

## **BISHNUPADA MUKERJI (1903-79) - A MEDICO-PHARMACEUTICAL PROFESSIONAL OF EMINENCE**

**HARKISHAN SINGH\***

(Received 11 June 2008; revised 5 December 2008)

Bishnupada Mukerji (1903-79) was an eminent medico-pharmaceutical professional of the twentieth century. On his graduation in medicine from the Calcutta Medical College he was privileged to start his career under the tutelage of the pioneer pharmacologist Col. Ram Nath Chopra at the Calcutta School of Tropical Medicine. After several years of research on Indian indigenous drugs, a fellowship from the Rockefeller Foundation enabled him to proceed abroad to work at laboratories in China and the United States of America. He obtained D.Sc. in pharmacology from the University of Michigan. During his stay abroad he also visited many institutions of interest in Japan, United States of America, Canada, England and continental Europe. On return home he worked for 15 years at the Biochemical Standardisation Laboratory and the statutory Central Drugs Laboratory. Dr Mukerji became a crusader for propagation of pharmacology. He conceived of a national institute for drug research, and on follow-up there got to be established the Central Drug Research Institute, the development of which he guided for a dozen years. During the years of his being at the helm of the BSL, CDL and CDRI though he was involved in the management of these institutions, but he also maintained his interest in biomedical investigations in a wide range of problems. Where Dr Mukerji significantly helped the development of pharmacology, his contributions to the pharmaceutical discipline in the country were equally important. There was no part of the pharmaceutical activity and the profession on which he did not leave an enduring impact.

**Key words:** Biochemical Standardisation Laboratory, Central Drug Research Institute, Central Drugs Laboratory, Drugs Enquiry Committee, Indian Pharmaceutical Association, Indian Science Congress, Indigenous drugs, Pharmacology, Pharmacopoeial Publications, Pharmacy.

---

\* Professor Emeritus, Pharmaceutical Sciences, Panjab University, 1135 Sector 43, Chandigarh 160022

### INTRODUCTION

During his undergraduate studies for a degree in medicine, having been impressed by his pharmacology teacher Ram Nath Chopra, Bishnupada Mukerji chose to follow his preceptor and become a pharmacologist. Chopra picked him to assist the Drugs Enquiry Committee, of which he was the chairman, which helped young Mukerji to get acquainted with the malaise which existed due to there being no control on drugs and pharmacy and the recommendations which the Committee made to correct the sad state of unorganized affairs. The development of both pharmacology and pharmacy continued to engage Mukerji all through.

After several years of carrying out studies and research in pharmacology under Col. Chopra, Mukerji proceeded abroad and worked at laboratories in China and United States of America, and also visited many institutions of interest in Japan, USA, Canada, England, and Continental Europe. He obtained his doctor of science degree in pharmacology from the University of Michigan.



*Bishnupada Mukerji  
(1903-79)*

*Photo: Courtesy of the Central Drug Research Institute*

Richer in experience and mature as a pharmacologist on return home Dr Mukerji was involved in developing the Biochemical Standardisation Laboratory, which later became the statutory Central Drugs Laboratory. He conceptualized the creation of a national institution of drug research, which led to the establishment of the Central Drug Research Institute, of which he remained director during its formative years.

Where Dr Mukerji significantly helped the development of pharmacology, his contributions in building the pharmacy discipline in the country were equally important. He was truly a medico-pharmaceutical professional of great merit.

To prepare Dr Mukerji's personal and professional profile, in addition to the material culled from the scientific and professional periodicals, the information obtained from memoirs of him as fellow of the Indian National Science Academy,<sup>1</sup> annual reports of the Calcutta School of Tropical Medicine,<sup>2</sup> correspondence with the Rockefeller Archive Centre,<sup>3</sup> the University of Michigan,<sup>4,5</sup> and several other important sources cited later have proved to be of good help. A documented account of the life, career and contributions of Dr B. Mukerji is given under the heads; Early Life, Work at the Calcutta School of Tropical Medicine and Studies Abroad; Making of the Central Drugs Laboratory and the Central Drug Research Institute; Leading Participation in Pharmaceutical Progress; The Years After Superannuation; and Medico-Pharmaceutical Professional of Prominence.

During his younger days Bishnupada Mukerji spelled his surname as 'Mukherjee,' which was later changed to 'Mukherji.' Subsequently he got to be known as Mukerji. At places his first name appeared split into 'Bishnu Pada.' In the literature his name largely appears as B. Mukerji and that is what has been used in this writing.

#### **EARLY LIFE, WORK AT THE CALCUTTA SCHOOL OF TROPICAL MEDICINE AND STUDIES ABROAD**

Bishnupada Mukerji, belonged to an orthodox Brahmin family.<sup>1</sup> He was born at Barrackpore, 24 Parganas, close to Calcutta. His date of birth has been mentioned as 1 March 1903<sup>1</sup> and 14 July 1903.<sup>6</sup> Bishnupada's father Upendra Nath Mukerji, served as Administrative Assistant with the then Eastern Bengal Railway; his grandfather became Vice-Principal of the Sanskrit College, Calcutta. Bishnupada was third of five children of his parents.

Mukerji received his school and college education at Calcutta.<sup>1</sup> For his matriculation he studied at Shyambazar Vidyasagar School; he passed the examination in 1919 with distinction in Sanskrit, Bengali and mathematics. He was student of Scottish Church College for the two years' intermediate in science course, which he passed with distinction in mathematics, physics and chemistry. For the Bachelor of Medicine course of six years, Mukerji joined the Calcutta Medical College. He completed the course in 1927, with honours in pharmacology, obstetrics and gynaecology, standing first in order of merit. Bishnupada remained a meritorious student all through and received scholarships and other recognitions. During 1927-28 he worked as Resident House Surgeon at the Eden Hospital of the College.

At one time Mukerji desired to be an obstetrician and gynaecologist.<sup>7</sup> But the destiny willed otherwise. During his studentship for graduation in medicine he had been much impressed by his pharmacology teacher Col. Ram Nath Chopra. He chose to work with him at the Department of Pharmacology of the Calcutta School of Tropical Medicine, located at the same campus as the Calcutta Medical College. Mukerji was appointed Second Experimental Assistant under the Indigenous Drugs Inquiry of the Indian Research Fund Association.<sup>8</sup> Thus started his career as a pharmacologist and lifelong interest in the study of indigenous drugs. His work progressed well.<sup>9</sup> In 1930 Mukerji's services were placed at the disposal of the Drugs Enquiry Committee of which Col. R. N. Chopra had become the chairman.<sup>10</sup> He rejoined IRFA Indigenous Drugs Inquiry on 1 April 1931,<sup>11</sup> and continued to work on the project till his proceeding abroad in 1933 as Rockefeller Foundation Fellow.<sup>12,13</sup>

During the period 1928-33, B. Mukerji participated in carrying out a substantial amount of work largely on indigenous drugs. The researches pertained to antimony test in the diagnosis of *Kala-azar*, narcotine, Indian species of artemesia, Indian squills, chenopodium and ipecauanha, musk, Indian sources of thymol, menthol and camphor, *Makaradhwaja*, *Rauwolfia serpentina*, anhydrocotarnine-resorcinal, *Thevetia nerifolia*, and toxic effects of ephedrine. All this work running into 13 papers was published in the *Indian Medical Gazette*, and *Indian Journal of Medical Research*.<sup>14</sup> A particular mention may be made of the work on *Rauwolfia serpentina*, a plant which gained prominence two decades later as a source of reserpine. In 1933 it was reported that an alkaloid obtained from the plant, on experimental studies in animals showed central depressant properties and lowered the blood pressure.<sup>15</sup> It was recorded that 'it should prove to be a valuable sedative drug' and 'if administered in proper dosage form should be of value as a remedy for hyperpiesis.'

