

Spreading Happiness and Scientific Enlightenment: 40 Years as a Friend and Colleague of John Spence

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John Spence was born in Canberra in 1946, and arrived in Arizona in 1976 after a stint as a postdoc in Oxford. I joined the Physics faculty at Arizona State (ASU) just three years later, and John was part of the committee that interviewed me. In John's case, the word interview applies loosely – it was a very amicable chat about the transition to life in the US. This was a portent of friendship to come. John became one of the best known electron microscopists of his generation, contributing, in addition, to many disciplines outside of electron microscopy. Recognizing the radiation damage problem in biological imaging, he pioneered the “diffract and destroy” technique of using ultrashort x-ray pulses to capture a diffraction pattern before the onset of damaging nuclear motions. This led to the “BioXFEL” (XFEL = X-ray free electron laser) project of which he was the scientific leader, particularly driving the push to make time resolved images of molecular structure changes in enzymes following excitation. In characteristic fashion, he did not “own” his marvelous invention, but realized the ways in which it was complementary to other important techniques. Thus, he led the project that brought cryo electron microscopy to ASU, a technique that does not require even nanocrystals, and captures distributions of molecular conformations. And he did this at the height of his commitment to BioXFEL. Many of John's scientific contributions will be covered at this meeting. John's ASU colleague and fellow-winner of the Gregori Aminoff Prize, Michael O'Keefe is unable to attend so I will briefly cover some of the landmark work of the Spence-O'Keefe collaboration. Three of the joint papers written by John and Mike O'Keefe stand out. In chronological order they are: (1) Their resolution of fundamental difficulties in quantifying the inner potential of a crystal.¹ (2) The imaging of chemical bonds in cuprates and resolution of the difficulties posed by ionic models of cuprate bonding.² (3) The demonstration that the “charge flipping” algorithm could also be applied to solving the phase problem in powder diffraction patterns.³

Beyond that, I want to focus on my real expertise: That acquired in many years of friendship with John. In the 42 years I have known him, he never uttered a nasty word about another human being. He bubbled with enthusiasm for many things beyond science. John was the go-to source for book, movie and music recommendations. More often than not, a book that had been discussed over dinner would appear a few days later in one's mailbox. John was a stellar, multi-instrument musician, and an adventurer: sailing, gliding and collecting vintage cars. John had a marvelous relationship with all those around him. No matter the disparity in scientific or musical talents, an interaction with John resulted in inspiration and encouragement (and those books in the mailbox). John couldn't help but spread happiness.

We always enjoyed discussing science (one our earliest, unfunded, NSF proposals was to untangle DNA by driving it through pores in zeolites – a technique now known as “nanopores”) but the real joint project was music. John had been a semi-professional musician in Australia (“The Sometime Singers”) and had a secret desire to re-create the Beatles in Tempe, Arizona. Unlike John, I had not discovered work-life balance, and John sought to rectify this by taking my wife Christine on a secret shopping trip to buy a bass guitar. He simply assumed I would learn to play it. And thus was born the Moondogs, a band that played together for over 30 years (Figure 1). At some point John instructed me to sing a part.

“I can’t possibly play and sing at the same time” was my reply. The – very typical of John – response was: “Why not? Paul McCartney does it all the time”. I was challenged to master that particular trick too. The Moondogs were more musical fun than musical depth, and John went on to found a Bossa-Nova/Jazz band, Who Knew (Figure 2). All physicists, they were professional-grade musicians and played in some major venues, leaving behind some excellent recordings (John ran a recording and mastering studio in his spare time).

John had built boats and sailed as a child. I came to sailing much later in life, but we were able to share this too (Figure 3). Finally, John was a prolific writer. In addition to his many scientific texts, he wrote a wonderful book on the measurement of the speed of light⁴ and a biography of his father.⁵ John was as unique a human being as he was a scientist. He is greatly missed.



Figure 1. Moondogs, playing a Millennium New Year’s Eve party, Phoenix 1999.



Figure 2. Who Knew playing outside the Gammage Auditorium, Tempe 2017.



Figure 3. On the Schooner Zodiac: John and Margaret with the Lindsays and Ondrej Krivanek

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