Angewandte International Edition Chemie

J. S. Miller

*The author presented on this page has recently published his **10th article** in Angewandte Chemie in the last 10 years:*
"Evidence for Multicenter Bonding in Dianionic Tetracyanoethylene Dimers by Raman Spectroscopy": J. Casado, P. M. Burrezo, F. J. Ramírez, J. T. L. Navarrete, S. H. Lapidus, P. W. Stephens, H.-L. Vo, J. S. Miller, F. Mota, J. J. Novoa, *Angew. Chem.* **2013**, *125*, 6549–6553; *Angew. Chem. Int. Ed.* **2013**, *52*, 6421–6425.

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Position:	Distinguished Professor, Department of Chemistry, Adjunct Professor of Materials Science and Engineering, and Adjunct Professor of Physics, University of Utah
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Education:	1967 Bachelor of Science in Chemistry, Wayne State University 1971 PhD with Alan L. Balch, University of California, Los Angeles 1971–1972 Postdoctoral position with the late Eugene E. van Tamelen, Stanford University
Awards:	**2000** American Chemical Society Award in the Chemistry of Materials; **2003** Utah Award, Central Utah and Salt Lake City Sections of the American Chemical Society; **2004** Governor's Medal for Science and Technology, State of Utah; **2007** James C. McGroddy Prize for New Materials, American Physical Society
Current research interests:	Molecule-based materials exhibiting the technologically useful property of bulk magnetic ordering; unusual electron transfer; long, multicenter carbon–carbon bonds
Hobbies:	Photography; magnetic toys and gadgets

My favorite piece of research is … "the current potential of electrochemistry".

If I were not a scientist, I would be … a detective solving unsolved crimes by sifting through evidence for non sequiturs and clues.

My greatest achievement has been … the exceptional journey through life with my wonderful wife of 43 years and our three sons, a fantastic daughter-in-law and granddaughter, and partaking in the opportunity to having superb colleagues throughout the proverbial four corners of the earth.

My worst nightmare is … apart from family misfortunes, having an accident in the laboratory with a safety-trained co-worker getting hurt.

The most exciting thing about my research is … developing new substances with designed or unexpected properties that confound chemists, physicists and/or theorists as well as creating insight, excitement, and curiosity into science.

Guaranteed to make me laugh is … hearing a new pun or oxymoron, especially after working at Occidental Petroleum Corp. (abbreviated OXY on Wall Street).

I like refereeing when … I can appreciate an easy-to-read, well-written paper, with a new insight that makes me wish "why didn't I think of this?" and to think differently.

What I look for first in a publication is … the important new aspect of the contribution, and I find that hype and buzzwords usually camouflage the lack of significance.

If I could have dinner with three famous scientists from history, they would be … Niels Bohr, Paul Dirac, and Linus Pauling.

And I would ask them … to explain in layman's terms the purely quantum mechanical basis of magnetism as well as electron spin to me. I would also like to capture Pauling's view of the long, multicenter carbon–carbon bonding that we have been studying.

My favorite place on earth is … hard to identify as the perks of the profession enable me to travel extensively, but I suppose Hawaii is particularly enjoyable, as well as it being as distant as possible from my birthplace, Detroit, MI.

I chose chemistry as a career because … all "stuff" is composed of common building components, that is, atoms and ions, and I thrive on problem solving and creating something new that others find of interest and value and is based on complex arrangements of atoms.

My favorite foods are … pistachios and chocolate.

My most exciting discovery to date has been … our demonstration that organic-based magnets can be made, and that some are stronger magnets than iron metal.

The most interesting chemistry adventures in my career were …

… asking a clerical request from Linus Pauling not knowing I was talking with him. If I had known I would have posed more insightful questions with a meaningful dialog.

… being accused of "crystal engineering" when the evidence was to the contrary as I achieved both the target structure and magnetic ordering I sought, and by using a structurally similar cation; and use of a neutral molecule to make an organic–metal alloy with variable band filling to test fundamental concepts.

… when while developing at DuPont CR&D a method for using an ink jet printer for the fabrication of printed circuit boards, I replaced the ink with a component of a fluid used for the electroless deposition of copper. In due course, the ink jet printer nozzles plugged up and the service technician bemoaned that we were too cheap to purchase replacement ink that the manufacturer sold. I ultimately was awarded a well-cited US Patent (number 4668533) for this work that was before its time considering the current growing excitement in the industry.