The excellent credentials earned as a student, followed by research of merit must have helped Bishnupada, at the age of thirty, to successfully compete for Rockefeller Foundation fellowship. This enabled him to proceed for studies in China and United States of America and also to undertake an extensive tour of Europe.

On the basis of information contained in the documents received from the Rockefeller Archive Centre,<sup>3,16</sup> a description is given next about Dr Mukerji's visit and studies abroad. The statement that subsequent to his studies in the United

States, Mukerji worked in China,<sup>1</sup> is not correct. It is the other way round. It comes out that Mukerji reached Peiping (later Peking and now Beijing) by the end of December 1933 and left China by the end of December 1934. After spending several days in Japan, he sailed to reach San Francisco in mid January 1935 and proceeded to Ann Arbor.<sup>17</sup>

While in China Mukerji engaged in study of experimental pharmacology and drugs indigenous to China. He worked till end of July 1934, with Professor H. B. van Dyke of the Department of Pharmacology of the Peiping Union Medical College, who initiated him into the pharmacology and biochemistry of the pituitary hormones, and then with Professor Bernard E. Read at the Henry Lester Institute of Medical Research, Shanghai;<sup>16</sup> Professor Read (1887-1949) was noted for his researches on Chinese drugs.<sup>18</sup> There is mention of a paper published by Mukerji in a Chinese journal.<sup>19</sup> During his brief halt in Japan on his way to the United States, Mukerji availed of visits to the Imperial University Medical School and the Keip Medical School in Tokyo and also acquainted himself of the medical work in Kyoto.<sup>16</sup>

Mukerji reported to Dr C. W. Edmunds of the Department of Pharmacology, University of Michigan.<sup>20</sup> He carried out his thesis research with Dr Ralph Grafton Smith, Assistant Professor in Pharmacology, as the advisor.<sup>5</sup> He took two pharmacology courses (204 and 304) and passed language examinations in French and German.<sup>6</sup> He was elected a member of the Society of the Sigma Xi. During the summer of 1935 he spent five weeks visiting different institutions of interest.<sup>21</sup> Bishnupada Mukerji's dissertation entitled 'The Effects of Certain Therapeutic Agents on Thiocyanate Metabolism in Cyanide Poisoning' was accepted and he was voted to receive the degree of Doctor of Science.<sup>22</sup> Later, Mukerji published the work with Dr R. G. Smith.<sup>23,24</sup>

What is interesting is that Mukerji spent just over one year at the University of Michigan and obtained a D.Sc. degree. I am told 'that he must have been admitted with significantly advanced standing.'<sup>25</sup> Before Dr Mukerji reached the University of Michigan he had six years' standing as a pharmacologist and a respectable number of published research papers to his credit.<sup>14</sup> Further, it may be noted that 'Dr Mukerji was, in fact, the first individual to complete a doctoral thesis project and earn a doctorate in Pharmacology from the University of Michigan.'<sup>26</sup>

Mukerji left Ann Arbor on 24 May 1936. After visiting the Insulin Standardisation Laboratories of Toronto, Canada, he sailed for Europe.<sup>27,28</sup>

It is recorded that 'Dr Mukerji came to England where he worked for three months in the laboratories of Pharmaceutical Society of Great Britain and the National Institute for Medical Research at Hampstead, learning the technique of biological assay of galenicals, organometallic compounds and biological products. Later, he undertook an educational tour of Europe and visited most of the physiological and pharmacological laboratories in Belgium, France, Germany, Austria and Switzerland.'<sup>27</sup> He reached home in October.<sup>29,30</sup>

B. Mukerji had a highly successful study stay and travel abroad. Where he gained rich experience as a pharmacologist, he built useful contacts with top scientists in the subject. He returned fully prepared to take up his new assignment as Pharmacologist at the Biochemical Standardisation Laboratory and also to engage in the promotion and consolidation of pharmacology and allied fields in the country.

#### **MAKING OF THE CENTRAL DRUGS LABORATORY AND THE CENTRAL DRUG RESEARCH INSTITUTE**

An account is given next of the roles played by Dr B. Mukerji in development of the Biochemical Standardisation Laboratory which changed to the Central Drugs Laboratory, and conceptualizing the need for a national institute for drug research, drawing the project plan for it and guiding the resultant Central Drug Research Institute during its formative years.

The Drugs Enquiry Committee (1930-31), with Col. R. N. Chopra as the chairman on which Dr B. Mukerji worked as assistant secretary, made comprehensive recommendations to ensure availability of drugs of quality. Among the steps to be taken was the setting up a well equipped Central Laboratory with a competent staff of experts in various branches of drugs standardisation work. In anticipation of establishment of such a laboratory there was created a nucleus as the Biochemical Standardisation Laboratory (BSL) in January 1937 at the All-India Institute of Hygiene and Public Health, Calcutta, situated next door to the School of Tropical Medicine. Later this laboratory developed into statutory Central Drugs Laboratory (CDL). A description which follows is largely based on the information drawn from the reports of the BSL and CDL.<sup>31-36</sup> Mukerji's inputs in

building this institution and certain of his own professional accomplishments during the decade and a half of his association with it, are brought out.

Col. R. N. Chopra was first director of the Biochemical Standardisation Laboratory who worked in honorary capacity; the next senior officer was Dr B. Mukerji.<sup>37</sup> Col. Chopra held the position till 15 November 1941 and Mukerji succeeded him as the officiating Director.<sup>38</sup> From 1 February 1947 the laboratory was designated as the Central Drugs Laboratory and it started carrying out statutory functions under the Drugs Act, 1940, and the Drugs Rules, 1945, which were brought into operation for the first time from 1 April 1947.<sup>39</sup> With the establishment of the CDL, Dr Mukerji became the Director through selection by the Federal Public Service Commission.<sup>40</sup> He was also given the charge of the Pharmacognosy Laboratory in April 1948.<sup>39-41</sup>

B. Mukerji shifted to the Central Drug Research Institute in July 1951 but held additional charge as CDL Director till his successor joined in June 1952.<sup>42</sup> In 1952 the Government decided to shift the Laboratory to Lucknow but the move had to be given up in view of the paucity of suitable living accommodation for about 80 members of the staff of the CD Laboratory;<sup>43</sup> earlier there had been a move to shift the Laboratory to Delhi.<sup>44,45</sup> The idea of shifting the Laboratory out of Calcutta was abandoned and the new premises at the 3 Kyd Street were requisitioned in January 1953.<sup>43</sup>

B. Mukerji participated in the building up of the Biochemical Standardisation Laboratory right from the beginning, its changeover to the statutory Central Drugs Laboratory and overall consolidation of the institution. The Laboratory continued with its activities involving survey of quality of drugs in the market, training of analysts, preparation and maintenance of standards for drugs, providing information concerning drugs and issue of technical and scientific publications, etc. The Laboratory also remained very active in research on standardisation of drugs, indigenous drugs and several other drugs related and allied problems. On change to statutory status, in the CDL the pace of research slowed down since the staff had now to devote a considerable time to analyse and test samples sent to the Laboratory as per requirement under the Drugs Act and Rules and to grant certificates of registration for patent and proprietary medicines with undisclosed formulae.

