IN QUEST OF KNOWLEDGE.

A TRIBUTE TO PROFESSOR V. LAKSHMIKANTHAM.

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“Mother”, observed a six-year-old child, “since creation needs Knowledge, maintenance needs wealth and destruction needs illusion, it looks like the pairing Brahma with Saraswati, Vishnu with Lakshmi, and Maheswar with Parvati (the Trinity and their consorts of Indian Theology) are man made concepts.” The impressed mother explained the higher philosophical truths of the Sanatana Dharma (Eternal Truth), further stimulating the child LakshmiKantham’s thinking and encouraging his questioning mind. She later instilled in him the need to respect other people’s faith and ideas by punishing him for belittling the villagers’ faith in temples. In her lap, with his photographic memory, the child learnt the epics, Ramayana, Mahabharata, Bhagavatham and other literature. Having no school in his village, he mastered whatever came his way (including street magic). He became proficient in his native language, Telugu, and started writing poetry in classical style.

He fervently desired to go to school. His efforts in that direction were nearly futile for the first few years; but can be termed worthwhile, as he met the determined beautiful girl, Saroja, who decided to marry him and no one else. Later he went to a nearby town for schooling. The village rustic was teased by town kids and initially refused admission by the school headmaster, as he had no formal foundation. However, with some luck and with dogged determination, he was able to join school at the age of thirteen, by passing the entrance exams by mastering English and Mathematics on his own. Soon his command of Telugu came to light and he emerged as a leader among his peers. It was during that time he learnt from his best friend not to lose self-control, even in totally adverse situations.

\textsuperscript{*}With courtesy of the publisher and editors, “Advances in Nonlinear Analysis, Theory, Methods and Applications (2009)
Still in school, he tied the knot with the wonderful girl, Saroja, who was to join him later. The following year, he successfully completed his schooling, the only one from his school to do so. In the next couple of years, he finished his pre-university education. Soon family obligations forced him to take up a bank job and a son was born around this time. His love for education compelled him to study all subjects related to banking and pass in all relevant examinations.

As his yearning for learning was not still sated, he left [or Hyderabad, where two years of work would entitle any employee a study leave. He took up a low paying storekeeper job in the Biology department and later secured a better position as a lab assistant in the Chemistry Department of Osmania University. During that period of formal education, he wrote poetry and was so good at it that his poetry became popular in literary circles.

With a little bit of persuasion, he was able to get the university rules altered, as he was working with the administrative head at that time, and that allowed him to study privately while working full time on campus. He finished his bachelor’s degree and later master’s in Mathematics, securing higher marks than the regular students of the university. He was appointed lecturer on a part time basis. Here, he had the opportunity to do research and a scholarship to go with it.

Little knowing what research meant, he browsed through the available journals and found that he could follow the works of Wintner, Hartman, Bellman, Coddington and Levinson. Without any guidance, he did research independently. Wintner’s letter, regarding one of his papers encouraged him. That letter boosted his self-confidence and within a span of two years he submitted his thesis and later wrote three letters discussing his work, one each to Coddington, Levinson and Cesario.

Meanwhile on the home front, the young lady, Mrs. Lakshmikantham, took complete charge of the family with three kids. Smart and capable, understanding her husband’s aspirations, she gave him total freedom from family affairs. He pursued his passion for knowledge with single-minded devotion and he continued to do so till his last day. Selling some precious possessions and securing financial help from his friends, he arrived in 1960 to UCLA, accepting the fellowship offered by Professor Earl Coddington. Determined to write thirty papers in three years, he worked with steadfast devotion. He popularized the Lyapunov method and his own work in differential inequalities. He visited the University of Wisconsin, Madison, RIAS, Baltimore and the University of Calgary in Canada. He spent a year in each of these places.

He established himself as a research scientist and was well known in all quarters of the institutions he visited. He was invited as head and professor in the department of Mathematics of what is now the Dr. Babasaheb Ambedkar Marathwada University, Aurangabad in India. With his mercurial mind, within a span of one and half years, he guided seven zealous PhD students (who all later became famous mathematicians). At about this time, Professor Bellman invited him to write a research monograph in his series. As the conditions in India were not conducive for such a major project, Professor
Lakshmikantham accepted the position of Professor and Head of the Department of Mathematics at the University of Rhode Island, Kingston, R.I. With his well-known resourcefulness, dynamism, generous and kind understanding of human nature, he successfully transformed the department into an active teaching-research unit. He was instrumental in starting a PhD. Program and an attractive colloquium program at that university. In his busy schedule, he completed the most extensively quoted and cited two-volume monograph, ‘Differential and Integral Inequalities’. In the second volume, he introduced the now standard notation for delay differential equations.

Be it at the University of Texas, Arlington (1973-1989) or at the Florida Institute of Technology, Melbourne, Florida (1989-2010), he changed the profiles of the Mathematics departments from being teaching oriented to research oriented. He started PILL programs in these departments and was instrumental in putting them on the global map of academics.

Much to the surprise of his family and friends, he never lost his cool or sleep for any earthly reason. But ”Madame Mathematics,” if she eluded him, gone was his coolness and sleep and he was a picture of impatience. His frustration at others for not following his lightning thought is phenomenal. So is his abundant generosity in explaining and re-explaining the intricacies of the subject involved to the interested students and collaborators with whom he relentlessly worked and published research papers and research monographs.

