution to introduce the concept of multimodal therapy in oral and breast cancers, raising the cure rate in locally advanced cancer from 19 to 55 per cent, 1964. She also founded the Avvai Home for the benefit of destitute women.

She was the only woman to be nominated by the Viceroy to serve on the Sir Philip Hartog Education Commission which was formed to review educational projects in India and Burma where she recommended systematic medical inspection of students in all schools and colleges, run by municipalities as well as other local bodies. In 1930, Muthulakshmi Reddy introduced in the Madras Legislative Council a Bill on the "prevention of the dedication of women to Hindu temples in the Presidency of Madras" which lead to the abolition of the devdasi system after a long struggle. Within a period of 1927-1930 as part of her work in the legislative council she enacted many acts of social reform like The Immoral Traffic Control Act, the Act to Prevent Cruelty to Children, raising the age of consent of girls for marriage.⁷



Fig 7:
Renu Malhotra
(1961-)

RENU MALHOTRA ‘RESONANCE SWEEPING HYPOTHESIS’

Renu Malhotra (Fig 7) was born in 1961, graduated with a bachelor's degree in physics in 1983 from the Indian Institute of Technology Delhi and did Ph.D in physics from Cornell University where she worked on non-linear dynamics. Her research in orbital mechanics has spanned a wide variety of topics, including extra-solar planets and debris disks around stars, the formation and evolution of the Kuiper belt and the asteroid belt, the orbital resonances amongst the moons of the giant planets, and the cratering history of the inner solar system. She has helped revolutionize our understanding of the early history of the solar system using the orbital resonance between Pluto and Neptune to

infer large-scale orbital migration of the giant planets and to predict the existence of the “Plutinos” and other small planets in resonance with Neptune.⁸ The asteroid 6698 Malhotra is named for her.

SULOCHANA GADGIL ‘HOW AND WHY OF MONSOON’



Fig 8:
Sulochana Gadgil
(1944-)

Sulochana Gadgil (Fig 8) was born in 1944, completed her master's degree in Applied Mathematics at Pune University and PhD (1970) in Applied Mathematics from Harvard. She is an Indian meteorologist who has played a key role in the establishment of the Centre for Atmospheric and Oceanic Sciences (1983). She has contributed significantly to the understanding of monsoon dynamics, tropical convection, coupling of the tropical atmosphere to the oceans and agricultural strategies for a variable climate. Her research contributions include the discovery of northward propagations of the equatorial cloud band, which maintain the rain belt over the monsoon zone, and of a threshold of 28 degree Celcius for sea surface temperature above which there is a high propensity of organized cloud systems over the tropical oceans. Her recent studies have demonstrated an important link of the droughts and excess rainfall seasons of the Indian monsoon with the equatorial Indian Ocean Oscillation. Her studies

have shown that while the adverse impact of droughts has remained unchanged over the last five decades, the beneficial impact of good monsoon has decreased substantially in the last two decades. She has developed a theoretical framework for using information/prediction of climate variability to identify farming strategies for maximizing the long-term average returns. Gadgil has published 65 research papers and edited two books.⁹

T.S. SOUNDRAM ‘PIONEER OF FREE PRIMARY EDUCATION IN INDIA’



Fig 9:
T.S. Soundram
(1904-1984)

Dr. Soundram (Fig 9) was born Aug 18th, 1904 and completed her medical degree from Lady Hardinge college in Delhi from 1930-1936. Married at the age of 12, Dr. Soundram became a widow at a young age when her doctor husband passed away while working amongst the victims of plague in Madurai in 1925. At a time when education for women was unheard of and widows faced many societal restrictions, Dr. Soundram decided to pursue her medical studies. While still a student she became involved with the Quit India Movement to gain India's freedom. In 1942 she was banished from the jurisdiction of the Thiruvananthapuram where she was practicing medicine and moved to Chennai where she continued her work in not just the protest movement, but, also in supporting the families of many freedom fighters who were jailed during the struggle.¹⁰ She was involved in setting up of a rural development centre that provided an integral approach towards rural development. During her tenure as Deputy Minister

she introduced compulsory and free primary education throughout India. Voluntary agencies working in the area of women's education were given encouragement and she allocated funds for such institutions. She strongly felt that the youth should be involved in voluntary service for the development of the nation, hence, promoted the National Service Scheme (NSS), which to this day is rendering remarkable service to the country and brings in more people into social service. In the year 1962 she was awarded Padma Bhushan for her contribution towards social work.

CONCLUSION

These women have left behind a remarkable legacy which helps in the advancement of entire mankind. They have demonstrated great fortitude, wisdom and strength in pursuing their career goals for the welfare of others. From setting up of medical colleges to development of nutritional supplements and abolishing customs like devdasi (marriage of young girls to temple deities) they have demonstrated thinking and courage much ahead of their times. These women embody the true spirit of science and are an inspiration to many.

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