B. Mukerji's expertise was very much in demand, in particular by several of the universities, for work on compilation of the official *Indian Pharmacopoeial*

*List*, Pharmaceuticals and Drugs Committee of the Council of Scientific and Industrial Research and subcommittees, the Drugs Technical Advisory Board as an *ex-officio* member, pharmaceutical organisations, and in several other ways. He frequently wrote general articles and lectured on pharmaceutical education and research, drug industry and other professional subjects. His research interests did not slacken, however.

While with the BSL-CDL Dr Mukerji himself and with associates published well over one hundred papers and articles.<sup>1,46</sup> During this period most of the research publications were on standardisation of drugs. In addition an extensive list of publications included the reports of the work on dextrorotatory hydrocupreidine derivatives, effect of anterior pituitary extracts on smooth muscles under influence of some amines related to ephedrine, effect of sodium nitrite and methylene blue on thiocyanate formation in cyanide poisoning, method of determination of prothrombin time, medicinal value of *Alstonia scholaris* and *Caesalpinia bonducella*, antimony content and toxicity of urea stibamine, assay of Indian ergot, cantharidin content of *M. macilenta* beetles, protein hydrolysates, assay for insulin, quality of peptone for bacteriological work, snake venom as a therapeutic agent, unsaponifiable matter in shark-liver oil, prolongation of insulin effect by combining with casein hydrolysate, assay of globin-insulin preparations, biological standardisation of liver extracts by pigeon method, assay of histamine content of tissue extracts using antihistaminic drugs, microbiological assay of vitamin B<sub>12</sub>, etc.

B. Mukerji received several honours and recognitions. He was elected member of the American Society for Pharmacology and Therapeutics.<sup>47</sup> The Calcutta University awarded him the Griffith Memorial Prize and Ashutosh Mookerjee Gold Medal on the strength of his researches on ergot and ephedrine like amines,<sup>47</sup> Nilmony Brahmachari Gold Medal for his work related to drug standardisation<sup>48</sup> and Coates Gold Medal for his contributions to drug research.<sup>49</sup> He was elected a member of Swiss Medical Biological Society<sup>49</sup> and a Corresponding Member of the Pharmaceutical Society of Great Britain.<sup>50</sup>

In 1943, Mukerji was elected a Fellow of the National Institute of Sciences of India, later changing to Indian National Science Academy; he became member of its Council from 1947.<sup>1</sup> He remained active with the Indian Science Congress. He was elected a member of the Executive Committee of the Congress.<sup>49</sup> He was the President of the Physiology Section of the Indian Science Congress in 1945,



its Acting General Secretary in 1946-47 and its General Secretary during 1947-52.<sup>1</sup>

The above is an overview of the experiences and credentials Dr B. Mukerji possessed by the time he moved to the Central Drug Research Institute at Lucknow. Before going further it is appropriate to look at the developments which fructified in the establishment of the CDRI.

Dr Bishnupada Mukerji had become a crusader for the propagation of pharmacology and allied fields. For his Presidential Address at the Section of Physiology of the 32<sup>nd</sup> Indian Science Congress (1945), he chose to speak on scope and future of pharmacology.<sup>51</sup> In his lengthy address he covered almost all aspects of the whole gamut of pharmacology and related areas. Here a brief mention may be made of what he said in favour of establishing a 'National Institute for Drug Research.'<sup>52</sup> He stood for collaborative drug research. He stated that "For the efficiency and expediency of such a collaborative effort, it is most desirable that all the work should be done in close co-operation with a group of specialists housed in the same institution. The only way to do this is to organise the establishment of a 'National Institute for Drug Research' in India as was suggested by Abel (1918) and Loevenhart (1918) for America when she was in a very similar situation to what India is today." He visualised a three-fold aim for such an institute :— '(1) promotion of drug research in general; (2) to offer facilities to industrial institutions to solve specific problems which they may encounter, particularly the smaller organizations who may not be in a financial position to support adequate technical staff on their own; and (3) provision of clinical trial under fully controlled conditions on hospital patients.'

The concept was born and in a due course, the ball started rolling. At the instance of the Pharmaceutical and Drugs Committee, Dr Mukerji drew up a plan for the national institute which was discussed by the Committee during 1947.<sup>50,54</sup> After discussion and some modification, finally the Board of Scientific and Industrial research at its meeting held on 5 February 1948 accepted the plan to establish a national laboratory to be called 'Central Drug Research Institute.'<sup>55</sup> The functions, structuring of the facilities and financial support were spelled out. Later, Chattar Manzil, Lucknow, was chosen to house the Institute.<sup>55</sup> On 20 November 1950, Sir Edward Mellanby joined the Institute as its first Director, and formally the Institute was inaugurated by Prime Minister Jawaharlal Nehru on 17 February 1951. This must have been a moment of great satisfaction and elation for Dr B. Mukerji to see what he had conceived become a reality.

At some stage Dr Mukerji's mentor Sir Ram Nath Chopra was involved in promotion of the move for establishment of the national institute since Sir Chopra went on record saying, 'During the post-war period and following the declaration of Indian Independence, there was a general scientific upsurge in India, and, along with this, pharmacology was given a big boost through the establishment largely through the efforts of Dr B. Mukerji and me of the first National Drug Research Institute of India.'<sup>56</sup>

Sir Mellanby stayed as the Director of the CDRI for short period of three months.<sup>55</sup> Dr B. Mukerji took over as the Director on 17 July 1951.<sup>42</sup> The organization work started in right earnest.<sup>57</sup> He superannuated in April 1963.<sup>1</sup> During his stewardship of the Institute for twelve years this national centre was appropriately structured, experienced and young scientists and supporting staff were recruited, and research facilities of high class were created. Gradually the institution started making an impact as a place of quality research. The institution was put on the right path to progress towards a world level place of biomedical research with interdisciplinary co-ordination as its major strength.

Though much of the time Mukerji was occupied in planning and management of research and development of the Institute, but still he kept his own interest in research alive. Out of his extensive published work from the CDRI a mention may be made of the contributions regarding pharmacological action of alkaloids of *Cissampelos pareira*, a method of isolation of dendritic cell from human and guinea-pig skin, evidence against corticotropin-like action of melanophore hormone on adrenal cortex of mice, studies on experimental atherosclerosis, studies on experimental diabetes, studies on experimental tuberculosis, studies on leucoderma including treatment, experimental peptic ulceration, and action of *makaradhwaja* (Ayurvedic mercuric sulphide preparation).<sup>1</sup>

At times Mukerji involved himself in preparing scientific reviews, out of which a mention may be made of the writings on rauwolfias,<sup>58</sup> synthetic dyes,<sup>59</sup> and statistical aspects.<sup>60</sup> He had been associated with Chopras in preparing a treatise on tropical therapeutics.<sup>61</sup> He co-authored *Pharmacognosy of Indian Root and Rhizome Drugs* (1950).<sup>1</sup>

Among the honours and recognitions received by Mukerji here a mention may be made of his continuing on the Council of the Indian National Science Academy, serving the Academy as a Vice-President in 1954-55 and 1962 and as the Foreign Secretary in 1957-60.<sup>1</sup> He became General President of the Indian

Science Congress and presided at the Cuttack Session (1962), where he deliberated on Impact of Life Sciences in Man. He was recipient of the Indian Science Congress Medal for 1951 and Barclay Medal for 1954 of the Asiatic Society. He was awarded the Padma Shri in 1962 for his services towards development of scientific research in the biomedical field.

