

Hardinge Professorship of Higher Mathematics at Calcutta University

Sabitri Ray Chaudhuri*

Retd. Faculty Member, Department of Mathematics, Basanti Devi College, Kolkata, Corresponding Address: B-12, Karaya Housing Estate, 98, Karaya Road, Kolkata-700019

(Received 09 July 2018, revised 12 August 2019)

Abstract

University of Calcutta was established in the year 1857 as an examining body by University Act of 1857. It remained so till the passing of the Universities Act of 1904. Asutosh Mookerjee after being appointed as Vice-Chancellor in 1906 tried to transform it into a teaching University. The article attempts to delineate the role played by Sir Asutosh in introducing modern mathematics and establishing the Hardinge Professorship of higher mathematics at Calcutta University. The contributions of the Hardinge Professors have also been discussed.

Key words: Asutosh Mookerjee, Calcutta University, G. Darboux, Hardinge Professor, R. M. Fréchet, W. H. Young.

1 Introduction

The Indian mathematical traditions can be traced to vedic rituals and continued up to sixteenth century CE (Seidenberg, 1983). After the decline of the Greeks, it was only in India, and to some extent China, one could find an abundance of creative and original mathematical activity for several centuries. Indian mathematics used to be held in high esteem by contemporary scholars. However, it saw a decline from the first half of the 16th century and lacked the essence of modern mathematics which was prevalent in Europe from the beginning of the 18th century. The British government in India was in favour of introducing western science in education. Three Universities viz. Calcutta, Bombay and Madras were established in 1857 with the patronage of the government. The aim of the British was not the encouragement of intellectual activity rather than to produce a sizeable group of Indian

“civil servants” to help the British in running the administration. This system of education had no room for independent thinkers who might dedicate themselves to scientific researches. The British had no wish to entertain any challenge to their authority which independent thinkers might well have made.

The educational atmosphere was not conducive to a really challenging academic career. Fortunately intellectual giants like Raja Rammohun Roy, Pandit Ishwar Chandra Vidyasagar, Maharshi Debendra Nath Tagore, Sir Asutosh Mookerjee and many others were in favour of a more sophisticated mode of instruction which would help in broadening the horizon of the mind. Sir Asutosh carried forward this ideal and was first to propose the idea that the University should be a centre of intellectual activity, of research and teaching of high quality at all levels.

The main interest of Sir Asutosh Mookerjee was in the field of Pure mathematics. He published nearly twenty original papers of high quality in the *Journal of the Asiatic Society of Bengal*, the *Messenger of Mathematics* and the quarterly *Journal of Pure and Applied Mathematics* dur-

ing 1880–1890. He obtained geometrical interpretation of French mathematician Monge's differential equation which renowned mathematicians like Sylvester and Lieut. Col. Cunningham had failed to achieve. No wonder a person like Asutosh, so passionately devoted to mathematics, will whole heartedly work for the all-round progress of mathematics in the University of Calcutta after being appointed as the Vice-Chancellor from 1906–1914 for four consecutive terms and from 1921–1923.

2 Development of infrastructure of the Calcutta University

Asutosh Mookerjee after being appointed as Vice-Chancellor of the University in 1906 took the task of transforming the Calcutta University from a merely examining body to a teaching University. His effort can be classified into the four areas: (i) instructions to post-graduate students by University lecturers which were delivered by professors of affiliated colleges earlier. (ii) University-chairs to be adorned by distinguished professors. (iii) appointment of regular and fulltime University professors, readers and lecturers. The huge endowments from Sir Taraknath Palit and Sir Rashbehary Ghosh helped Sir Asutosh to establish the University College of Science and Technology. (iv) prior to 1917, arrangements for MA and MSc teaching existed in Calcutta University and partially in Presidency College and Scottish Church College. But due to the adoption of the new scheme of post-graduate teaching in 1917, post-graduate teaching in Calcutta became centralized under the control of the Calcutta University. Moreover post-graduate departments of arts and science were founded.

