



Molecular Physics

An International Journal at the Interface Between Chemistry and Physics

ISSN: 0026-8976 (Print) 1362-3028 (Online) Journal homepage: <http://www.tandfonline.com/loi/tmph20>

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To cite this article: Sourav Pal, Trygve Helgaker & Andreas Savin (2017) Foreword, Molecular Physics, 115:21-22, 2627-2628, DOI: [10.1080/00268976.2017.1380450](https://doi.org/10.1080/00268976.2017.1380450)

To link to this article: <http://dx.doi.org/10.1080/00268976.2017.1380450>



Published online: 31 Oct 2017.



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Foreword

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Debashis Mukherjee was born in Naihati near Kolkata (formerly Calcutta) in West Bengal, India on 17 November 1946. Naihati played an important role in fostering the independence movement of India through the great works of the novelist Bankim Chandra Chatterjee, and Debashis was deeply influenced in his schooldays by the cultural heritage of his birthplace. He grew up in the vibrant and intellectual atmosphere of Kolkata in post-independent India, receiving his Bachelor and Master degrees in Chemistry from Calcutta University. He obtained his PhD under the supervision of Prof. Mihir Chowdhury, a gifted spectroscopist and an inspirational researcher and teacher, who had a profound influence on him. It is interesting to note, however, that much of the theoretical PhD work was done independently by Debashis. His broad range of interests in chemistry, physics and mathematics shaped his fascination in quantum chemistry of many-electron atoms and molecules.

After obtaining his PhD in the early 1970s, Debashis did not go abroad for post-doctoral studies, but began teaching in a college in Kolkata, while simultaneously engaged on his research on multi-reference coupled-cluster theories. His first paper on the subject, one of first papers in the field, was published at that time. He moved for a period of about two years to the Indian Institute of Technology Bombay before embarking on what turned out to be a significant career in the Indian Association for the Cultivation of Science (IACS). There, he rose through the ranks to professor in 1985, served as department Head, and then as Director from 1999 to 2008. It was primarily due to Debashis that IACS came to be internationally recognised as a major centre for many-body theory. At IACS, he built an internationally recognised school of theoretical chemistry and supervised and mentored many PhD students. His PhD students enjoyed complete freedom – which always remained a hallmark of his leadership and mentorship. Upon retirement, Debashis has continued to work at IACS, where he is now Professor Emeritus at the Raman Centre for Atomic,

Molecular and Optical Sciences and is a Science Engineering Research Board (SERB) Distinguished Fellow of the Ministry of Science and Technology.

Debashis is a world leader in molecular many-body theories and theoretical spectroscopy. He has also developed a rigorous finite-temperature non-perturbative field theory to study thermodynamics of strongly interacting many-body systems, which is now being revived in the context of finite-temperature descriptions of band theories. As mentioned earlier, he was the first to develop and implement multi-reference coupled-cluster methods in quantum chemistry – state-of-the-art in many-body theories capable of predicting the energetics of molecular excitations and ionisations with quantitative accuracy. Since his first formulation of multi-reference cluster-expansion methods in the 1970s, he has continued to refine the methodologies for energy and spectroscopic properties. With Lindgren and Kutzelnigg, he pioneered the development of the Fock-space multi-reference coupled-cluster method. More recently, he has developed the first rigorously size-extensive state-specific multi-reference coupled-cluster formalism (Mk-MRCC), formulated unitary-group adapted state-specific multi-reference cluster-expansion methods, and showed their efficacy.

Debashis has co-authored about 250 papers on various aspects of theoretical chemistry and has edited *Aspects of Many-Body Effects in Molecules and Extended Systems*, Lecture Notes in Chemistry, Vol. 50 (Springer Verlag, 1989) and *Applied Many-Body Methods in Spectroscopy and Electronic Structure* (Plenum Press, 1992). Extensive reviews of multi-reference cluster-expansion methods, written by him and his colleagues and published in *Advances in Quantum Chemistry* in 1989 and 1998 and in the book *Theory and Applications of Quantum Chemistry: the First Forty Years* remain influential and relevant.

Debashis is a fellow of the International Academy of Quantum Molecular Science and a recipient of the Humboldt Prize. He has been awarded the Fukui Medal of

the Asia-Pacific Association of Theoretical and Computational Chemistry and has been inducted to its Fellowship. He also received the Senior Medal of the Centre de Mécanique Ondulatoire Appliquée. He has delivered several named international lectures including the Charles Coulson Memorial Lecture at the University of Georgia. In India, Debashis is a Fellow of National Academies of Science of India and he is a recipient of the Shanti Swarup Bhatnagar Prize of the Government of India.

Apart from all his professional achievements, Debashis has been a mentor and inspiration to younger colleagues. He has always been accessible to discussion on science

and has been particularly encouraging and supportive of students and younger colleagues. He is especially good in one-to-one discussions, where he can explain difficult themes of quantum chemistry with ease. With his wide range of interests and broad knowledge, ranging from science to many aspects of culture and society, he is always an interesting and lively discussion partner, for colleagues and many friends.

We are very pleased to present this special issue of original research articles in the area of many-body theory – written by experts and leaders in the field to honour Debashis on his 70th birthday.