

## **Tribute to Professor Atta-Ur-Rahman, FRS**

### **75<sup>th</sup> Birthday of Man of Thousand Attributes**

Dedicated to Professor Dr. Atta-ur-Rahman *FRS*, a great teacher, a great mentor, and great patriot, on his 75<sup>th</sup> Birthday, 22<sup>nd</sup> September 2017.

It is a great pleasure to write a preface in honor of my teacher and mentor, Prof. Dr. Atta-ur-Rahman *FRS*, for this issue of Journal of Chemical Society Pakistan (JCSP), on his 75<sup>th</sup> birthday. Prof. Dr. Atta-ur-Rahman has been associated with the CSP since the beginning as past president, Editor of the JCSP, member of JCSP's Editorial Board, Fellow of the CSP, and as mentor, and guide. I therefore greatly appreciate thoughtful decision of the CSP to dedicate an JCSP issue to him on this monumental occasion.



There are certain moments which leave permanent impression on our minds. One such occasion was my first meeting Prof. Atta-ur-Rahman on the afternoon of September 13, 1983, in a small laboratory of the Husein Ebrahim Jamal Research Institute of Chemistry (H.E.J. Institute), crowded with students and researchers. Since then I have been associated with his great personality in numerous capacities, as a student, as a colleague and co-worker, and as the Director of the institute he developed. But they most cherish and enduring relationship which I have with Prof. Atta is my association with him as a student which now spread over three and half decades. With over 700 joint research publications, 30 joint international patents, and 22 jointly authored/edited books, I can safely claim that no two scientists of the world have worked so long and so productively.

In this tribute, I have tried to summarize some of the most important aspects of Prof. Atta-ur-Rahman's personality, though I must admit it requires a dedicated volume. The objective is to celebrate the life of a great son of Pakistan, who has given so much to his nation and humanity at large.

As a person Prof. Atta-ur-Rahman is amazingly kind, pleasant, modest, affectionate, and cheerful. His humility as a person, and his respect to other human being are exemplary in their own merit. He is inherently optimistic, sincere, and hardworking. The best of human attributes have come together in his wonderful and attractive personality.

Prof. Atta-ur-Rahman's scientific contributions are internationally recognized, and widely appreciated. He is one of the most prominent natural product chemists of recent times. His work is characterized by its volume, originality and depth. He carved out his niche in indole chemistry and NMR spectroscopy, and produced very high-quality work in leading journals. His astounding number of publications on the discovery and development of new medicinal agents, isolation and structure elucidation and synthesis of several hundred natural products are internationally read and appreciated. The first synthesis of vinblastine, which is among the most important anticancer drugs, was reported by Prof. Atta-ur-Rahman in 1978, patented in the UK, Germany and Pakistan. He continued the synthetic studies on indole alkaloids, added several new methodologies and new indole derivatives and published dozens of research papers in this field of research during 1980–1988. He has also developed efficient methods for the large-scale isolation of vinblastine and vindol from the leaves of *Catharanthus roseus*, which is an important anticancer natural product. An intriguing challenge in the late 1960s and early 1970s was the biosynthetic origin of the tetracyclic indole moiety of vinblastine/vincristine, anti-tumour alkaloids of *C. roseus*. It was believed that such tetracyclic indoles would exist in the plant but no such tetracyclic indoles had been isolated. Atta-ur-Rahman first proposed that vinblastine may arise from a pentacyclic precursor alkaloid, such as catharanthine. He demonstrated the conversion of pentacyclic catharanthine into the tetracyclic 'cleavamine' moiety in high yields, leading to the first synthetic vinblastine derivative. This approach (i.e. using catharanthine as the precursor) became the preferred procedure for subsequent synthetic approaches to these anti-leukaemic alkaloids. A biomimetic synthesis of vinblastine was subsequently developed and patented. Interesting synthetic transformations/rearrangements were discovered including the high yield fragmentation of the hexacyclic 16-epi-19-S-vindolinine to a tricyclic indole. The work of the Nobel Laureate Sir Robert Robinson and co-workers on the chemistry of harmaline was also corrected and it was shown that an interesting ring fragmentation occurs with Nb-acetyl harmaline under certain conditions.

In the field of isolation and structural studies of natural products, Prof. Atta has isolated and established structures of hundreds of new natural products from a variety of sources including medicinal plants, marine invertebrates, sea alga and micro-organisms. His work on the isolation, structure elucidation and biological studies of steroidal, indole and isoquinoline alkaloids, withanolides, physalins and many other important classes of natural products has been widely recognized for originality and significance. These natural products isolated by Prof. Atta-ur-Rahman and co-workers, have exhibited exciting biological activities including anti-oxidant, anti-leishmanial, anti-AIDS, immunomodulating, antiasthmatic, analgesic, nematocidal and anti-cancer activities. Some of his recent contributions in the field of structural studies are enzyme inhibitors, anti-oxidants, anti-MDR agents, and anti-leishmanial agents. Isomeric mixture of isoxylitones A and B, obtained from a medicinal plant *D. denudatum*, is in first phase of clinical trials in North America.

