

Prof. J. Medhi : the ‘Gyan-Yogi’ par excellence



Professor Jyotiprasad Medhi

by

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Prof. Jyotiprasad Medhi, popularly known as Prof. J. Medhi world over, passed away for his heavenly abode on 3rd February, 2017. Many people of Assam do not know about the contributions Prof. Medhi made towards the world of Mathematics in particular and knowledge in general and the respect he commanded all over the academic world. In this article, I have tried my best to give a glimpse of this really great scholar from Assam to the readers of this paper.

In one of the slokas of *Aitareya Brahmana* it is said :

***“Charanvai madhu vindati, charantsvadu mudumbaram
Suryashya pashya shremanam, yo na tandrayate charan,
Charaivati, charaivati ”***

The meaning of the above Sanskrit sloka is : (Bees) Find honey on wandering, (Birds) find Udumbara fruit (a tasty fruit) on moving. Look at the eminence of the Sun, who (Sun) never sleeps and keeps on moving. Move on, Move on.

Probably Prof. Medhi followed this rich Indian philosophy throughout his life and so had attained a position which very few of his contemporary Indians reached in the field of Mathematics and Statistics. He was born to a culturally rich family of Ramdia Village in Kamrup district of Assam in 1924. His father Binandi Chandra Medhi who got his Law degree from Calcutta University, joined the Law profession and shifted to Dibrugarh, a prominent place in upper Assam. So, Professor Medhi spent his childhood in Dibrugarh. His mother Kadambari

Medhi, though did not have any formal degree, yet, she was a worthy daughter of Rai Bahadur Kaliram Medhi, one of the first few Assamese officers of the Assam Civil Service who is better known for his contributions to Assamese language and literature.

Professor Medhi had a very brilliant academic career since his childhood and he completed his Master's degree in Pure Mathematics from Calcutta University with two gold medals : one for securing first position and the second for securing record marks. In 1948, he joined Cotton College of Guwahati, Assam as Lecturer in Mathematics for a very brief period because he was inducted to the Mathematics and Statistics department of Gauhati University in 1949. In 1952, driven by the passion for higher studies Prof. Medhi went to U.K and joined the Manchester University for a MS degree in Statistics (by Thesis) where he worked under the supervision of Prof. M. S. Barlett on Time Series Analysis.

Prof. Medhi's maiden research article '*On the efficiency of procedures for smoothing periodogram from time series with continuous spectra*' which he wrote with Prof. Barlett and which was published in Biometrika (London) in 1955 had far reaching consequences which can be seen from the tributary paper written by Prof. T. Subba Rao, the first Ph.D scholar of Prof. Medhi at Gauhati University and a former Professor Emeritus at Manchester University, UK in a special issue of *Assam Statistical Review*, a research journal in Statistics published by Dibrugarh University as a mark of respect to Prof. Medhi in 1991.

Prof. T. Subba Rao wrote :

"..... when I discussed with Prof. Medhi for a possible topic for research, he suggested to me then that I should look into spectral analysis of time series to which he introduced me and which was considered at that time (during 1960s) to be the most advanced and useful (with potential applications for engineering and meteorology etc.). In fact many of the chapters of my Ph.D thesis submitted to the University of Gauhati (1966) were on spectral estimation ; a subject on which I am still working nearly for 50 years. I choose this topic as a tribute to Professor Medhi..... "

After completing his MS degree from Manchester University, UK, Prof. Medhi joined University of Paris for a Doctorate degree. As he was required to defend his thesis in French, Prof. Medhi had taken a diploma course in French, simultaneously with his Doctoral Programme and passed the '*Diplome de Langue Francaise*' with '*mention honorable*' in 1955. Prof. Medhi pursued his Doctoral programme under the guidance of Prof. R. Fortet. In 1956, the University of Paris conferred the degree of Dr-es-Sc (D.Sc) on him with mention '*Tres-Honorable*'. During his stay in France Prof. Medhi had the good fortune of meeting intellectual giants like Emile Borel, Maurice Frechet and Jacques Hadmard.

In 1956, Prof. Medhi came back to Assam and joined the Department of Statistics at the Gauhati University as a Lecturer. In the same year he was promoted to the post of a Reader and

in 1963 he became a Professor and Head of the same department. He continued his service in the same post till his retirement in 1985. During 1979 to 1985 he was also the Director of the Population Research Centre, Gauhati University and was the Dean, Faculty of Science of Gauhati University from 1972 to 1975. During the period from 1956 to 1985, Prof. Medhi guided ten research scholars for their Ph.D degree in diverse fields like *Time Series Analysis, Univariate and Multivariate distributions, Stochastic Processes, Econometrics, Demography, Operations Research, Optimization Theory and Mathematical Logic*; wrote around fifty research papers most of which were widely acclaimed throughout the world; visited University of Montreal, Canada (1967-1969); McMaster University, Canada (1984,1993); University of Wisconsin, USA (1985) and University of Toronto, Canada (1982, 1987) in different capacities of Visiting Professor / Scientist / Fellow, apart from writing several books some of which are now considered to be ‘classic’ all over the world. During the period of 1956 to 1995 he completed five long term projects in the capacity of Director which were sponsored by the DST, Govt. of India.