… when I thought I had made an aromatic TeO_2-containing compound and later determined it was just a common diselenide, because of a colleague knowing, but not correcting the name on a mislabeled bottle.

… when I was curious as to why my co-worker was stirring a clearly rotating NaK (liquid at room temperature) reduction reaction on a stirrer-hotplate, and was informed that there was no magnetic stirring bar in the system. My curiosity mounted and I quizzed a physics colleague and instantaneously received a "… that's obvious, but why is NaK a liquid" response. I conclude that what is obvious to a chemist is not obvious to a physicist (and, of course, vice versa).

… being noted along with Bill Gates (Microsoft) in "The Last River: The Tragic Race for Shangri-la" by Todd Balf.

My 5 top papers:

1. "Electrochemical Growth of Highly Conducting Inorganic Complexes": J. S. Miller, *Science* **1976**, *194*, 189.
   High-quality single crystals of molecule-based conductors could be grown electrochemically. It later became the method of choice for the synthesis of organic superconductors.
2. "Mixed Phenazine-*N*-Methylphenazenium 7,7,8,8-Tetracyano-*p*-quinodimethanide. A Quasi-One-Dimensional "Metal-Like" System with Variable Band Filling": J. S. Miller, A. J. Epstein, *J. Am. Chem. Soc.* **1978**, *100*, 1639–1641.
   By taking note of the shape similarity of a neutral molecule and a related cation, as well as the ability of TCNQ to have several stable charge states, an organic–metal alloy with controllable band filling and electrical properties was designed and prepared.
3. "Ferromagnetic properties of one-dimensional decamethylferrocenium tetracyanoethylenide (1:1): $[Fe(\eta^5\text{-}C_5Me_5)_2]^{\bullet+}[TCNE]^{\bullet-}$": J. S. Miller, J. C. Calabrese, A. J. Epstein, R. W. Bigelow, J. H. Zhang, W. M. Reiff, *J. Chem. Soc. Chem. Commun.* **1986**, 1026–1028.
   Unpaired electron spins residing in a carbon p orbital could stabilize ferromagnetic ordering—one does not need metals for a magnet.
4. "A Room-Temperature Molecular/Organic-Based Magnet": J. M. Manriquez, G. T. Yee, R. S. McLean, A. J. Epstein, J. S. Miller, *Science* **1991**, *252*, 1415–1417.
   The magnetic critical temperature of an organic-based magnet was enhanced to significantly exceed room temperature (127 °C).
5. "Exceptionally Long ($\geq$2.9 Å) C–C Bonds between $[TCNE]^-$ Ions: Two-Electron, Four-Center π^*–π^* C–C Bonding in π-$[TCNE]_2^{2-}$": J. J. Novoa, P. Lafuente, R. E. Del Sesto, J. S. Miller, *Angew. Chem.* **2001**, *113*, 2608–2613; *Angew. Chem. Int. Ed.* **2001**, *40*, 2540–2545.
   Characterized long, multicenter carbon–carbon bonds and showed that carbon is not limited to two-center bonds that have served organic chemistry very well.

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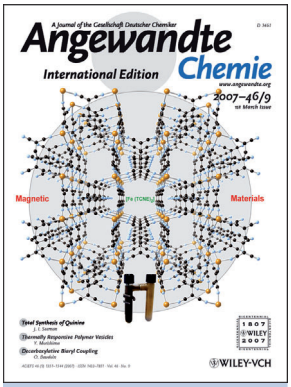

The work of J. S. Miller has been featured on the cover of Angewandte Chemie: "Cross-Linked Layered Structure of Magnetically Ordered $[Fe(TCNE)_2]\cdot z CH_2Cl_2$ Determined by Rietveld Refinement of Synchrotron Powder Diffraction Data": J.-H. Her, P. W. Stephens, K. I. Pokhodnya, M. Bonner, J. S. Miller, *Angew. Chem.* **2007**, *119*, 1543–1546; *Angew. Chem. Int. Ed.* **2007**, *46*, 1521–1524.