Biographical sketch: Regent's Professor John C.H. Spence. August 2011.

Professional Preparation Ph.D. 1973 Physics. Melbourne University, Australia.

Present positions: John Spence is Regent's Professor of Physics at Arizona State University, jointly appointed at Lawrence Berkeley National Laboratory, Berkeley, Ca. USA.

Previous positions include: Postdoctoral Research Fellow, Oxford University, U.K.

Honors. Buerger Medal of the American Crystallography Association (2012). Distinguished Scientist Medal of the Microscopy Society of America (2006). Burton Medal of the Electron Microscopy Society of America (1980). Fellow, American Association for the Advancement of Science (2008). Fellow, American Physical Society. (1991), Fellow, Institute of Physics UK (FInstP)., Fellow, Churchill College, Cambridge, UK. Fellow, Microscopy Society of America (1997). Miller Fellowship, UCB Ca., Kernot Research Scholarship in Physics, (1971), , National Science Foundation Creativity Award (1983), Alexander von Humbolt Senior Scientist Award (1991). Morrison Lecturer, MacMaster University (2001), FEMS Distinguished Lecture Award (2003), FASR Distinguished Lecturer, Cornell Physics/CHESS (2005).
H index 40 (in Physics, based on 310 of 420 published papers found by Web of Science).
A Festschrift special issue of the journal Ultramicroscopy appeared on the occasion of Spence's 65th birthday in June 2011 (Vol 111, Issue 7) containing articles by his colleagues.

Patents: 3 awarded, 3 pending
Recent Books and Publications. See http://physics.asu.edu/people/faculty for full CV. Over 430 publications in refereed journals (Nature, Science, Phys Rev. Letts etc) including
"Femtosecond X-ray Protein Nanodiffraction" H. Chapman.....J. Spence. Nature, 470, 73 (2011).
“Electron Microdiffraction”. J. Spence and J. Zuo. 1992. Plenum. New York.
"High resolution electron microscopy" J.Spence. Ox.Univ.Press.3rd Ed. '02. (Russian, Chinese Eds)
"Science of Microscopy". Two volumes. Springer 2006. P. Hawkes and J. Spence.
“Direct Observation of d holes and Cu-Cu bonding in Cu2O”. J. Zuo et al Nature, 401, 49 (1999).
“Phase measurement for accurate mapping of chemical bonds.” M. Spackman, B.Jiang, T. Groy, H. He, A.E.Whitten, J.C.H.Spence. Phys Rev Letts**.** 95, 085502 (2005)
"Single Molecule Diffraction" Spence and Doak. Phys Rev Letts. 92, 198102 (2004)
"Dislocation core structure". Chapter in "Dislocations in Solids" eds Nabarro & Hirth V13(2006).
"International Tables for Crystallography". Authored several sections (diffraction physics).
"A new technique for locating foreign atoms in crystals", J. Spence et al. J. Micros, 130, 147 (1983)

Professional Activities: Member, BESAC, DOE Basic Research Advisory Committee for the US National Laboratories; Chairman, Int. Union of Crystallography Commission on Electron Diffraction ; Member, Int. Union of Crystallography Commission on Charge, Spin and Momentum densities; US National Committee for Crystallography (USNCCr) of NAS; Director, Xradia Inc. Ca.; Scientific Advisory Committees. Advanced Light Source, LBNL; Molecular Foundry, LBNL, Berkeley. Co-Editor for North America “Acta Crystallographica A” (Diffraction Physics) 1990-2000; Chair, Gordon Conference on Charge, Spin and Momentum densities (2006), Editorial Boards including Rep. Prog. Phys, Ultramicroscopy. In 2001 Spence initiated the biannual series of international conferences in the new field of Coherent Lensless X-ray Imaging. In 2011, Spence initiated the first international conference in the new field of X-ray Lasers for Biology (at LBNL).

Students, Teaching, Grants 20 PhD and 4 MSc students graduated, 9 Post-doctoral fellows mentored. Current grants held from NSF, ARO and DOE plus LBL, LLNL collaborations. NSF funding since 1979.

Some Publications

Book reviews
"The age of wonder". R. Holmes. "Physics Today" (2009)
"The Battery" Physics Today (2010).

Serial Crystallography, LCLS, X-ray lasers for biology.
Femtosecond pulses from free-electron X-ray lasers make molecular movies.
406 "Femtosecond X-ray Protein Nanodiffraction" Chapman.....Spence. Nature, 470, 73 (2011).
412 "Phasing of coherent femtosecond X-ray diffraction from size-varying nanocrystals". J. Spence et al Optics Express 19, 2866 (20110
409 "Single virus imaged on-the-fly with an X-ray laser". M. Seibert et al. Nature 470, 78 (2011)
401 "Femtosecond protein nanocrystallography - data analysis". R. Kirian, J. Spence et al. Optics Express 18, 5713 (2010).