Along with faculties of other departments, in 1907, C. Little, Professor of mathematics, Presidency College, was appointed as University lecturer in mathematics. C. E. Cullis (1884?–1954), renowned mathematician was appointed University reader in Mathematics in 1909. In 1911, Syamadas Mukherjee (1866–1937) and D. N. Mullick (1866–1941), both professors of Presidency College, were appointed University lecturers in Mathematics. In the same year, i.e. in 1911, Babu Phanindralal Ganguli and Babu Indubhusan Brahmachari were appointed University lecturers in mathematics. In 1912, Haridas Bagchi (1888–1968) was appointed University lecturer in mathe-

atics.

On 11th August 1906, mathematics was divided into two branches, Pure and Applied mathematics.¹ Ganesh Prasad, a distinguished mathematician and a graduate of the Universities of Calcutta, Allahabad and Göttingen was the first appointee of the Chair of Rashbehary Ghose Professor of applied mathematics.

On July 27, 1912, Sir Asutosh Mookerjee gave an account of the Post-graduate teaching in the pure mathematics department. He stated:

Finally, in Pure Mathematics, we have four Lecturers of considerable distinction, Dr. Syamadas Mookerjee, Babu Indubhusan Brahmachari, Babu Phanindralal Ganguli and Dr. Haridas Bagchi. In Pure Mathematics, we have in the Fifth-year class, more than 90 students. I venture to express the hope that the University may now rightly be called a teaching University, teaching not merely through its affiliated colleges but directly through the agency of Lecturers appointed and maintained by the University.²

3 Contribution of Sir Asutosh in creating Chair Professorships

In an effort to establish Calcutta University as a foremost seat of learning, Sir Asutosh initiated the establishment of Chair-Professorships. He was successful in creating seventeen Chair-Professorships. They were: (i) Minto Professor of economics founded in 1908. It was named after Lord Minto, the Chancellor. A substantial government grant aided the maintenance of the Chair. (ii) Sir Asutosh utilized each and every opportunity to found Chair-Professorship. The visit of King-Emperor George V during 1911–1912 offered him the cherished opportunity. He persuaded Lord Hardinge, Viceroy of India, to create two Chairs for the University of Calcutta and with the consent of the Governor-General in Council (a) George V Professor of mental and moral science and (b) Hardinge Professor of higher mathematics were founded. The Government placed adequate funds for their maintenance at the disposal of the University. (iii) Sir Asutosh also created a Chair of Carmichael Professor of ancient Indian history

¹University of Calcutta, New regulations, Chapter XI.

²Minutes of the Senate, University of Calcutta, July 27, 1912.

and culture. The maintenance of the Chair was done out of the sale proceeds of certain Sanskrit publications of this University. (iv) The famous jurist Sir Taraknath Palit made an endowment to the University amounting to fourteen lakhs of rupees including his own dwelling house in June 1912 and 14 October 1912 for advancement of science and technology. Sir Asutosh created (a) Palit Professor of chemistry and (b) Palit Professor of physics with the princely donation (v) Sir Rashbehary Ghose, a distinguished jurist made an endowment of twenty one lakhs forty three thousand rupees for founding post-graduate teaching and research departments of Science and Technology on 8 August 1913 and 27 December 1919. In keeping with the conditions stipulated by Rashbehary Ghose, Sir Asutosh founded six Chair-Professorships as Rashbehary Ghose Professor of (a) applied mathematics (b) chemistry (c) physics (d) botany (e) applied chemistry (f) applied physics (vi) Kumar Guruprasad Singh, the Raja of Khaira made a princely donation to the University of Calcutta. Sir Asutosh proposed a scheme to utilize the gift for the advancement of Post-Graduate teaching and research. The scheme was adopted by Senate on 6 August 1921. As per the scheme of Sir Asutosh five Chair-Professorships created were Guruprasad Singh Professor of (a) Indian linguists and phonetics (b) physics (c) chemistry (d) agriculture, and (e) Bagiswari Professor of Indian fine arts.

4 Establishment of Hardinge Professorship

It was the pragmatic and farsighted vision of Sir Asutosh which led to creation of George V Professor of mental and moral science and Hardinge Professor of higher mathematics. Sir Asutosh was astute enough realize this dream during the proposed visit of King-Emperor George V and Queen-Empress Mary to India during 1911 to 1912.³ He hurriedly proposed to a high ranking government personnel to create two Chairs of Professorship on 8th February 1912 to make the visit memorable. According to his suggestion, one Chair to be named after George V be called Regius Professor of Indian history and antiquities and the other as the Hardinge Professor of higher mathematics.