In one of his trips to London, he came across the book ”India in Greece,” by E. Pockoke, a Greek. Excited with its contents claiming that Greeks were of Indian origin, he started his tireless search for truth. For 25 years, he collected related information and papers. In the process, he learnt philology, archeology, theology, anthropology, geography, history and Vedanta. This passionate search resulted in two monographs, ”The Origin of Human Past - The Children of Immortal Bliss” and “What India Should Know.”

Every Summer and winter, he would travel to various countries giving lectures. He visited more than 70 countries including countries like Russia and China. Throughout his travels, he would listen to the local language and discover, either Sanskrit words or Sanskrit roots in that language. This further strengthened his belief that the roots of all races and nationalities are one.

In the World Congress of Nonlinear Analysts (WCNA) 2000 organized in Sicily, Professor Lakshmikantham read in a local newspaper that Madhava, an Indian, was at the forefront of the development of Calculus, earlier than Newton and Leibnitz. Intrigued by this news, he immediately made an extensive search for facts and came up with the title ”The Origin and History of Mathematics”

Looking for new frontiers to conquer, he became interested in metaphysics and the latest developments in particle physics. With his unique understanding of the eastern wisdom, he integrated both approaches in his paper ”Hybrid Unified Theory” and later
published a research monograph titled, 'The Hybrid Grand Unified Theory.'

More recently, at the age of eighty-three, he was reintroduced to fractional calculus, a 300-year old subject. He immediately was captivated by it and in a couple of months, or even less, completed a research monograph “Theory of Fractional Dynamic Systems” in that field, a veritable record indeed. His last book in terms of research dealt with Differential Equations in Cones.

His speed at work, his intuition in selecting future research areas, his focus on core principles and his capacity to sieve out the unessential are all unbelievable, and are a rare treat to observe, as they generate awe, enchantment and admiration.

A great visionary, he could foresee that unification would be the underlying principle of the 21st Century and that Mathematics in general, and Nonlinear Analysis, in particular, would be fundamental to the growth of knowledge. A champion for the cause of knowledge dissemination, he started the number-one journal, Nonlinear Analysis Theory Methods and Applications, and also founded the International Federation of Nonlinear Analysts (IFNA). All disciplines that rely on nonlinear analysis, from medicine to physics, from seismology to economics, from pharmacology to ecology, all were included under this umbrella. A colossus, he single-handedly arranged, with secretarial help, five World Congresses of Nonlinear Analysts (WCNA) from 1992 to 2008, once in every four years. The WCNA is a platform for exchanges of ideas between peoples of the world and in various disciplines.

Having traveled throughout the world, lecturing in nearly all institutions where there is research in differential equations and/or nonlinear analysis, he met many young researchers and experienced scientists. He had encouraged each one to achieve their potential and helped them in many ways. The number of publications (600+) with different joint authors and research monographs (50+) with various collaborators, as well as the number of journals for which he is a member of the editorial board, all bear testimony to his generosity and all encompassing compassion in promoting talent.

Not only did he encourage his fellow scientists but he motivated and helped his secretaries to study and enhance their qualifications. To his credit is the achievement of one secretary obtaining a Ph.D. in Library Sciences, another opting for Medicine, yet another working for Ph.D. in Operations Research, and the last one is determined to obtain a Ph.D. in Computer Science.

To him, philanthropy meant educating and motivating people to seek knowledge. With his philosophy of "detached attachment," he majestically flowed like a river brushing away small rocks and boulders, but changing course if a mountain came in his way, never losing focus of his destination. An able planner, he thought of the worst that could happen in any endeavor and if he felt confident enough to survive the worst, he plunged into the project with utmost dedication, striving for the best. Thus all his enterprises have been highly successful.
Astrology was his hobby and he has considerable command in that subject. Mathematics to him was life and he enjoyed mathematics as life itself. His other sources of entertainment were literature, poetry and information related to Indian culture and heritage.

A world citizen, knowing no barriers of nationality, religion, race or gender, he has helped and encouraged many young scientists realize their dreams. The only criterion he required was dedication to pursue knowledge. Whoever came to him, whatever his/her capacities, never went empty handed. He always gave every one more than they expected and wished them the best, a sign of a great soul.

A good judge of human capacities, he quickly gauged a person’s strengths and weaknesses. He supported the growth of the person, nurturing their strengths and helping minimize their weaknesses. Understanding each one, he did his best to help them achieve their potential, never bothering about the other person’s behavior or their approach towards him, a great yogi.

In 2007 the (Gayatri Vidya Parishad) GVP - Professor V. Lashmikantham Institute for Advanced Studies was established to promote research. Professor V. Lashmikantham created a facility wherein a recurring grant of Rs. 20,00,000/ is made available to the centre. This centre is planning to be an institute that promotes the aspirations and philosophy of Professor V. Lakshmikantham.

His family members along with GVP created, GVP-Lakshmikantham foundation to support the school education programme in India and another Rs.20 Lakhs is available annually for this purpose. His family plans to work towards achieving his dreams in schools.

We salute this beacon of light, who has taught us not only mathematics but also about life. We bow down to the person who worked without worrying about the fruits of his work, Karma Yogi, who showed us the way to approach life. We offer floral tributes to this legend of Mathematics (1924-2012).

We humbly salute Professor V. Lashmikantham, a great thinker, a remarkable visionary, and a world citizen.