Obituary

Olivier Kahn (1943–99)

Olivier Kahn, a pioneer and protagonist of molecular-based magnetic materials, and a major influence on contemporary inorganic chemistry, died suddenly in Paris on 8 December of an aneurysm at the early age of 57. He had just returned from a visit to Japan, where he was collaborating with a multidisciplinary group at the Institute of Physical and Chemical Research (RIKEN), and the following day was due to chair a meeting of the French Chemical Society on coordination chemistry. These are just two examples, in his always-crowded diary, of the international reach of his interests and his intellectual roots as an inorganic coordination chemist.

Olivier Kahn played a key part in the transformation of inorganic chemistry, over the past 20 years, from a science largely concerned with individual molecules to one in which greater emphasis is placed on the behaviour of bulk material. He was born and grew up in Paris in a family in which intellectual debate, in the highest tradition of French metropolitan life, was part of the atmosphere (his brother is a noted social and political commentator on French television). Graduating first in his class in chemistry from the Ecole Nationale Supérieure de Chimie, he carried out his doctoral research at the same school. Particularly influential in developing his ideas was a postdoctoral stay in Britain, at the University of East Anglia, in the early 1970s, where he learned about the quantum-mechanical approach to magnetic interactions from the chemist Sid Kettle.

The 1950s and 1960s had witnessed a renaissance in inorganic chemistry, driven by attempts to first synthesize and then rationalize the structures and properties of new compounds, in which metal atoms (usually from the transition elements) were surrounded by organic molecules called ligands that modulate both structure and reactivity. At the time, the dominant theoretical framework for understanding inorganic properties was ligand field theory. This theory necessarily focused attention on single metal atoms and their immediate surroundings (usually organic ligands) — a mindset that became even more entrenched with the explosive flowering of organometallic chemistry.

Cracks were already beginning to appear in this purely molecular view of inorganic chemistry. They were fuelled in part by a resurgence of interest in the classical solid-state chemistry of oxides

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Magnetochemist who helped create a new approach to inorganic chemistry

and other continuous lattice compounds, pioneered by J. S. Anderson and others. It was also beginning to be appreciated how important interactions between molecules can be in determining properties of matter in bulk, such as cooperative magnetic and optical phenomena in one- or two-dimensional solids. Into this epoch burst the figure of Olivier Kahn.

Kahn grasped the opportunity presented by his appointment as the youngest full professor at the University of Paris-Sud, Orsay, to build up (and, in the expressive Gallic phrase, 'animate') a new laboratory. He was eager, following his apprenticeship in coordination chemistry and molecular quantum mechanics, to create and articulate a new subject.

Early success came with the design and synthesis of a molecular complex containing one element from the beginning (vanadium) and one from the end (copper) of the first transition series, placed side by side so that orbitals containing the unpaired electrons were strictly orthogonal to one another. This arrangement was predicted by P. W. Anderson, M. Kanamori and J. B. Goodenough to lead to a parallel alignment of the spins, resulting in ferromagnetism (that is, each molecule becomes strongly magnetized, like permanent magnets such as iron). It was a triumph. A ferromagnetic ground state was observed, though not of course one where the ordering was long range — this was molecular ferromagnetism.

In quick succession, Kahn made further marks on coordination chemistry by two contrasting *démarches*. First, with B. Briat and others, he recast the Anderson–Kanamori–Goodenough model of exchange interactions between localized magnetic moments into a form accessible to chemists. Second, he extended his synthetic success with ferromagnetic dimers to infinite chains of transition-metal ions coupled through organic bridges to make ferrimagnetic arrays, in which the spins are aligned antiparallel, but unequal contributions still produce magnetization. In this way, Kahn connected the molecular world with the physicists' paradigm of infinite one-dimensional magnetic order.

—Magnetic chains may be infinite in one sense, but are not themselves true bulk magnets because the chains must interact with each other to give three-dimensional order. It was then that Kahn showed, by a beautiful piece of supramolecular chemical tweaking, how the chains in his one-dimensional ferrimagnets could be arranged so as to give ferromagnetic interactions between the chains. Other lattice topologies followed, including one with three-dimensionally interlocking rings of metal atoms joined together by organic ligands. This one Kahn compared, with a characteristic flight of fancy, to a necklace that he had bought for his wife.

Throughout his career, first in Orsay and later Bordeaux, where he established a large and flourishing laboratory in the 1990s, Kahn led his young team by his own lively example: exclamations of delight at the latest findings of a graduate student echoed through the corridors. When a colleague chided him gently for spending little time at home, his reply was "but we are always together on Sunday afternoons".

For Olivier Kahn, finding beautiful new patterns in nature — whether strung together by necklaces of atoms in a crystal lattice or in his recent theories of molecular bi-stability as a basis for information storage — was an all-consuming passion, which he shared ebulliently with everyone he met. For his friends across the globe, as well as for the molecular sciences he espoused so eloquently, the hole left by his passing will be hard to fill. Not to see that eager figure, bolt upright in the centre of the front row in the lecture theatre, spectacles gleaming, poised to ask the first question, makes our science duller as well as sadder. **Peter Day**

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