In no time his plan proved to be successful. On 14th

February 1912 within six days, his much cherished reply arrived in the form of a letter which is given below:⁴

Government House, Calcutta,
14th Feb, 1912.

My Dear Sir Asutosh,

Please refer to your letter, dated the 8th February, in which you made a proposal that the University should have a Regius Professor of Indian History and Antiquities and a Hardinge Professor of Mathematics. On looking up the University Regulations I find that what is required is that the Senate should found these Professorships and obtain the consent of the Governor-General in Council. If therefore you will take the matter up with the Senate and make official proposals on the subject, I fancy the matter will go through without any difficulty and the Viceroy might be able to make an announcement about it at convocation, but you ought to take the matter up without delay.

Yours sincerely
Sd. J.H.Du. Boulay

P.S. I understand that the Education Department would support the proposal and probably funds could be promised for the Professorships for the next five years but that point must be definitely settled when the proposals of the Senate came up for consideration through the proper channel.

Sir Asutosh was waiting for such a proposal and lost no time in sending formal proposal. Sir Asutosh placed that important letter in the Syndicate meeting of 16th February 1912. It recommended to Senate that: (i) to commemorate the visit of their Imperial Majesties, two Professorships be founded, one for Indian history and antiquities and the other for mathematics. (ii) first Professorship be associated with the name of His Imperial Majesty the King-Emperor and called the Regius Professorship of Indian history and antiquities. (iii) second Professorship be associated with the name of His Excellency the Chancellor of the University and called the Hardinge Professorship of mathematics. (iv) salary of each Professor be fixed at Rs 12,000/- a year and that the first incumbent of each

³Calendar, University of Calcutta, for the year 1917, Part I, pp 70, List of Hardinge Professors, 1st and 2nd line.

⁴Feb 16, 1912, University of Calcutta, minutes of the Syndicate meeting for the year 1912, part I, pp 321, resolution No. 880.

chair to hold office for a term of five years. (v) an application be made to the Governor-General in Council to sanction the foundation of these Professorships and to place at the disposal of the University adequate funds for their maintenance. The motion was unanimously adopted.⁵ The Senate also approved the proposal.

Sir Asutosh Mookerjee observed that His Excellency the Chancellor, being himself a distinguished graduate in mathematics, it appeared especially appropriate that the Chair be founded in his name and should be associated with mathematics. Being pragmatic, he realized that nobody would dare object to the idea of a Professorship in the name of the Viceroy. He provided some other reasons also for selection of mathematics in preference to other branches of science. He pleaded that this discipline formed a kind of basis and supporting framework for every branch of physical science and also did not require establishment and constant up-keeping of an expensive laboratory. In other science disciplines huge amount of money was required to establish and run laboratories. Syndicate and Senate resolved that in addition to a salary of Rs 12,000/- per annum, the first Hardinge Professor should be granted house rent allowance of Rs 3000/-. A sum of GBP 20 was ordered to be paid to G. Thibaut (the then Registrar, University of Calcutta) by the Syndicate as travelling expense for interviewing candidates in Europe for Hardinge Professorship of mathematics.

The Syndicate minute of 1912 recommended R. M. Fréchet as Hardinge Professor for a period of three years on a salary of Rs 12,000/- a year plus Rs 3,000/- as house allowance and A R Forsyth as Reader for 1912–13 and the subject of his lectures be “The Theory of Functions of two complex variables”. The recommendation of the Syndicate was approved by the Senate. Sir Asutosh dwelt at length in the Senate meeting of Nov 30, 1912 (part VII, p. 2348) how he found R. M. Fréchet (René Maurice Fréchet) (1878–1973) after contacting mathematicians of four different countries in Europe, namely England, France, Germany and Italy. Sir Joseph Larmour informed that any English mathematician would hardly be willing to come out to India, on the terms the University was in a position to offer which was confirmed by personal enquiries made in England in August and September last by G. Thibaut, the

Charmichael Professor of ancient Indian history and civilization. Enquiries made by G. Thibaut in Germany and Italy also led to no practical result. Fortunately Fréchet a French mathematician recommended by Professor G. Darboux accepted the offer. The Governor-General in Council also approved three new posts in mathematics, mental and moral science and ancient Indian history and civilization.