#### **LEADING PARTICIPATION IN PHARMACEUTICAL PROGRESS**

At a time B. Mukerji put in his own words as to how his involvement with the matters pharmaceutical started: 'Though a medical man, I had been interested in the scientific aspects of pharmacy since 1930. In the year (1930) Col. Sir Ram Nath Chopra, my former professor and chief was appointed Chairman of the Drugs Enquiry Committee of the Government of India to investigate the status of drugs and pharmacy in India. I was chosen by him as the Assistant Secretary of the Drugs Enquiry Committee and in this capacity, I had opportunity of touring all over India and of getting first hand acquaintance with the status and quality of drugs in the Indian market, as also with chemists and druggists' shops and the pharmacists all over the country. I had also opportunities of collecting relevant information in this connection and as result of the data then gathered the chapter on Profession of Pharmacy was written in the Report of the Drugs Enquiry Committee.....'<sup>62</sup> This was reference to Chapter V of the Report.<sup>63,64</sup> The chapter contained an elaborate coverage on the state of pharmacy in different provinces in India and attention was drawn as to the pharmacy practices in the Great Britain, the United States of America and Germany. In fact, not only for the investigation on the profession of pharmacy but for different aspects of drugs and drugs control, drugs industry, need for a pharmacopoeial publication etc., and the background materials and making of the respective recommendations, the technical assistance of Mukerji must have been fully utilised. The setting up of the Drugs Enquiry Committee, the studies and recommendations made by it, have been taken to constitute the most significant pharmaceutical event of the twentieth century to herald systematic developments related to pharmacy and drugs.<sup>65</sup>

For young Mukerji, then in his twenties, the participation with working of the Drugs Enquiry Committee must have proved to be a rewarding experience to grasp the intricacies of the struggle which lay ahead in shaping of the new pharmaceutical discipline. Further, in 1936, on his way back from abroad, while working for a brief period at the laboratories of the Pharmaceutical Society of Great Britain,<sup>27</sup> he must have interacted with other departments of the Society and

gained knowledge about pharmacy practice in Britain and thus got better equipped for promotion of pharmacy back home.

To build a link with his pharmaceutical activities on coming back, a brief information is necessary about the relevant developments which had taken place during the period 1933-36 when Mukerji was away from home. The recommendations of the Drugs Enquiry Committee were still laying in abeyance. The All Bengal Compounders' Association which was in existence since 1929, on the advice of Col. R. N. Chopra had changed to the Bengal Pharmaceutical Association.<sup>67</sup> The nucleus of pharmaceutical instructions which had been created at the Banaras Hindu University in 1932, developed into a B.Sc.(Pharm.Chem.) degree course of two years' duration at the BHU Department of Pharmaceutics in 1934, and got organised for start of a regular B.Pharm. course of three years in 1937.<sup>69</sup> Professor M. L. Schroff who was the spirit behind the pharmaceutical education at Banaras, had also founded the United Provinces' Pharmaceutical Association in 1935; and he had started getting attention at the national level.<sup>70</sup>

At Calcutta Dr B. Mukerji started his vocational and professional activities afresh, again in tandem with Col. R. N. Chopra. There are references available to Mukerji working first as a Joint Secretary of the Bengal Pharmaceutical Association, with Col. Chopra as the President,<sup>71</sup> and then as the General Secretary,<sup>72</sup> for the 1937-38 and 1938-39 terms, respectively. In April 1938, the *Indian and Eastern Chemist*, published from Calcutta, became official organ of the Association; Col. Chopra as the BPA President headed the Editorial Advisory Board with B. Mukerji as a member of the Board.<sup>73</sup> They held the positions till July 1940. Chopra and Mukerji duo also worked together as Chairman and Secretary, respectively, on the Committee which the Bengal Government appointed for start of a College of Pharmacy.<sup>74</sup> The Committee impressed upon establishment of College of Pharmacy at Calcutta and also recommended for enacting legislation to control the profession of pharmacy in Bengal.

Col. R. N. Chopra relinquished his offices as the Director of the School of Tropical Medicine and also the Biochemical Standardisation Laboratory, near the close of 1941 and left Calcutta. Dr B. Mukerji took over as officiating Director of the BSL. This added to his responsibilities at the Laboratory. Several exigencies arising because of the second world war being on, affected Calcutta and for Dr Mukerji the working of the BSL in particular. Most of his time was spent on official duties.

In general, there was a lull on the BPA front for the years 1939-45. With the arrival of dynamic Professor Schroff at Calcutta in early 1943 after resigning from his position at Banaras, the things started changing. He began publishing the journal *Indian Pharmacist*, from the later part of 1945; B. Mukerji was on the first Advisory Board of the journal.<sup>75</sup> Professor Schroff revived the almost defunct Bengal Pharmaceutical Association on his taking over its presidency in February 1946. A new vigour was infused into the organisation. Mukerji was called upon to preside over the Sixth Session (1950) of the Bengal Pharmaceutical Conference at which he made an impressive presentation.<sup>76</sup>

At Banaras in 1939 the United Provinces' Pharmaceutical Association started publishing the *Indian Journal of Pharmacy*. In 1940, the Association acquired a national face on renaming itself as the Indian Pharmaceutical Association. Mukerji began taking active interest in the IPA and *IJP* affairs. As a senior professional he was well regarded in the pharmaceutical circles.

In the mid 1940s, a move for shifting the headquarters of the Indian Pharmaceutical Association from Banaras to Bombay became a contentious issue. At the Annual General Meeting of the Association in January 1947 at Delhi, as tempers rose high when the item was under discussion, it was B. Mukerji's resolution for holding a referendum on the subject which assuaged the unpleasantness.<sup>77</sup> A follow-up on the resolution made the shift of the IPA headquarters to Bombay possible; it became a reality from 1 January 1953.<sup>78</sup>

Gradually, Dr Mukerji got thickly identified with the Indian Pharmaceutical Association. At times he remained on the IPA Council and the Advisory Board of the *Indian Journal of Pharmacy*. He also represented the IPA on the Executive Committee of the Indian Pharmaceutical Congress Association.<sup>79</sup>

Dr B. Mukerji's standing in the Indian Pharmaceutical Association was recognised on his election to Presidency of the Association for the years 1954<sup>80</sup> and 1955.<sup>81</sup> Dr Mukerji's proposal to set up 'Presidents' Page' in the *IJP* was accepted;<sup>82</sup> ever since this practice has largely continued for the *IJP* and the *Pharma Times*. During his two years as the IPA President, Dr Mukerji every month reached the membership through his short informative articles on professional issues and emerging areas of therapy and drug research.

