PREFACE

The coming of European knowledge, its science, its arts as well as its tangible technological artifacts and inventions, invoked complex responses within the Indian society. In my research work, I have dwelled upon perception, response and the impact of these developments on the society in the British Punjab during the years 1849 to 1947.

My research covers the period from 1849-1947; the reason for choosing this period is that the year 1849 marked the termination of the Sikh rule. On 29 of March 1849, the British government of India announced the annexation of the Sikh Kingdom of Lahore, finishing the process of expansion that had witnessed the gradual absorption of Indian states into the British Empire. This study ends in the year 1947 when India got independence and was divided into two parts – India and Pakistan. After partition, Punjab was also divided into two countries - Eastern Punjab and Western Punjab. Eastern Punjab remained in India and Western Punjab became part of Pakistan. My period of study covers undivided Punjab which was administered by the British from 1849 to 1947.

It will be pertinent to mention that after annexing the kingdom of the Sikhs in 1849, the British formed the state of Punjab, which was bigger than the empire of Maharaja Ranjit Singh. The clusters of kingdoms existing east of the river Satluj were merged in the British Punjab, which became a bigger province. The style, functioning and governance by the British were completely different from that of previous existing kingdoms and empires. The British had a modern style of governance, which they introduced, in their newly annexed territories. A basic change, which the British brought about in Punjab, was the governance through set of uniform rules, laws and procedures applicable to one and all. They introduced the civil procedure codes, criminal procedure codes, the penal codes and various procedures in revenue collection, agricultural management and military build-up.

In fact, this period acquires attraction owing to the institutionalisation of survey operations, the introduction of railways, and the extension of
telegraphs, A number of hospitals, dispensaries, modern industries were set up. It was followed by the introduction of a number of scientific and technological projects in Punjab, which affected its social fabric, life-styles, and attitudes of the people in several ways. The development of new ideas in the nineteenth century, based on scientific and technological developments were regarded as the need of contemporary Punjab. A new awareness among the people was caused by dissemination of education on western model followed by establishment of institutions and societies dealing with surveys, researches and innovations. Through them, these new ideas and values were expressed. Introduction of science and technology is a very important development in the nineteenth century that influenced the life of the people of Punjab. It is the scientific institutions and technological projects during the British period in Punjab, which determine the extent and nature of changes in every walk of life of its people.

Yet another significant change was in the form of state-sponsored education on the western model. This period saw the establishment of schools, colleges and universities in Punjab. The educational sphere was an important but contested arena of debate that determined what kind of science and technology would eventually be institutionalised in India. Research and training institutions had been established in Punjab during the colonial rule, for the up-liftment of the people, and to meet the interest of colonial government. Indians appreciated those innovations, which suited their requirements and rejected or opposed the ones which were contrary to their interests. This period was of transition. People started making inroads into what had hitherto been exclusively European preserves and were demanding greater share in scientific and technological activities as the colonial science had reached its peak. Similar tensions were reflected in the discussions regarding replacement of indigenous education by the western education.

Therefore, for a balanced understanding of development of science and technology in a particular state, it is essential to delve deep into the perception of the common people and their response towards these new developments taking place in the society. This work is thus an attempt to bring
to light, the totally neglected aspects of the response of the people of Punjab towards introduction of science and technology.

The first chapter analyses the development of science and technology during the ancient and medieval periods in India. An effort is made to identify the specific contribution in these fields of science and technology in Punjab where around 2500 B.C. to 1500 B.C. an advanced civilisation i.e. the Indus Valley Civilisation flourished which left a deep and meaningful impact upon the future trends and tendencies.

In my research work, I have made efforts to give a broad-based picture of the growth of science and technology during ancient period i.e. from 2500 B.C. to 1000 B.C. in specific areas such as medicine, surgery, mathematics, astronomy, metallurgy, architecture, town- planning, inter-linked drainage system, solid wheeled carts, and modern ploughing techniques. This chapter has also taken into account the debates amongst nationalists, scientists and administrators on the reasons leading to the stagnation of science and technology that had set in, from eleventh century onwards. The majority of European observers who encountered indigenous science and technology in India during the late eighteenth and nineteenth century denounced it as traditional, crude, simple, unscientific and stagnant is duly discussed. It also discusses the factors that discouraged a breakthrough in this field.

Second chapter discusses the introduction of science and technology in education. Before annexation, the pattern of education in Punjab was religious in character and the Maulvis, Brahmins and Granthis, who were paid by the students themselves in cash or kind, imparted it through madrassas, mosques, temples and gurdwaras. Teaching of western science and technology in their system of education was different from the one in Europe. After annexation of the Punjab in 1849, the British gradually changed the character of education from religious to secular. They initiated teaching of some new subjects related to science and technology like medicine, geology, zoology, botany, physiology, engineering, agriculture, veterinary, commerce and industry. They opened various schools and colleges for the propagation of western science.
Science education was regarded as an important channel for the transmission of modern science in Punjab. At the same time, technical education was expected to lead Punjab to industrialization and material prosperity. What was its result? The response of the people towards scientific and technological education is discussed in this chapter, in addition to the results.

