Foreword to the special issue of the Canadian Journal of Physics in honour of Professor Li-Hong Xu¹

This special issue of the Canadian Journal of Physics is dedicated to Professor Li-Hong Xu (May 2, 1957 – January 21, 2019) in recognition of her remarkable contributions to molecular spectroscopy, teaching, and outreach activities, as well as service to the Physics and local communities.

Li-Hong Xu was born on May 2, 1957 in Suzhou in the People's Republic of China. Her family offered a nurturing and supportive environment where education was highly regarded and protected her from some of the effects of the Chinese Cultural Revolution. Through hard work and independent study, Li-Hong gained a prized admission to one of the first classes when the universities subsequently re-opened. She obtained her B.Sc. in physics with highest honors and was then selected to become an Assistant Professor at her university in Suzhou. She arrived in Canada in 1988 as a visiting scholar in the Department of Physics at the University of New Brunswick (UNB). She transitioned to the doctorate program and in 1992 obtained her Ph.D., specializing in high resolution molecular spectroscopy. Her research focused on molecules with internal rotation, such as methanol and its isotopic species, and on optically pumped far-infrared laser emissions in these molecules. In parallel, she was among the first graduates of the Diploma in University Teaching program at UNB, Fredericton, NB.

During her post-doctoral stage, first at UNB in the Centre of Excellence in Molecular and Interfacial Dynamics under the NSERC Networks of Centres of Excellence Program, and then with Dr. Jon Hougen at the National Institute of Standards and Technology, Gaithersburg, MD, Li-Hong expanded her research breadth with novel high resolution spectroscopic studies of molecules of atmospheric interest. She made her mark in the field as a prolific researcher who paid great attention to detail both in experimental work and in theoretical studies, and who was constantly pursuing new research directions. Her papers were like small masterpieces in which concepts were presented clearly and in depth, in a flow of ideas that became the hallmark of her research writings.

The research expertise acquired put her in an optimal position to start and develop her research program as an Assistant Professor in Canada at UNB, Saint John, NB, in 1995. She overcame many obstacles while setting up a lab in a small department and through determination and hard work, she attained international recognition for the high quality of her research. Both new and established international researchers were often visitors in her lab. Among other aspects, these research visits enhanced the quality of mentoring and research experience that she offered to her post-docs and graduate and undergraduate students.

As Li-Hong's career flourished, she became a member on the Editorial Board of the most well-known journal in her field, the Journal of Molecular Spectroscopy, and was invited to the International Organizing Committees of two of the most prestigious conferences in the field: the International Symposia on Molecular Spectroscopy and the International Conferences on High Resolution Molecular Spectroscopy. Conference attendees looked forward to her engaging and well thought-out presentations.

Li-Hong's distinguished service and outreach activities had a big impact in both the Physics community and her local community in Saint John. She served the Canadian Association of Physicists and NSERC in a wide variety of roles. She received many honours, including awards for teaching excellence from her Department and the Faculty. In the local community, she was very involved with the Chinese cultural association, founded the Saint John chapter of the Asian Heritage Society, and played violin with the school district Senior String Orchestra and the Alto Mare community orchestra, in addition to raising her two children, Alex and Miranda, and supporting and encouraging them through university and on to medical school.

In this special issue, former research collaborators and colleagues of Li-Hong present their recent research results as a tribute to her. The tone of the articles is reminiscent of Li-Hong's enthusiasm for creative scientific activities, the wide range of her research activities, and her willingness to share her knowledge with others. They also speak of the respect and personal warmth that colleagues felt for Li-Hong, and of the strong legacy she left behind.

The first paper in this special issue is a warm tribute to Li-Hong as an outstanding scientist and role model in the Physics and local communities from her husband, Professor Ron M. Lees. The second paper is a "point of view" paper prepared by the Guest Editor on recent mentoring techniques, leadership approaches, and different paths to success. G. Moruzzi and A. Predoi-Cross have prepared a review paper on the Ritz program, a user-interactive software program that enables the assignment of transitions observed in infrared spectra of asymmetric molecules. Per Jensen presents a tutorial on a novel theoretical exploration of linear molecules.

The section of the special issue on most recent research commences with the paper of C. di Lauro et al. on a semiclassical method to predict the torsional splitting patterns in internally rotating molecules of G6(EM), G12, G18, and G36(EM) symmetries. R.M. Lees presents a study of the CSH-bending and CH₃-rocking vibrational bands of methyl mercaptan (CH₃SH), a molecule with internal rotation present in the interstellar medium. The rotational spectrum of C-13 methyl mercaptan has been investigated in the research work of H. Muller et al., providing accurate molecular constants needed to enable searches for this molecule in astronomical spectra.

The group of researchers led by H.V.L. Nguyen have studied the spectra of coffee furanone recorded using a molecular jet Fourier transform microwave spectrometer. The carbon structure obtained experimentally has been compared with results of quantum chemistry. Pulsed jet Fourier transform microwave spectroscopy was used by K.P. Nair et al. to investigate the microwave rotational spectra of 2,3,4- and 2,4,5-trifluorotoluenes, and their C-13 isotopic species. The microwave and far-infrared spectra of methyl formate in the COC deformation state have been explored by D. Tokaryk et al., providing molecular parameters much needed for the interpretation of astronomical spectra.

S. Melandri et al. present their measurement results for rotational transitions belonging to the s-cis and s-trans conformers of

¹This paper is part of a special issue to honor Professor Li-Hong Xu.

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acrolein and selected isotopologues. The measurements have been carried out using a Free-Jet Absorption Millimeter Wave spectrometer. The NH_2 scissors band of methylamine has been analyzed for the first time under high resolution by I. Gulaczyk et al. using room temperature spectra recorded at the AILES beam-line at the SOLEIL facility and cold spectra recorded using a quantum cascade spectrometer. The UV attenuation of Martian brines has been investigated in a laboratory setting by P. Godin et al. who have measured the individual UV absorption cross-sections of nine different aqueous solutions of salts found in the Martian brines.

The last section of the special issue includes papers on novel teaching activities involving university level and high school level students. M. Milner-Bolotin and her co-authors discuss the challenges and outcomes of implementing demonstrations using state-of-the-art instrumentation during university lectures. A.I.V. Voros et. al. report a case study on how energy related concepts and facts can be introduced through in-class panel discussions. The study involved grade 11 students from 15 classrooms belonging to 9 Romanian high schools. The results were positive and the

authors propose expanding this method of teaching to other physics classes. A. Schramek discusses the results of a project carried out at the Wigner Research Centre for Physics of the Hungarian Academy of Sciences, where high school students working with teachers and researchers learned about particle physics and participated in a research project.

The paper by Z. Csernovszky et al. discusses how chaotic systems can be introduced to students at high school and undergraduate levels. A. Tasnadi et al. report on a method to introduce thermodynamic cyclical processes at the high school level using in-class experiments.

We thank all authors and the anonymous referees that provided their input to this collection of papers. The Editors-in-Chief of the Canadian Journal of Physics, Drs. Michael Steinitz and Shohini Ghose, and Mrs. Nicole Huskins from the Editorial Office, are thanked for allowing this special issue and for their advice and support during the journey to prepare it.

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