As the Director of the Central Drugs Laboratory, in his *ex-officio* capacity B. Mukerji became member of the Drugs Technical Advisory Board<sup>83</sup> and the first Pharmacy Council of India.<sup>84</sup> The PCI elected him to its Executive Committee and Education Regulations Subcommittee.<sup>85</sup>

The deficiencies in the profession and practice of pharmacy ever remained a matter of concern to Dr Mukerji.<sup>86-90</sup> He propagated improvement of the status of pharmacists and level of pharmacy practice and backwardness in practically nonexistent hospital pharmacy. He pleaded for appropriate statutory control over pharmacy and drugs.<sup>91</sup>

For better pharmacy there had to be better pharmaceutical education. An inadequate training for pharmacists continued to disturb him. He spared no efforts to promote this important component of the pharmacy profession. He was well informed about the status of pharmaceutical qualifications required for registration in Britain.<sup>92</sup> He submitted a memorandum on 'Pharmaceutical Education' to the Health Survey and Development Committee (Chairman: Sir Joseph Bhole), and suggested syllabi for degree and diploma courses in pharmacy.<sup>94</sup> He was a member of the subcommittee on pharmaceutical education which appeared before representatives of the Committee in January 1944.<sup>95</sup> He also proposed composition of Central Pharmaceutical Council on the lines of the Indian Medical Council.<sup>96</sup> Later, at a Symposium on "Ideal Courses in Pharmaceutics," Dr Mukerji spelled out the details for pharmacy syllabi in his address as the Chairman.<sup>97</sup> He remained actively associated with different universities in various capacities.

The prospects of development of drug industry in the country also attracted his attention. He made knowledgeable presentations on different aspects of the industry.<sup>98-100</sup> He laid emphasis on collaborative research as an aid to the Indian drug industry<sup>99</sup> and impressed on quality and standard of drugs.<sup>100</sup> Dr Mukerji became a member of the statutory Development Council for Drugs and Pharmaceuticals.<sup>101</sup>



*Dr B. Mukerji with Professor N. K. Basu (on his left) and Dr G. P. Srivastava of the Banaras Hindu University (Photo: Courtesy of Dr G. P. Srivastava Jr)*

The other pharmaceutical activity with which Dr Mukerji was in fact intimately involved was the preparation of pharmacopoeial and related compendia. The Committee which prepared the *Indian Pharmacopoeial List 1946* was chaired by Sir R. N. Chopra.<sup>102</sup> Dr B. Mukerji was one of the members of the Committee and Convener of the Working Subcommittee which was appointed; the brunt of correspondence and integration of data and opinions received fell on him at the Biochemical Standardisation Laboratory. Later, Dr Mukerji with the help of his colleagues at the Central Drug Research Institute brought out the *Indian Pharmaceutical Codex*.<sup>103</sup>

It was after independence of the country that the work on the National Pharmacopoeia started. Dr B. Mukerji remained associated in different capacities in the making of the *Pharmacopoeia of India* (1955) and its 1960 *Supplement* and the *Pharmacopoeia of India* (1966).<sup>104</sup> He was a member of the first Indian Pharmacopoeia Committee formed in 1948 and reconstituted in 1955. He was on the 'Coordination Sub-committee' as a Secretary, of which Sir Chopra was the Chairman. In February 1958 Dr Mukerji was appointed Chairman of the Indian Pharmacopoeia Committee on the demise of the incumbent Dr B. N. Ghosh. Dr Mukerji was the Chairman of the Committee entrusted with the compilation of the 1966 edition of the pharmacopoeia. All through, his expertise in pharmacology and bioassays remained of particular help.

Dr Mukerji served as a member of the Expert Committee on International Pharmacopoeia of the World Health Organization.<sup>105</sup> He reviewed the first edition of the *International Pharmacopoeia*, in two volumes, published during 1951 and 1956, respectively.<sup>106, 107</sup>



*Expert Committee on International Pharmacopoeia (1951)*  
*Dr Charlesbest Hampshire (Chairman) seated in the middle Dr B. Mukerji standing third from right (Photo: From Indian Journal of Pharmacy, 17 (1955) 85)*

From the above selective coverage, the pharmaceutical contributions of Dr B. Mukerji, a man of medicine, vividly stand out, comparable with, in certain ways even better than the leading pharmacy luminaries of the contemporary period. He received several recognitions from different pharmaceutical organisations. In 1948, Mukerji was appointed Corresponding Member of the Pharmaceutical Society of Great Britain.<sup>50,108</sup> He was conferred Honorary Memberships by the Indian Pharmaceutical Association (1953)<sup>109</sup> and the Pharmaceutical Society of Egypt (1955).<sup>110</sup> He received the Squibb Award (1961) from the Indian Pharmaceutical Association.<sup>111</sup> Dr B. Mukerji had the honour of presiding at the Indian Pharmaceutical Congress (1961). In his presidential address,<sup>112</sup> he laid stress on collaborative organisation and joint efforts in drug research. While concluding, he stated, 'Provided the will and leadership is available, India can figure in this field of research by developing better cooperative work between existing institutions and stimulating more research efforts in commercial concerns.'

#### THE YEARS AFTER SUPERANNUATION

B. Mukerji superannuated as the Director of the Central Drug Research Institute in early 1963. This did not mark, however, his retirement from professionalism. He continued to be active and also earn more of recognitions.

He joined the Chittranjan National Cancer Research Centre of the Ministry of Health, Government of India, at Calcutta.<sup>1,113</sup> He was the first whole time Director of the Centre and worked at the position for five years (1963-1968). He consolidated the working of this Centre and opened a Cancer Chemotherapy Field Research Centre at Chandernagore. Mukerji and associates reviewed the status and the trends of cancer chemotherapy.<sup>114</sup>

During 1970-71 under a University Fellowship Programme he had a trip around the world, lecturing and attending several international conferences.<sup>1</sup> Later, he associated with the Department of Biochemistry of the University of Calcutta as Honorary Visiting Scientist and held a temporary assignment of a Consultant on Reproductive Biology at the Calcutta Office of the Ford Foundation.

Among the several activities Dr Mukerji maintained at Calcutta was also the Presidentship of the Asiatic Society (1972-75).<sup>1</sup> During his tenure an account of the life-story of the Society was published.<sup>115</sup> Dr Mukerji who had been a Foundation Fellow of the Institution of Chemists (India), was President of the Institution for two years (1972-73).<sup>1,116</sup> He received the H. K. Sen Memorial



Medal for 1963 of the body, and delivered the memorial lecture on 'Indian Drug Industry – past, present and future.'

B. Mukerji remained Foreign Secretary of the INSA (1967-68).<sup>1</sup> He received the Acharya P. C. Ray Memorial Gold Medal (1976) of the Bengal Branch of the Indian Pharmaceutical Association.<sup>117</sup> The Indian National Science Academy honoured him by the award of Shree Dhanwantri Prize for 1976.<sup>1,118</sup>

Before closing it may be recorded that Dr Mukerji had a very happy and peaceful family life.<sup>1</sup> It was a few days before his departure for studies abroad that on 18 November 1933, he married Susama, daughter of Benoy Krishna Banerjee, Principal, D. A. V. Art College, Lahore, and Lukshimoni. They had two sons, Debangshu and Sudhangshu and a daughter Sucheta.