Lensless (diffractive) imaging with X-rays.
We use a computer instead of a lens to reconstruct 3D images of nanoscale objects.
336 "High resolution three-dimensional X-ray diffraction microscopy". H. Chapman, A. Barty, T.Beetz, C. Cui, H.He, M.Howells, S.Marchesini, A. Noy, R. Rosen, J. Spence, U. Weierstall, T. Beetz, C. Jacobsen and D. Shapiro. J.Opt. Soc. Am. 23, p. 1179 2006.
410 "Ab-initio structure determination of one particle from scattering fluctuations of many copies". D. Saldin.....J. Spence. Phys Rev Letts. 106, 115501 (2011)

Condensed Matter, Ab-initio Quantum Molecular Dynamics for defects.
We predict mechanical properties of materials using atomistic quantum mechanical calculations.
25. "Electronic structure of the unreconstructed 30 partial dislocation in silicon", J.E. Northrup, M.L. Cohen, J.R. Chelikowsky, J. Spence and A. Olsen, Phys. Rev. B24, 4623 (1981).
120. "Lattice trapping and surface reconstruction for silicon cleavage on (111).". J. Spence, Y. Huang and O.Sankey. Acta Met. 41, p. 2815 (1993)

Ordering in Glasses.
" The most important unsolved problem in Condensed Matter Physics" (P. Anderson).
261 "Long range structural fluctuations in a CaO glass by spatially resolved near-edge spectroscopy.N. Jiang, J. Qiu and J.C.H.Spence. Phys Rev B66, p.054203 (2002).

Biophysics, Cryomicroscopy.
"*New solution to the phase problem speeds up 3D cryo-em"*
288 Three-dimensional diffractive imaging for crystalline monolayers with one-dimensional compact support. J. Spence, U. Weierstall, K. Downing,R. Glaeser. J. Struct. Biol. 2003.

Bonding in solids. Electron Microdiffraction.
We image the chemical bonds which glue atoms together in solids, and test many-electron theory.
177."Charge density of MgO: Implications of precise new measurements for theory". J.M.Zuo, M. O'Keeffe, P. Rez, J. Spence. Phys Rev Letts. 78, p. 4777-4780. (1998) .
82. "Bonding in GaAs", J.Zuo, J. Spence and M.O'Keefe. Phys. Rev. Letts 61, p. 353 (1988).
104. "Bonding in Cu2O". J. Zuo, Y.Kim, M.O'Keeffe, J. Spence. Nature 401, p.49, (1999).

Coherent Bremsstrahlung

Charged particles buzzing through crystals create tunable coherent X-rays at buzz frequency

68. "Pendellosung Radiation and Coherent Bremsstrahlung", J.C.H. Spence and G. Reese, Acta Cryst. (P. Ewald Festschrift) 1986 Acta Cryst. A42, p. 577-585, NSF

Electron energy -loss spectroscopy.

Similar information to soft-Xray absorption spectra, with nanometer spatial resolution.

2. "Observation of double plasmon excitation in aluminium", J.C.H. Spence and A.E.C. Spargo, Phys. Rev. Letters 26, 985 (1971).

Channeling effects on secondary processes, internal source holography

Electron standing waves in crystals locate foreign dopant atoms by X-ray flourescence.

47. "ALCHEMI - a new technique for locating atoms in small crystals", J.C.H Spence and J. Tafto, J. Micros, 130, 147 (1983), NSF 80.

In-situ observation of STM operation in a TEM

Manipulate atoms by STM and watch simultaneously by TEM

124 Investigation of STM image artifacts by in-situ reflection electron microscopy. W. Lo and J. Spence. Ultramic. (1992). 48, p.433.

Atomic-scale imaging of defects, ordering. High Tc, Dislocation kink dynamics.

The atomic structure of defects controls many materials properties. First direct observation of a dislocation kink, the atomistic defect which controls the strength of materials.

154 "Observation of moving dislocation kinks and pinning". H. Kolar, J. Spence and H. Alexander. Phys. Rev. Letts. 77, p. 4031-4034 (1996).

Field emission nanotips, electron antibunching, low energy electron holography in biology.

New electron sources can field-emit from just a few atoms, and be controlled by laser.

131 "Brightness measurement of nanometer sized field emission electron sources". W. Qian, M. Scheinfein and J. Spence. J. Appl. Phys. 73, 7041 (1993).

396 "A coherent photofield electron source for fast diffractive and point-projection imaging". J.C.H. Spence, T. Vecchione and U. Weierstall. Phil Mag. 90, 4691. (2010).

Further papers not listed are on **New electron detectors, Electron holography, Atom probe STM, Inversion problem of multiple scattering, X-ray holography, diffractive imaging, Cathodoluminescence in STEM.** (see http://www.public.asu.edu/~jspence/).