After his retirement in 1985, he became the Director of *Institute of Advanced Study in Science and Technology*, Guwahati (1985-1987); Chairman, *Assam State Selection Board* (1985-1990); Chairman, *Education Reforms Commission*, Assam (1993-1995). He was also closely associated with the IIT, Guwahati from the time of its inception.

Prof. Medhi is a life member of the *Institute of Mathematical Statistics, USA* since 1963. He was the President of *Indian Science Congress Association* (Statistics Section) in 1978-79; President, *Assam Science Society* in 1979-81; Vice President, *Indian Society of Probability and Statistics* in 1981-82 and President, *Indian Society of Probability and Statistics* in 1992-94.

Gauhati University, Assam conferred on him the title of *Professor Emeritus* in 1987. Professor Medhi was awarded *D.Sc degree (Honoris Causa)* by Dibrugarh University, Assam in 1997, by Central University, Tezpur, Assam in 2001 and by IIT, Guwahati in 2014.

On many occasions Prof. Medhi acted as nominated member and advisor for various bodies such as *UGC, UPSC* and other Institutes and Departments under the Government of India.

Prof. J. Medhi remained actively engaged in research throughout his life making significant contributions. In fact, his publications placed Gauhati University on the ‘*academic world map*’ of research in different branches of Statistics. Prof. K. R. Parthasarathy, an emeritus Distinguished Scientist of ISI, Delhi in one of his papers entitled “*Some highlights on the work in probability theory in India during 1980-2008 : A report*” published in *Current Trends in Science* wrote- “*A considerable amount of research in applied probability have been going on in the universities and IITs..... . Some major centres of such activity have been the groups around Professor J. Medhi in Guwahati,*”. He was one of the pioneer researchers on the problems of *estimation of spectral density function of time series*. Another research field where Prof. Medhi’s contributed immensely is *Probability Distributions*. His research in this field led some

common distributions to their extended form and many of his derivations were recognized as simpler alternative approaches.

Another research field where he stamped his authority through his seminal research papers is *stochastic process in queueing*. The results he obtained in this field are of immense practical importance, mainly because of the potential applications in computer, communication system, transportation and industrial processes. The research he did particularly in this field attracted the attention of scholars from very prestigious universities abroad. The doctoral thesis of a scholar from MIT and another from University of Toronto leaned heavily on his works. In a research paper entitled “*A Diffusion Model for Packet Travel Time in a Random Multi-Hop Medium*” on Computer Communication Networks which was published in ACM Journal, Vol. 2, No. 3, pp 111-128, 2006, Prof. Erol Gelenbe of Imperial college, London wrote “....*We represent the distance of the packet to the destination by a Brownian motion [Einstein 1926; Medhi 1991].....*”. Citation of Prof. Medhi’s name in the same bracket along with Einstein indeed highlights Prof. Medhi’s stature as a researcher of highest caliber. In another research paper entitled “*The Bulk Service Queue with a General Control Strategy : Theoretical Analysis and a New Computational Procedure*” written by Prof. W. B. Powell of Princeton University and Prof. P. Humblet of MIT, USA, the authors cited 5 (five) papers of Prof. Medhi and his co-workers out of a total of 16 (sixteen) papers in the reference section. Apart from these fields Prof. Medhi wrote research papers on problems of *Meteorology and Hydrology, Demography, Econometrics* etc.

Apart from producing high level research papers, Prof. Medhi wrote six books, five of which are in English and one in his mother tongue Assamese. His last book ‘*Introduction to Queueing Systems and Applications*’ was published by New Age International in 2014 when he was completing his 90 years of life ! All the earlier four books written in English were widely appreciated by many experts of the subject all over the world. A very few of which are given below :

Prof. Medhi’s first book *Stochastic Processes* published in 1982 jointly by John Wiley & Sons, New York and their subsidiary Wiley Eastern Ltd., New Delhi, had been widely used as a text book for graduate, postgraduate and research level courses in a number of countries including USA, Britain, Canada etc. following the appearance of its review in *American Mathematical Monthly*, December 1982. In the said review Prof. Theodore A. Vessey, an expert in Probability theory and Stochastic Processes from USA wrote--

“.....*Of the dozen or more texts published in the last five years aimed at the students with the background of first course of probability and statistics but not yet to measure theory, this is the clear choice. An extremely well organized, lucidly written text with numerous problems, examples and references. The emphasis is on Markov process with applications.....*”.