Mukerji passed away on 30 July 1979 at the age of 76.<sup>119</sup>

#### **MEDICO-PHARMACEUTICAL PROFESSIONAL OF EMINENCE**

Dr. Bishnupada Mukerji was a medico-pharmaceutical professional of great eminence. As to his personal characteristics, Mukerji was a man of pleasing personality. He was highly sociable by nature.<sup>1</sup> It was a treat to hear him speak. His articulative approaches used to be impressive. He was 'very methodical and regular in his habits, very prompt in attending to his letters and correspondence.' He was an able writer in English and Bengali.<sup>120</sup> 'He was an administrator who was endowed with a natural gift of clear thinking and quick decision.'<sup>7</sup> He was 'a great organiser amongst the scientists of the country keeping in view the prevailing environmental conditions and the resources available to him.'<sup>1</sup> 'He was very regular in attending meetings and liked to take active part at such meetings. As he was intimately connected with numerous organisations and was a member of a large number of Committees, Commissions, Delegations, etc., attendance at such meetings was a regular part of his daily programme throughout his life extending up to his last day.'

B. Mukerji became a crusader for the propagation of pharmacology and its allied fields. He started building on the strong base which had been prepared by his preceptor pioneer pharmacologist Professor Ram Nath Chopra. When Mukerji was called upon to preside at the Section of Physiology of the Indian Science Congress (1945), he chose to speak on scope and future of pharmacology.<sup>51</sup> In his lengthy address, he looked at the evolution and scope of

pharmacology, its status and future in India, need for improving its teaching and expansion of research in the subject, collaboration with drug industry; in fact he covered every aspect of pharmacology. He impressed upon collaborative drug research and built a case for establishing a 'National Institute for Drug Research.' What he conceptualised later took the shape of the Central Drug Research Institute at Lucknow. His most significant contribution to drug research and pharmacology during his tenure as Director, CDRI (1951-63) continues to be remembered for it. The annual Dr B. Mukerji Lecture at CDRI is sponsored by the Sachin and Sikta Pradhan Foundation, Bethesda, Maryland, U.S.A.<sup>121</sup>

B. Mukerji's contribution in building the pharmacy discipline in the country was equally significant. He was an active participant in all the major developments which took place in relation to drugs and pharmacy during later part of the colonial period and the first two decades of independent India. He guided the development of the Central Drugs Laboratory to become an effective body as an important wing of the drugs control administration. He became member of the Drugs Technical Advisory Board. Later, when the Pharmacy Act 1948 became operational, he was on the first Pharmacy Council of India constituted in 1949 and was elected to its Executive Committee and the Education Regulations Subcommittee.

B. Mukerji worked with pharmaceutical professionals at all levels, lowly compounders, qualified pharmacists, technologists and scientists. He held the position of General Secretary of the Bengal Pharmaceutical Association. He got to be actively associated with the Indian Pharmaceutical Association. His standing in the IPA was recognized in his election as the President. He also presided over the Indian Pharmaceutical Congress. He helped in the development of the official organs of the BPA and IPA.

There was no part of the pharmaceutical activity and the profession on which Dr Mukerji did not leave an enduring impact; he actively took part in the development of pharmaceutical education, drug research, drug industry, drug control administration, preparation of pharmacopoeial and related compendia, pharmaceutical fora and so on. He built for himself an impeccable set of credentials to earn a place among the preeminent pioneers of modern pharmacy in India. It was befitting that the Indian Pharmaceutical Association conferred on him the

Honorary Membership and bestowed the Squibb Award; the only other personage who got these two top IPA recognitions of the time was Sir Ram Nath Chopra.

Looking to his role in building pharmacology and pharmacy, undeniably Dr Bishnupada Mukerji stands tall as a medico-pharmaceutical professional of great merit of our land.

#### ACKNOWLEDGEMENT

The collection of source material for this publication became possible through support from the Indian National Science Academy for my research on pharmaceutical developments, which is gratefully acknowledged.

#### REFERENCES AND NOTES

1. R. N. Chakravarti, "Bishnupada Mukerji (1903-1979)," *Biographical Memoirs of Fellows of the Indian National Science Academy*, 8 (1984) 191-204.
2. Annual Reports of the Calcutta School of Tropical Medicine, Institute of Hygiene and the Carmichael Hospital for Tropical Diseases.
3. Rockefeller Archive Center, Sleepy Hollow, New York; correspondence with Charlotte L. Sturm, Senior Archivist, during September-October 2007.
4. Bentley Historical Library, the University of Michigan, Ann Arbor, Michigan. B. Mukerji and M. L. Khorana, who later became professor at the Bombay University, were known to have qualified from the University during 1930s. In my correspondence with the Library during 1996, it came to me as a rude shock when I was told that they 'did not find any information regarding Mukerji or Khorana' (letters dated 25 June and 21 November 1996). On my persistence they went deeper. Ultimately they were able to locate the appropriate website and inform me about it through letter dated 20 March 2006. Both having qualified from the university stood confirmed, relieving me of the decade-long tension on my mind. The information received is cited later (ref. 22).
5. Paul F. Hollenberg, Chair, Department of Pharmacology, University of Michigan Medical School, Ann Arbor, Michigan, *personal communications*; correspondence during March-October 2006.
6. B. Mukerji, Transcripts, Office of the Registrar, the University of Michigan, Ann Arbor, dated 13 September 2006, obtained through Professor Paul F. Hollenberg (ref. 5). In the transcript the first name appears as Bishnu Pada.
7. N. K. Datta, in guest editorial, *Pharma Times*, 11(9) (1979) 3-5.
8. Ref. 2, 1928, p 39.
9. Ref. 2, 1929, p 48.

10. Ref. 2, 1930, p 59.
11. Ref. 2, 1931, p 67.
12. Ref. 2, 1932, p 71.
13. Ref. 2, 1933, p 61.
14. "Bibliography," ref. 1, pp 198-204. This contains around 200 publications authored/coauthored by B. Mukerji. Some publications out of this list as appropriate and other which have not been included in the bibliography, are directly cited in the present biography on Dr Mukerji.
15. R. N. Chopra, J. C. Gupta and B. Mukherjee, "The Pharmacological Action of an Alkaloid from *Rauwolfia serpentina* Benth. – A Preliminary Note," *Indian Journal of Medical Research*, 21 (1933) 261-271.
16. Ref. 3. Rockefeller Foundation Collection, Record Group 10. The correspondence having been discarded, only excerpts have been saved, of which a copy was made available to me.
17. Ref. 16. It is noted that B. Mukerji arrived at Peiping on 30 December 1933. Left China for Japan in the third week of December 1934. Sailed from Yokohama by s/s President Coolidge on 4 January 1935, arriving at San Francisco on 16 January 1935.
18. *Canadian Medical Association Journal*, 61 (1949) 195; *Journal of History of Medicine*, (1950) 216-217.
19. B. Mukerji, "The Effect of Pressor Principle of the Posterior Lobe of the Pituitary Body on the Liver-fat after the Feeding of Choline Chloride," *Chinese Journal of Physiology*, 9 (1935); through ref. 1.
20. Ref. 16. Dr B. Mukerji remained at the University of Michigan for the period 24 January 1935 to 24 May 1936. The support to him through Rockefeller Foundation Fellowship for the stay continued till January 1936.
21. Ref. 16. Mukerji visited the pharmacological laboratories of the Cornell Medical School, Johns Hopkins Medical School, University of Pennsylvania Medical School, Parke Davis & Co. and Eli, Lilly and Co., and Food and Drug Administration Laboratories, etc.
22. *Proceedings of the Board of Regents* (1932-1936), University of Michigan, Annual June Meeting on 19 June 1936, p 888. Mukerji's name was listed in the Ninety-second Commencement, 20 June 1936, p 20, to receive the doctoral degree. The University records show Mukerji having earlier received the degree of B.S., University of Calcutta, M.B., *ibid*.
23. R. G. Smith and B. Mukerji, "Effects of Sodium Nitrite and Methylene Blue on Thiocyanate Formation in Cyanide Poisoning," *Journal of Pharmacology and Experimental Therapeutics (Proceedings)*, 66 (1939) 34.