In the third chapter, I have focused on the attempt of the British to introduce some improved and new technological projects in Punjab. This describes analytically the introduction of science and technology in the field of industry, agriculture and medicine. It also throws light on the introduction to technology in agricultural sector, for instance in plant genetics, tools and implements. It discusses the introduction of technology in engineering for instance railways, laying of pucca roads, and road transportation, steam navigation, electric telegraph, civil engineering. In the field of medical science, there was a sort of revolution by the introduction of technology like x-ray, electro-therapeutics, radiology, arthroscopy, clinical laboratory, dentistry and surgery etc.

All these technologies, when introduced, brought about a change in the attitudes and lives of the people of Punjab. My focus is whether the British used these tools to augment the production of raw materials which was further meant for the consumption of factories in Britain or for promoting the industries in India, apart from improving the physical fitness of Indian soldiers and the British officers who were required only for the expansion and consolidation of the British empire in India. I have tried to explain and analyse the impact of these technologies on the socio-economic activities of the people of the region.

In the fourth chapter, I have assessed and evaluated the response of socio-religious reformers to the introduction of new science and technology. The spread of western education and the import of liberal ideas of the west brought about an awakening among the intelligentsia. They were convinced that some social and religious reforms were necessary for the growth of a healthy society. The desire for reforms received a further impetus owing to the onslaughts of the Christian missionaries who were then active in the province.
The challenge of Christianity aroused the numerically dominant communities of the Punjab viz. Hindus, Muslims and the Sikhs to set their houses in order. They realised that their respective religions, in the existing form, could offer no antidote to the Christian influences. They, thus, sought to strengthen the old by purifying it. As a result, many socio-religious organisations of the Hindus, the Muslims, and the Sikhs, sprang up.

These movements became the precursors of the introduction of modern European scientific thought into this region. These movements started as religious revivalists, but their protagonists promoted the cause of modern European scientific education. They used scientific rationality as a tool for bringing about a socio-cultural change in the society.

In the fifth chapter, I have focused upon the response of a number of intellectuals including professors, scientists, writers and poets of the nineteenth century who had an ambivalent attitude towards introduction of science and technology. Nevertheless, they contributed substantially to the popularisation of science among the people of Punjab.

The perception of some of the indigenous practitioners of science is also taken into account. These practitioners professed their own native system of medicine despite the advent of allopathic system of medicine based on the western model. Apart from the above-mentioned professionals, the people who made a dent on the Punjabi society were poets, novelists, journalists, social commentators and writers. I have made an effort to examine and evaluate crusades launched by these people for teaching science and technology and its popularization. Their work is also taken into account.

In the last sixth chapter, the response of local populace towards introduction of western science and technology is examined. People's response was bipolar. On the one hand, there was an urge to look forward to change and break with the existing notions and practices. On the other, the tendency to look backward was common. The positive and negative
responses of the people are identified in this study.

I have also critically analysed the perception of the local people regarding the changing trends in society owing to the introduction of railways, post and telegraph network, new education system and introduction of new commodities like electricity, metallic tools, drugs, chemicals, modern machinery and wooden furniture, and how these changes helped to build a social class which broke the age-old taboos, superstitions and rigidity of the caste system.

My research work is an interface between history of science and sociology of science. The study has been based upon the original resources available in the National Archives of India, New Delhi, the Punjab State Archives, Patiala. Of these, mention may be made of the Proceedings of the Government of India in the Home, Foreign and Public Works Departments, Annual Reports on the Administration of the Punjab. District and State Gazetteers of undivided Punjab, published and unpublished private papers of the Punjab Officials, Governor-Generals and Viceroy's. Census Reports of the State as well as the District Reports on education, industry, irrigation, roads and agriculture have been utilized. Travelogues, memoirs, biographies, autobiographies, books, contemporary journals, newspapers and pamphlets have also been taken into consideration.

Reports of the Punjab Legislative Council Debates (Proceedings), which represent different shades of public opinion, have also been drawn upon to make the study as objective as possible. Relevant information has also been gleaned from other sources such as published books, periodicals and unpublished theses.

I am beholden to the following institutions for allowing me to consult the relevant records and books in their possession: National Archives of India, New Delhi; Punjab State Archives, Patiala; Punjab State Archives, Chandigarh; the Nehru Memorial Museum and Library, New Delhi; Central Secretariat Library, New Delhi; the Punjabi University Library, Patiala; the
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