Prof. Marcel F. Neuts from University of Arizona, USA wrote--

“..... Professor Medhi is to be commended on this impressive book. Professor Medhi’s book belongs to the desk, rather than on shelf, of every person who uses probability models in his or her job.....”.

Prof. H. C. Tijms and Prof. J. W. Hogenkamp from Vrije University, Amsterdam, in a research paper entitled *Probability Models and Statistics : A Medhi Festschrift* wrote--

“..... It is a pleasure to have this chance of paying tribute to Professor Medhi. He has made many important contributions to the field of applied probability and stimulated others to study this field by writing a nice book on Stochastic Processes.....”.

The book have enjoyed more than 30 years of unabated popularity. The revised and enlarged second edition was published in 1994 and the third edition was published in 2010. About the second edition of the book Prof. Jim Freeman wrote in the *Journal of the Operations Research Society, U.K* (1996)- *“As before, it rightly deserves to be ‘nominated’ as the first choice”*. In the review of the third edition of the book Professor Susan Pitts of University of Cambridge wrote in the *Journal of American Statistical Associations*, (Vol. 106, 223-4, Sept. 2011) -

“... The book is attractive and nicely presented.....

A key helpful feature of the book is the large number of worked examples and exercises. In addition, there are indications, with some references, of the existence and importance of further topics beyond the scope of the book.

..... the improvements and changes in the third edition mean that this book will be more useful to practitioners and those in applied fields and that it will maintain its appeal and attractiveness for these readers”.

It is noteworthy to mention that the fourth edition of this book was published just few days before the death of this great scholar.

About Prof. Medhi’s second book *Bulk Queueing Models* published in 1984 by Wiley Eastern Ltd., New Delhi, Prof. D. Bertsimas (MIT) and Prof. X. Papacostantinou wrote in a paper in *Transportation Science* 22(1988), 125-138 as

“... the two relevant books (on Bulk Queues) by Chaudhury and Templeton and Medhi not only trace exhaustively the development of the various subjects but give also a meticulous and as far as possible, unified account of the complexities and niceties of structures and the potentialities of implementing them in practice.... ”.

About his third book *Stochastic Models in Queueing theory* published in 1991 by Academic Press, Prof. J. L. Madrigal of Brigham Young University, USA wrote in *The Statistician*, (UK) Vol. 43, No.2, 1994 : Journal of the Royal Statistical Society, UK, Series D as:

“.....The author did a fine job in writing a book that is very readable for anyone with a background in advanced calculus and applied probability.....”

In this book the author goes a little further in the derivation of results. This is something that will indeed be very much appreciated by readers.....

In each chapter a very comprehensive list of references up to 1989 is given. This is supplemented with an excellent selection of problems. In addition, complementary notes about the material being discussed are included. I found these notes very useful and informative. In particular, inclusion of these notes on the problems is excellent because they provide the reader with opportunity to gain a more complete understanding of issues related to the problem in hand. In summary, this book is excellent for the intended audience ”.

In a personal letter to Prof. Medhi, the Principal staff Engineer, Advanced Technology for Cellular Radio, Motorola Inc. USA Mr. Patrick L. Relly wrote-

“... I plan to offer a seminar-in-house to our Engineers using this book.....”

A second edition of his book *Stochastic Models in Queueing theory* was published in 2003 by the Academic Press, Inc., USA.

In a personal communication (23 November 2003) Dr. L. D. Servi of Lincoln Laboratories, MIT, USA complimented Prof. Medhi as follows :

“.....My library just got the second edition of your Stochastic Model book. I have not seen the first edition, so this edition was a treat..... ”

About Prof. Medhi's fourth book *Statistical Methods : An introductory text* which was published in 1992 by Wiley Eastern Ltd., New Delhi, Prof. Philip Sedgwick of St. George's Hospital Medical School, London wrote in *The Statistician*, (UK) Vol. 45, No.3, 1996 : Journal of the Royal Statistical Society, UK, Series D as :

“.....This text is designed for degree level students of India. However, I imagine that it could still play a useful role for those in Britain as well. Although the author says that it is mainly geared as an introductory text for those studying the social sciences and economics, individuals from other disciplines would, no doubt, still find it as a general reference..... Indeed it is a useful addition to my library, having already referred to it often”.

Prof. Medhi's fifth book *Ek Dui Jog Biyog* written in Assamese was published by his wife Mrs. P. Medhi for B. K. Prakashan, Guwahati contains origins of the concepts of graph theory, combinatorics, algorithmic processes etc. in a very interesting manner.