24. R. G. Smith, B. Mukerji and J. Seabury, "Thiocymate Formation in Cyanide Poisoning as affected by Methylene Blue and Sodium Nitrite," *Journal of Pharmacology and Experimental Therapeutics*, 68 (1940) 351-364.
25. Ref. 5, e-mail dated 18 October 2006 from Professor Paul F. Hollenberg.
26. Ref. 5, letter dated 12 May 2006, from Professor Paul F. Hollenberg. In the letter it was also stated that 'Since that time, our department has awarded 237 additional doctoral degrees and has awarded more Ph.D. degrees in pharmacology than any other American university.'
27. Ref. 2, 1936, pp 14-15.
28. Ref. 16. Dr Mukerji sailed from Quebec on 30 May 1936 by s/s Empress of Australia.
29. Ref. 2, 1936, p 74.
30. Ref. 16. Dr Mukerji's stay in China, travel to Ann Arbor and stay there till January 1936, and journey home were covered under the Rockefeller Foundation Fellowship. No information has become available about the source of financial support for rest of the period and other travel.
31. R. N. Chopra, *Report of the Bio-Chemical Standardisation Laboratory (1937-1940)*, Government of India Press, Calcutta, 1941.
32. B. Mukerji, *Report of the Bio-Chemical Standardisation Laboratory (1940-1943)*, Government of India Press, Calcutta, 1950.
33. B. Mukerji, *Report of the Bio-Chemical Standardisation Laboratory (1943-1946)*, Government of India.
34. B. Mukerji, *Report of the Bio-Chemical Standardisation Laboratory ( 1 April 1946 to 31 January 1947)* and the *Central Drugs Laboratory (1 February 1947 to 31 March 1949)*, Government of India Press, Calcutta, 1952.
35. *Annual Report of the Central Drugs Laboratory (1949-1954)*, Government of India Press, Nasik Road, 1957.
36. Ref. 31-35. These reports became available through visits to the Central Drugs Laboratory, Calcutta; otherwise these reports are now almost inaccessible.
37. Ref. 31, p 55. Pharmacologist Dr B. Mukerji, M.B.(Cal.), M.D., D.Sc (Mich.), (GO), who looked after the Pharmacology and Bioassay Section. This and other sources of the following period of around a decade show Mukerji possessing a doctor of medicine degree. In the later documents which have become available there is no mention of M.D. against his name.
38. Ref. 32, p 1.
39. Ref. 34, pp 1-2
40. Ref. 34, pp 26-27.

41. Ref. 35, p 1.
42. Ref. 35, pp 48, 80.
43. Ref. 35, pp 135-136.
44. Ref. 33, p 3.
45. Ref. 3. Rockefeller Foundation Collection, Record Group 2—1947, series 464, Box 384, Folder 2591, a personal letter dated 11 March 1947 Dr B. Mukerji wrote to Dr John B. Grant. In this letter Dr Mukerji stated, "Together with the decision to convert the B.S. Lab., into the C.D. Lab., the Government of India have agreed to construct a building for this unit in Delhi along with the new School of Nursing. This would be located somewhere in old Delhi within a mile of the University area. Pending the movement of this laboratory to Delhi, we are located as before, partly in all India Institute building and partly in the Biology Department of the Calcutta Medical College.'
46. Ref. 31, pp 57-58; ref. 32, pp 29-31; ref. 33, pp 43-48; ref. 34, pp 24-26; ref. 35, pp 16-18.
47. Ref. 31, p 49.
48. Ref. 32, p 34.
49. Ref. 33, p 49.
50. Ref. 34, p 27.
51. B. Mukerji, "The Scope and Future of Pharmacology in India," *Calcutta Medical Journal*, 42 (1945) 50-56, 73-75, 101-107, 123-128.
52. Ref. 51, pp 123-124.
53. *Silver Jubilee Souvenir*, Central Drug Research Institute, Lucknow, 17 February 1976.
54. Ref. 53, "The Beginning," pp 1-2.
55. "Central Institute for Drug Research," *Indian Journal of Pharmacy*, 10 (1948) 112-113.
56. R. N. Chopra, in "Problems and Prospects of a Pharmacological Career in India," *Annual Review of Pharmacology*, 5 (1965) 1-8.
57. Reference 53, "Growth and Organisation," pp 3-4.
58. B. Mukerji, "Concluding Remarks on Rauwolfias in Modern Therapy," *Indian Journal of Pharmacy*, 18 (1956) 433-440.
59. B. Mukerji and J. D. Kohli, "Medicinal and Allied Uses of Synthetic Dyes, A Review," *Indian Journal of Pharmacy*, 20 (1958) 364-369.
60. B. Mukerji, "Statistical Aspects of Biological Standardisation," *Souvenir Haffkine Institute Diamond Jubilee 1899-1959*, pp 12-24.

61. R. N. Chopra, B. Mukerji and I. C. Chopra, *A Treatise on Tropical Therapeutics*, U. N. Dhir & Sons Ltd, Calcutta, Second Edition, 1950, pp xi + 705; reviewed in the *Pharmaceutical Journal*, 166 (1951) 221.
62. B. Mukerji, "Inaugural Address," Midnapore Pharmaceutical Conference, June 1949; *Indian Journal of Pharmacy*, 12 (1950) 155-157.
63. *Report of the Drugs Enquiry Committee 1930-31*, Government of India Central Publication Branch, Calcutta, 1931, pp vi + 436.
64. Ref. 63, pp 73-85.
65. H. Singh, "Drugs Enquiry Committee 1930-31," *Eastern Pharmacist*, 44 (November) (2001) 21-25.
66. H. Singh, *History of Pharmacy in India and Related Aspects, Volume 4: Mahadeva Lal Schroff and The Making of Modern Pharmacy*, Vallabh Prakashan Delhi, 2005, pp xvi + 216.
67. Ref. 66, "Bengal Pharmaceutical Association," pp 116-118.
68. H. Singh, *History of Pharmacy in India and Related Aspects, Volume 2: Pharmaceutical Education*, Vallabh Prakashan, Delhi, 1998, pp xvi + 204.
69. Ref. 68, pp 28-34.
70. Ref. 66, "United Provinces Pharmaceutical Association," pp 109-111.
71. *Indian and Eastern Chemist*, 19 (1938) 133, 161-162.
72. *Indian and Eastern Chemist*, 19 (1938) 311.
73. H. Singh, "The Indian and Eastern Druggist/Chemist," *Eastern Pharmacist*, 39 (November) (1996) 45-48.
74. *Report of the College of Pharmacy 1938-39*, Government of Bengal, Department of Local Health and Local Self Government, Bengal Government Press, Alipore, 1941.
75. *Indian Pharmacist*, 1(1) 1945-46 title page.
76. B. Mukerji, "The March of Pharmacy in India," *Indian Pharmacist*, 5 (1949-50) 306-314.
77. *Proceedings of the IPA Annual General Meeting*, 4 January 1947, item 2; *Indian Journal of Pharmacy*, 9 (1947) 40-41; also see p 3.
78. *Proceedings of the IPA Council Meeting*, 25 May 1953, item 2; *Indian Journal of Pharmacy*, 15 (1953) 329-332.
79. The Indian Pharmaceutical Congress Association was created by Professor M. L. Schroff on breaking away from the IPA. On rapprochement between the IPCA and IPA in 1954 the former was entrusted with holding of annual conferences and the latter looked after the other professional activities.