The Syndicate and Senate recorded the appointment of G. Thibaut and M. Fréchet to the Charmichael Chair of ancient Indian history and civilization and Hardinge Chair of higher mathematics respectively through resolution no. 138 dated January 11, 1913. The senate defined the duties of Hardinge Professor as (i) to devote themselves to research and literary work in their respective branches of study and to publish from time to time the result of their labours – in cases where that may appear convenient, under the immediate auspices of the University and to deliver lectures in their branches of study and (ii) to guide and superintend the attempts at original work made by the advanced students.

But unfortunately Fréchet declined to accept the professorship and expressed his inability to come out for a period longer than one year.

Sir Asutosh also placed a letter received from A. R. Forsyth, FRS in the syndicate meeting of June 14, 1913 stating that W. H. Young, MA, DSc, FRS (lecturer in Higher Analysis at the University of Liverpool and sometime Fellow of Peterhouse, Cambridge) who was also the author of a treaties on the Theory of sets of Points was willing to accept the Professorship on certain terms. The syndicate recommended to the senate that Young be appointed Hardinge Professor for a term of 3 years on a salary of Rs 12,000/- plus house allowance of Rs 3,000/- or Rs 15,000/- a year.

Young (1863–1942) joined in August 1913 and subsequently the Senate and the Syndicate entrusted him with the responsibility of gathering first-hand knowledge of the development of mathematics—pure and applied; physics and cognate branches of knowledge in the chief universities of Europe. Babu Mahendranath Ray moved this resolution in the Senate meeting of 28th March 1914 which was seconded by Babu Birajmohan Majumdar. Besides Europe, Young visited U.S.A., Japan and China. Having completed his tour Dr. Young submitted his report and Calcutta University set to get it printed for circulation.

⁵University of Calcutta, Minutes for the year 1912, Part I, pp 382, resolution No. 1010, February 24, 1912.

Table 1 List of Hardinge Professors of higher mathematics.

Year	Name
1913–1916	W. H. Young, MA, DSc, FRS
1917–1920 and 1920–1922	C. E. Cullis, MA, PhD, DSc ^a
1923–1935	Ganesh Prasad, MA, DSc
1935–1948	Friedrich William Levi, D Phi Nat
1951–1953	Haridas Bagchi, MA, PhD, FNASc.
1954–1960	Rabindranath Sen, MA, PhD, FNI
1973–1978 ^b	M. C. Chaki, MA, D Phil (PhD)
1979–2002	Jyoti Das, MSc (Cal), D Phil (Oxon) ^c

^a Cullis was made Emeritus Professor of Mathematics after retirement from the University.

^b Hardinge Professorship was renamed Asutosh Birth Centenary Professorship from the year 1973.

^c Nobody has succeeded Dr. Jyoti Das as Asutosh Birth Centenary Professor till date.

By the time galley proof was ready, Professor Young resigned from Calcutta University to accept an assignment in the University of Wales. The proof was sent to him but the matter was not further pursued. Anyway, after an excruciatingly long delay, Professor P. K. Bose, the Pro-Vice Chancellor of Calcutta University brought it back in 1974. The report is regarded as a tremendous important landmark in the field of mathematics in India.

5 Hardinge professors and their contributions

The uniqueness of the Hardinge Professorship lies in the fact that Chair-Professorship was created in the name of a person and sustained with the help of the endowment made by the person or his family, e.g. Palit and Rashbehary Ghose Professorship. However Hardinge Professorship was created in the name of Viceroy Lord Hardinge with the financial help of Government of India. The tireless efforts of Sir Asutosh helped to crystallize the entire project. The list of Hardinge Professors and their tenures is given in Table 1 (Calendar 1958, Part I, University of Calcutta).