He also developed convenient method for the determination of absolute configurations of chiral carboxylic acids,  $\alpha$ -amino acids, amino alcohols, polynucleic acids and ephedrine isomers by partially or totally restricting their conformational flexibility through complexation with trinuclear metals, such as Fe, Cr, Mn, Rh, Ru, etc., L  $\frac{1}{4}$  water or pyridine and n  $\frac{1}{4}$  0 or 1. The method was extended to peptides. He has also developed correlations between structures of steroidal alkaloids with their specific rotations. Based on his interests in modern pulse NMR spectroscopy, he has contributed several original books to the applications of new NMR techniques which are used as standard text books globally. He is the Editor of several high impact factors journals, and prestigious books series.

*He is the first resident Pakistani scientist to be honored by the Cambridge University with a Sc.D. degree in October 1987. He is also among the only three Pakistanis to be elected as the Fellow of Royal Society, in last 70 years of our history to receive this unique honor. He is also the first scientist from the Muslim World to have won the UNESCO Science prize. He was the President of the Pakistan Academy of Sciences for two successive terms and has also been the President of Network of Academies of Sciences in Islamic Countries (NASIC). The government of Pakistan has conferred four Civil Awards on him; Tamgha-e-Imtiaz, Sitara-e-Imtiaz, Hilal-e-Imtiaz, and the highest national Civil Award Nishan-e-Imtiaz but what he cherishes most is the Fellowship of the Royal Society (London). He is also the second Pakistani scientist to be elected as fellow of three major academies including the Third World Academy of Sciences, Islamic Academy of Sciences and Pakistan Academy of Sciences. He was elected Honorary Life Fellow of Kings College, Cambridge University, UK, in 2007. Prof. Atta-ur-Rahman was awarded the TWAS Prize for Institution Building in Durban, South Africa, in October 2009 in recognition of his contributions to bringing about revolutionary changes in the higher education sector in Pakistan. The Austrian government also honored him with its highest civil award (the 'Grosses goldenes Ehrenzeichen am Bande') in 2007 in recognition of his eminent contributions. Most recently he became the only Pakistani and Muslim to become the Foreign Fellow of the Chinese Academy of Sciences.*

In addition to his excellent scientific achievements and globally recognized leadership for the promotion of science, technology, higher education and information technology in Pakistan and the developing world. He served as the Minister of Science and Technology and Information Technology, Advisor to the Prime Minister for Science and Technology, and then Chairman (Federal Minister) of Higher Education Commission. In these capacities, he promoted IT and Mobile telephony sectors, launched the first satellite of Pakistan in space, established over 100 new universities, sent over 12,000 young Pakistanis to top universities of the world for Ph. Ds., arranged to increase the budgets of higher education (over 5000 folds) and science and technology (over 6000%), and thus changed the entire landscape of higher education and science and technology in Pakistan. Work done under his leadership are now regarded as monumental achievements of Pakistan, and the golden era in the history of the country.

However, in my opinion, the most notable contribution of Prof. Atta-ur-Rahman is the development of the International Center for Chemical and Biological Sciences (H.E.J. Research Institute of Chemistry and Dr. Panjwani Center for Molecular Medicine and Drug Research) against all odds. The ICCBS is now the largest academic research Institution in Pakistan with over 600 Ph.D. students from every corner of Pakistan and many other countries, working on frontier aspects of chemistry, biochemistry and molecular medicine. The center is regarded as one of the finest and well-equipped research institutions anywhere in the world in the fields of organic chemistry and molecular medicine. The man who established this great institution almost single-handedly, and is still serving this largest and most productive academic and scientific establishment of Pakistan as the Patron in Chief.

The scientific contributions of Prof. Atta-ur-Rahman, *FRS*, and his tremendous services for the promotion of science and technology in Pakistan and other developing countries will always be cherished and remembered. His towering personality, his gentle nature and, most importantly, mentoring of generations of young chemists from all around the world are the attributes of an ideal scientist and an excellent human being.

Personally, it has been the greatest honor to know him, learn from him, follow his footsteps, and to call him my teacher and mentor. I, on behalf of the chemistry community of Pakistan and world at large, congratulate Prof. Atta-ur-Rahman *FRS* on his 75<sup>th</sup> birthday, and wish him health and happiness in many years to come. May he live in the blessings of Allah swt today, and always.

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