Obituary

Kathryn McWilliams (1972–2025)

Honorary Fellow of the RAS, trailblazing ionosphere scientist, inspiring teacher, respected leader and friend, fondly remembered by Prof Emma Bunce and Prof Mike Lockwood

It came as a terrible shock to learn that our cherished collaborator and dear friend Kathryn McWilliams has died at the age of just 52. Kathryn was the first ever Honorary Fellow of the Royal Astronomical Society in Canada. She was a superb leader of the Canadian contribution to the SuperDARN radar project and, later, the Chair of the executive committee for the whole international SuperDARN consortium. This consortium grew to include institutes in the USA, UK, China, Norway, France, Italy, Japan and South Africa as well as Canada and individual collaborating scientists from a great many other countries. Everywhere she went, Kathryn was respected and popular. She had a remarkable natural ability to bring teams together and get them collaborating, and at the heart of that was her own generous but purposeful spirit and a great sense of fun. At SuperDARN meetings she repeatedly thought up prizes and games that made sure all enjoyed contributing to the global effort and that nobody was feeling left out.

That global effort was to map the patterns of flows in Earth's ionised upper atmosphere, the ionosphere, around the poles. These flows are caused by the solar wind magnetoplasma passing by Earth's near-space environment, the magnetosphere. To first order, those flows mirror the circulation of plasma and magnetic field in the magnetosphere, but it is not that simple. There are time constants for responses to changes and, whereas the magnetic field in the magnetosphere is compressible, that in the ionosphere is not. There is also frictional drag on the ionospheric flows caused by collisions with the neutral upper atmosphere. This, and the associated currents and aurora, cause heating following large events, which can propagate around the globe generating disruptions to satellite communications and causing satellite orbits to change, in some cases resulting in the spacecraft re-entering and burning up in the middle or lower atmosphere. In addition, the currents can induce large voltages in power cables and pipelines, potentially causing damage to transformers and lengthy power outages. These are just some of the many 'space weather' effects that Kathryn's work with the SuperDARN radars helped us to understand and monitor. But the work was not just of importance to the many and varied effects on Earth's operational systems; it was also a way of using near-Earth space as a natural plasma laboratory. Kathryn's work also investigated the nature of magnetic reconnection, the process that causes the solar wind to drive the ionospheric flows, and this has applications in disciplines as diverse as astrophysics, planet and exoplanet studies, and fusion research. This, along with her work to improve the SuperDARN software analysis suite, was a huge contribution to the SuperDARN project winning an RAS Group award in 2017.

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Both of us first met Kathryn when she came to University of Leicester on a Commonwealth Scholarship to study for a PhD with Tim Yeoman: one of us was a fellow PhD student and the other her external PhD examiner. From our very different perspectives we both saw the same thing – a wonderful, funny person who was extremely generous with her time and effort but also had real determination and strength, allied to a great thirst to learn all that she could. For the fellow PhD student she instantly became a great personal friend and supporter through the highs and lows of PhD life. The PhD examiner wasn't so lucky: he had to wait until she accepted an offer to spend six months on sabbatical with his group at Reading to really get to know her and form a highly productive scientific collaboration.

Kathryn was a true trailblazer, being the first tenured female faculty member in the Department of Physics and Engineering Physics at the University of Saskatchewan (USask), where she gained her BSc and MSc. She was awarded two International Association for the Exchange of Students for Technical Experience (IAESTE) internships with which she travelled to Imperial College, London to work with Michele Dougherty on magnetic field data from the Pioneer and Voyager spacecraft at Saturn – in preparation for the upcoming Cassini mission. Even after she had secured an academic post at USask, she did not stop learning and improving herself. In order to be allowed to teach an engineering course, she needed to have an engineering degree: she studied, passed the exams and then gave the course.

She was a hugely popular teacher; her brother Ian (who taught drama, also at USask) once feared she was forming a cult because he noticed that her students would pass her and give a strange hand salute, that she would acknowledge with the same gesture. It turned out to be the right-hand rule for coordinate systems and vector analysis. It was their ritual greeting because, in order to help the students remember it, she told them never to greet her with anything else.

She was so proud of her students and they respected, admired and invariably warmed to her: she supervised a great many at all levels and developed new curricula and innovative programmes such as the Canada-Norway Student Sounding Rocket exchange programme and the International Space Mission training programme. In the middle of a period of seriously reduced funding for science in Canada, she managed to secure the resources needed to keep the Canadian SuperDARN effort running. She went on to help a remarkable number of others secure funding that allowed them to further their careers in science. She was a natural communicator and inspired many with her TV interviews and presentations. Her colleagues tell of daughters and nieces who have gone on to careers in science because of the example she set: she was a wonderful and brilliant role-model.

Kathryn was a truly delightful person to be with; her dry sense of humour was gentle yet incredibly insightful. She delighted in giving things names that invariably brought a smile, as at her funeral when her youngest brother Allen referred to a mix-tape CD that she had made and named 'Big Hair Ballads' that he had happened upon. She also had a wonderful set of expressions that one had never heard before yet fitted the situation under discussion absolutely perfectly and made you laugh. And if that situation was a problem, then her words somehow made it less of a problem.

Kathryn travelled the world a great deal, but stayed firmly rooted back in the family farm in Moose Jaw where she grew up. She talked with huge pride and affection about her parents on the farm, her 'little brother' and her 'little little brother' and their families to whom she was a much loved aunt. Her sudden death has been an enormous shock to the whole UK MIST community. Kathryn 'grew up' as a scientist in this supportive community (fostered by the RAS), giving many early research presentations at the Geological Society and at RAS Specialist Discussion meetings. The UK was her second home, with many close friends and scientific collaborators; we are all feeling her loss deeply.

Friends and colleagues at the University of Saskatchewan have established the Kathryn McWilliams Memorial Fund. This fund in her memory , will be used to support women in science, technology, engineering, and math (STEM) programs in the College of Arts and Science at USask. Donations can be made at donate.usask.ca via this link: tinyurl.com/uf9n2bhn

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AUTHOR

Prof Emma Bunce, University of Leicester, UK, was that PhD student and **Prof Mike Lockwood**, University of Reading, UK, was the PhD external examiner.