

Peter Martin brief bio-sketch for Sigma Xi

Peter Martin grew up Owen Sound, Ontario, studied Math and Physics at the University of Toronto, and obtained his PhD from the Department of Applied Mathematics and Theoretical Physics at the University of Cambridge in 1972. He has been a professor of theoretical astrophysics at the University of Toronto for 54 years.

His research concerns physics and chemistry of the material and the radiation and magnetic fields that exist between the stars in our Milky Way Galaxy. This “interstellar medium” (ISM) is important because it is where new stars and planets are born and because the material produces contaminating signals that must be removed to study the extragalactic universe. He has written over 400 refereed journal papers, with over 100,000 citations, and an h-index of 122.

In 2020 Martin finished off his decade-long work on the Planck satellite mission as a core team member, co-coordinator of WG7 on the interstellar medium, and Editorial Board member, contributing to the collaboration’s last 15 publications (totaling 814 pages) both directly and through the rigorous internal review process. Since then he has published over 20 papers on original new research on various aspects of the ISM including: (i) analysis of his GIGHLS and DHIGLS HI spectral line survey data to identify and quantify the thermal phase transition of warm neutral hydrogen to the cold denser phase (plus the resulting CNM mass fraction); (ii) joint modelling of Dragonfly scattered light and Herschel thermal dust emission to constrain dust properties in faint cirrus (plus predicted diagnostic advantages of observing polarized scattered light); (iii) a deep dive into the myriad uncertainties of Herschel frequency maps to produce optimally robust measures of dust temperature and opacity in Gould Belt molecular clouds; (iv) developed new techniques to identify and remove scattered light cirrus foreground to deep imaging of extragalactic fields through quantitative morphology and statistical structural analysis; (v) solved a 40-year old mystery of the nature of infrared-bright stars toward W3, using Gaia and multiband photometry; (vi) critically assessed the usefulness of Zeeman observations of deeply embedded HI in molecular clouds for magnetic field estimates as a function of depth along the line of sight.

Enabled by his renewed NSERC grant (55 years continuous funding), his latest work on the ISM is focused on teasing out and modelling 3D structure in nearby molecular clouds to elucidate their dynamics and assembly history. Main drivers are how structure can be identified and quantified, under what influences structure arises, and how expounding structure facilitates understanding fundamental processes in the ISM, and vice versa.

Martin stands out for his visionary and innovative institution building. He (with R. Henriksen) founded the Canadian Institute for Theoretical Astrophysics in 1984, which has earned an international reputation for high quality training of postdoctoral fellows, and the Dunlap Institute in 2008, which develops astronomical instrumentation for internationally competitive telescopes.

Research supervision has been a major focus (35 postdocs, 25 PhDs, 14 MSc, 33 senior undergraduate projects). Given the nature of astronomical research, his many research trainees have fanned out internationally.

Martin's leadership and contributions have been recognized in many ways including Fellowship in the Royal Society of Canada and the Royal Canadian Geographical Society and by the Order of Canada. Most recently he was awarded the biennial George Van Biesbroeck Prize of the American Astronomical Society that honours living individuals for long-term, extraordinary, and unselfish service to astronomy that goes well beyond the requirements of their paid positions.

He is presently working to establish the School of Cosmic Future, with the radical hope of mitigating the confluence of high risk threats to continued habitability of Earth.