W. H. Young (1863–1942)

Young made fundamental contribution in real analysis (Hardy, 1942). He, working independently developed a general theory of integration which was essentially equivalent to H Lebesgue's. Having discovered the similarity, he recasted his theory. Young made wonderful contribution to the theory of Fourier series (and other special orthogonal series) and the elementary differential calculus of functions of several variables. He dealt at length on the theory of the sets of points. He made noteworthy contribution towards finding the area of surfaces, a problem of notorious difficulty. He authored three books and published more than 200 papers.

C. E. Cullis (1884?–1954)

Cullis made outstanding contribution in the field of Algebra (Majumder, 1995, pp. 476–477). He authored two volumes of books on matrices and determinoids which were published by the Cambridge University Press in 1913 and 1918. Out of his 12 research papers published in *Bulletin of Calcutta Mathematical Society* during the period 1909–1923, four were related to Möbius space and the remaining eight to matrix. After retirement he was engaged with theory of numbers.

Ganesh Prasad (1876–1935)

Prasad wrote about fifty research papers on different branches of mathematics which were published in various Indian and foreign journals (Kapur, 1983, pp. 6–8). He authored 11 books of which *A treatise on spherical harmonics and functions of Bessel and Lamé* is treated as a classic. He did distinguished research work on the theory of potentials, theory of functions of a real variable, Fourier series, theory of surfaces etc. Prasad is also well-known for his work on the history of mathematics. Prasad deserves credit for inspiring his students B. B. Datta and A. N. Singh to undertake research in ancient and medieval Indian mathematics. They co-authored the book *History of Hindu Mathematics (Part I and Part II)* which garnered wide respect and recognition. B. B. Datta also wrote a remarkable book *Science of Sulva*. Ganesh Prasad's remarkable paper on 'On the zeros of Weierstrass's non-differentiable function' inspired Bholanath Mukhopadhyay, Santosh Kumar Bhar and many others to study the zeros of different types of non-differentiable functions.

Levi (1887–1966)

Levi introduced Indians to modern algebra (Banerjee, 1957, pp. 211–318). He played a vital role in the introduction of algebra in university syllabi all over India. His published lectures at the University of Calcutta on Fundamentals of analysis (1939) and Finite geometrical systems (1942) are of utmost importance to persons having interest in the subject.

Haridas Bagchi (1888–1968)

Bagchi was essentially a geometer (Mukherji and Bhattacharjee, 2014, pp. 52–53). He concentrated his research mainly on plane curves, surfaces and bi-circular quartic. His contribution in the areas of special functions, theory of functions and infinite series is noteworthy. His research scholar Prafulla Prasun Chatterjee served Calcutta University as a Professor in applied mathematics.

Rabindranath Sen (1896–1974)

Sen has made important and valuable contribution to the domain of geometry (Chaki, 1979, pp. 37–41). He was engaged mainly with Differential Geometry of Riemannian and Finsler space. His investigation on the behaviour of an arbitrary parallel displacement in a metric space resulted in the discovery in 1949–50, of an algebraic system of affine connections in which the Levi-Civita parallelism could be identified. This work is referred to by IMH Etherington of Edinburgh University as “Senian Geometry”. He introduced the concept of telleparallelism. A large number of students obtained PhD degree under his supervision. His student Hrishikesh Sen became a faculty member of Burdwan University. He carried out research work in several directions in Riemannian Geometry. Chaki, his celebrated student, enriched various branches of geometry by his valuable inputs. He introduced new structure on Riemannian manifold and their applications. The outstanding contributions of Hirendra Mohan Sengupta (1902–1960) in the ‘*Quarterly Journal of Mathematics*’ attracted the attention of R N Sen and who persuaded Sengupta to join the department of Pure mathematics. Sengupta built a school of mathematical analysis in the department.

Manindra Chandra Chaki (1913–2007)

Chaki was an outstanding geometer (Majumder, 1995, pp. 423–425). It may be noted that apart from geometry, he was adept at various other subjects too. His research works in classical and modern differential geometry, general relativity, cosmology, statistics, mathematical biology, mathematical anthropology, pedagogic mathematics, history of mathematics and material science are noteworthy. He got us acquainted with the notion of pseudo-symmetric manifolds. This manifold has been termed Chaki (PS)_n by Toomannian and is now mentioned in mathematical literature as Chaki Manifold. Chaki inspired a large number of students to pursue doctoral degree. Bandana Barua was the first woman to receive PhD degree in pure mathematics (geometry) from Calcutta University under him. Bandana Barua, Manjusha Majumdar and Dipak Ghosh joined Calcutta University while Ashok Kumar Ray Jadavpur University. U. C. De one of his students was appointed Emeritus Professor of the Calcutta University.