80. *Proceedings of the IPA Council Meeting*, 28 December 1953; *Indian Journal of Pharmacy*, 16 (1954) 28.
81. *Proceedings of the IPA Council Meeting*, 3 January 1955; *Indian Journal of Pharmacy*, 17 (1955) 41-43.
82. *Proceedings of the IPA Council Meeting*, 1 February 1954, item 5; *Indian Journal of Pharmacy*, 16 (1954) 28-29.
83. *Indian Journal of Pharmacy*, 10 (1948) 51.
84. *Indian Journal of Pharmacy*, 11 (1949) 48-49.
85. *Minutes of the First Meeting of the Pharmacy Council of India*, 16 May 1949, items 2 and 3.
86. "The Profession of Pharmacy in India," *Indian and Eastern Chemist*, 19 (1938) 185-187. Based on a lecture delivered by Dr B. Mukerji before the Ninth Assam Provincial Compounds' Association at Shillong.
87. B. Mukerji, "Presidential Address," U. P. Practising Pharmacists' Conference, Lucknow, *Indian Journal of Pharmacy*, 14 (1952) 199-201.
88. B. Mukerji, "President's Page: Indian Pharmacy—Problems and Prospects," *Indian Journal of Pharmacy*, 16 (1954) 2-4.
89. B. Mukerji, "President's Page: Pharmacists and Prescription Practice," *Indian Journal of Pharmacy*, 16 (1954) 89-90.
90. B. Mukerji, "Welcome Address," Indian Pharmaceutical Congress, Lucknow, *Indian Journal of Pharmacy*, 21 (1959) 73-75.
91. B. Mukerji, "The Future Pharmacy and Drugs Legislations," *Indian Journal of Pharmacy*, 7 (1945) 43-49.
92. B. Mukerji, "The Pharmaceutical Qualifications in Britain," *Indian Journal of Pharmacy, Pharmaceutical Conference Number*, 6 (1994) 47-48; also see *Indian Journal of Pharmacy*, 6 (1944) 103.
93. *Report of the Health Survey and Development Committee, Volumes I-IV*, Manager of Publications, Government of India, Delhi, 1946.
94. Ref. 93, *Volume III*, p 343. The details of the memorandum and the syllabi not given.
95. "Proceedings of the Preliminary Meeting of the Pharmaceutical Subcommittee on Pharmaceutical Education," and the "Memorandum on Pharmaceutical Education," *Indian Journal of Pharmacy*, 6 (1944) 37-39.
96. Ref. 93, *Volume III*, p 344.
97. B. Mukerji, *Indian Journal of Pharmacy*, 8 (1946) 17-24; also see *ibid.*, 9 (1947) 25-27.



98. J. C. Gupta and B. Mukerji, "The Future and Prospects of the Drug Industry in India," *Indian and Eastern Chemist*, 19 (1938) 120-122, 264-268.
99. B. Mukerji, ref. 51, p 107.
100. B. Mukerji, "Indian Drug Industry and Medical Profession," *Indian Journal of Pharmacy*, 11 (1949) 120-124.
101. *Indian Journal of Pharmacy*, 23 (1961) 261.
102. *The Indian Pharmacopoeial List 1946*, Department of Health, Government of India Press, Calcutta, 1946, pp i-ii, 182.
103. B. Mukerji, *The Indian Pharmaceutical Codex, Volume 1 – Indigenous Drugs*, Council of Scientific and Industrial Research, New Delhi, 1953, pp xii-431.
104. H. Singh, *History of Pharmacy in India and Related Aspects, Volume 1: Pharmacopoeias and Formularies*, Vallabh Prakashan, Delhi, 1994, pp 112-127.
105. B. Mukerji, "President's Page: International Pharmacopoeia and Indian Pharmacy," *Indian Journal of Pharmacy* 16 (1954) 127-128.
106. B. Mukerji, "The World Health Organization and the First International Pharmacopoeia," *Indian Journal of Pharmacy*, 13 (1951) 281-282.
107. B. Mukerji, "The International Pharmacopoeia, Vol. II," *Indian Journal of Pharmacy*, 19 (1957) 134-135.
108. *The Pharmaceutical Society of Great Britain Calendar 1954-1955*, p 10. Listed election in 1948.
109. *Proceedings of the IPA Council Meeting*, 6 August 1953, item 4; *Indian Journal of Pharmacy*, 15 (1953) 332-333.
110. *Indian Journal of Pharmacy*, 17 (1955) 102. In recognition of his contributions in the field of leucoderma research.
111. *Proceedings of the IPA Council Meeting*, 30 October 1961, item 11(ii); *Indian Journal of Pharmacy*, 23 (1961) 352-353.
112. B. Mukerji, "Presidential Address," Fourteenth Indian Pharmaceutical Congress, Puri, *Indian Journal of Pharmacy*, 24 (1962) 37-41.
113. *Indian Journal of Pharmacy*, 25 (1963) 311.
114. S. Mukerji, A. K. Banerjee, B. N. Mitra and B. Mukerji, "Chemotherapy of Cancer—Current Position and Trends," *Indian Journal of Pharmacy*, 31 (1969) 1-14.
115. *Brochure on the 190<sup>th</sup> Anniversary*, *The Asiatic Society*, Calcutta, 1974, pp 14. It included a prefatory note by Dr Mukerji.
116. *Golden Jubilee Brochure 1928-1978, Institution of Chemists (India)*, Calcutta, 1978.

117. Listed in the *Brochure of the 29<sup>th</sup> National Pharmacy Week*, Bengal Branch, Indian Pharmaceutical Association, Calcutta, 1990.
118. *Pharma Times*, 8(5) (1976) 13.
119. "Obituary," *Pharma Times*, 11(9) (1979) 5.
120. "Doyen of Indian Pharmacologists," *Pharma Times*, 11(9) (1979) 7.
121. Technical Information, Industrial Liaison & Planning Division, Central Drug Research Institute; through communication of 9 September 2008 from Dr R. C. Tripathi, Sr Assistant Director.