About his last book '*Introduction to Queueing Systems and Applications*' which was published by New Age International in 2014 Prof. Myron Hlynka of University of Windsor, Canada wrote-

" A book like this is only possible from someone with a clear overview and love of queueing and a thorough knowledge of the entire literature in the field. I cannot think of anyone more capable of such a task than Jyotiprasad Medhi. He has succeeded admirably in his goal. This book is highly recommended. "

Prof. Medhi's creative brain was still at work before he got hospitalized on last 18th January, 2017. About his research paper entitled "*Success runs in symmetric Bernouli Process*" which was published in the *Missouri Journal of Mathematical Sciences, USA, Vol. 25, issue 2. Pp 215-219* in 2013 Prof. Myron Hlynka of University of Windsor, Canada commented-

"It is a gem- small and beautiful..... and Prof. Medhi connected his work with some Indian linguistic history. Wonderful !"

'Gyan Yogi' Prof. Medhi did not enjoy being in the lime light. It was his nature to shun publicity. Prof. Medhi's stature as a scientist of world class is brought clearly in the book '*Glimpses into the life and works of J. Medhi*' written by Dr. Chandra Kanta Chetia, an Ex Professor of Statistics of Dibrugarh University, Assam and published by 'Vigyan Prasar', an autonomous organization under the Department of Science and Technology, Government of India in 2007. In the foreword of the book Prof. D. Kakati, an Ex Prof. of IIT, Madras and IIT, Guwahati and Former Vice Chancellor of Dibrugarh University, Assam rightly mentioned "*..... Writing the life story of a world class scientist emerging through the miasma of a region tangled in traditions has been commendable achievement of Dr. Chetia....*".

Prof. Medhi commanded respect not only from the academic world but also from the big corporate houses all over the world. The following incident clearly shows how much importance they bestowed on Prof. Medhi.

In August 1993, Prof. Medhi, after completion of an assignment in Canada was on a private visit to USA with a tourist visa. Motorola Inc. (Sattelite Communications Division, Chandler, AZ, USA) on their own initiative, requested the *Immigration and Naturalization Service* of USA to grant him non-immigrant visa classification that would allow him to render scientific consultation. In the application, Teresa B. Stricklin, Srategic Business Manager, Sattelite Communications Division of Motorola wrote –

“.... It is an application done at our request, and not one which was planned by Professor Medhi.

As you may be aware, Motorola, one of the United States’ largest employers, is involved in a project of global significance which expands the current limits of communication technology. This effort, in which Motorola has taken the lead, is known colloquially as the “Iridium^{TM/SM}” Project.

The Iridium project, which is based in Chandler, Arizona, will provide technology to allow instant personal cellular telecommunications around the world. The resulting system will make it possible to ‘phone’ from Antarctica to North Pole, regardless of geography, weather, etc. on a hand-held device.

One of the fundamental theoretical underpinnings of this effort is “queuing”. Queuing has been a key part of our research since the beginning of the Iridium project..... .

Dr. Medhi, an Emeritus Professor at Gauhati University and a visiting professor at university of Toronto, University of Montreal and the University of Wisconsin, among others, is a recognized worldwide expert in queuing theory. His publications and papers on the subject have been presented to the brightest scientific minds in the world. Dr. Medhi has authored the textbook “Stochastic Models in Queuing Theory”, perhaps the only work in existence which brings the theory of stochastic processes with classic queuing theory.

Motorola learned through a colleague that Dr. Medhi was visiting his son and daughter in the US. We contacted him to see if he would be willing to present a brief series of seminars and academic colloquia to our top researchers in queueing theory. He agreed on condition that we assist him in obtaining proper visa classification.

It is a remarkable stroke of luck that Medhi is available to us in this fashion and is willing to interrupt his vacation with his family to provide us with his expertise. We respectfully request that he be granted the (appropriate) non-immigrant (visa) classification. Obviously his participation is of enormous benefit to the Iridium Project’s success, and hence, to the stability and expansion of job opportunities to our US work force”.

With the fame and glory Prof. J. Medhi earned from the early part of his academic life, he could have easily settled in any one of the advanced countries of the world and earn more name and fame for himself. But his rare patriotism and inner urge to do something for the people of his motherland pulled him back to Assam and India. Prof. Athreya, an Ex-Prof of IISc Bangalore and IOWA State University, USA rightly observed “... he has remained in Assam to serve his home state despite being offered many opportunities to live abroad.....”. The future generations of our country should be indebted to him for this rare sacrifice on his part.

In the name of Prof. J. Medhi, J stands for ‘Jyoti’, the light. He was really a ‘light’ in the field of education and research which has brightened the academic world not only in Assam and India but throughout the world.

*Agyan timir-andhasya Gyananjan Shalakaya.
Chakshur-oonmeelitam yena tasmai Shri Gurave Namah.*

Our Salutations to this reverential teacher, who has enriched our lives by his teaching, research and other academic works and who also had set before us an example of uncommon patriotism and an exemplary lifestyle of simple living and high thinking.