Jyoti Das (1937–2015)

Das has done valuable research work on Eigenfunction expansions (Mukherji and Bhattacharjee, 2014, pp. 108–111). Her joint paper with W. N. Everitt entitled “On the square of a formally self-adjoint differential expression” published in 1969, opened up a new avenue for hundreds of researchers. The paper provided the vital clue necessary for the study of iterated second-order linear differential operators. In 1989, she utilized coordinate geometry to establish Weyl’s limit classification of second-order ordinary differential equations. Das developed some new methods for solving ordinary differential equations. She generalized Leibnitz’s rule, Rolle’s theorem etc. to show the importance of research at elementary level. She also generalized Brahmagupta’s triangle as a tribute to him on his 1500th Birth Anniversary. She authored two books namely, *Ordinary Differential Equations* and *Analytical Geometry*. Apart from being a great teacher, she was an outstanding research guide. At least nine scholars were awarded PhD degree under her supervision. Notable amongst her research scholars are Krishna Kumar (Calicut University), Jayasree Sett (Calcutta University), Gopinath Laha (Gurudas College) and Late Monju Majumdar (Midnapore Women’s College). They

carried out research work in the field of boundary value problem (BVP) associated with ordinary differential equation. SMH Islam conducted research work in the area of some partial differential equations and their geometrical interpretations. Sharmistha Sen made significant contributions in the field of some special functions associated with hypergeometric differential equations.

6 Conclusion

Introduction of modern mathematics opened a new horizon in the structure and study of mathematics at Calcutta University and Calcutta in general. Sir Asutosh Mookerjee converted the university from an examining body to a teaching university. During his tenure as the Vice-Chancellor, post-graduate teaching became centralised under the control of the University and post-graduate departments in arts and science were formed. Full-time regular university professors, readers and lecturers were appointed which was non-existent earlier. The seventeen newly Chair-Professorships specially the holders of Hardinge Professor of higher mathematics took university to new heights. Their contributions enriched mathematical research in Calcutta University and their scholastic endeavours added an element of dynamism to the field of research.

Acknowledgement

The author expresses her heartfelt gratitude to the learned referee for his valuable suggestions for the improvement of the paper. She is also extremely thankful to late Jyoti Das of Calcutta University and Pradip Kumar Majumdar of Rabindra Bharati University for their guidance in the preparation of the present paper.

Bibliography

- [1] Banerjee, Pramathanath and Ray, Nihar Ranjan. *Hundred Years of the University of Calcutta*, Calcutta University Press, Calcutta, 1957.
- [2] Chaki, M. C. Rabindranath Sen (1896–1974), *Biographical memoirs of fellows of the Indian National Science Academy*, 6 (1979): 37–41.
- [3] Hardy, G. H. William Henry Young, *Journal of London Mathematical Society*, 17(1942): 218–237.
- [4] Kapur, J. N. *Some Eminent Indian Mathematicians of the 20th century*, Vol. I, Mathematical Science Trust Society, New Delhi, 1983.
- [5] Majumder, Pradip Kumar. *Ganit Shastre Smaraniya Janra*, The Asiatic Society, Calcutta, 1995.
- [6] Mukherji Purabi and Bhattacharjee, Mala. *Pioneer Mathematicians of Calcutta University*, University of Calcutta, 2014.
- [7] Raghavan Narasimahan: *The Coming of Age of Mathematics in India, Bhāvanā*, 1.1 (2017): 246.
- [8] Seidenberg, A. The Geometry of Vedic Rituals, In: F. Staal (Ed.), *Agni: The Vedic Ritual of the Fire Altar*, Vol. II, Asian Humanities Press, Berkeley, 1983, reprinted Motilal Banarasidass, Delhi.