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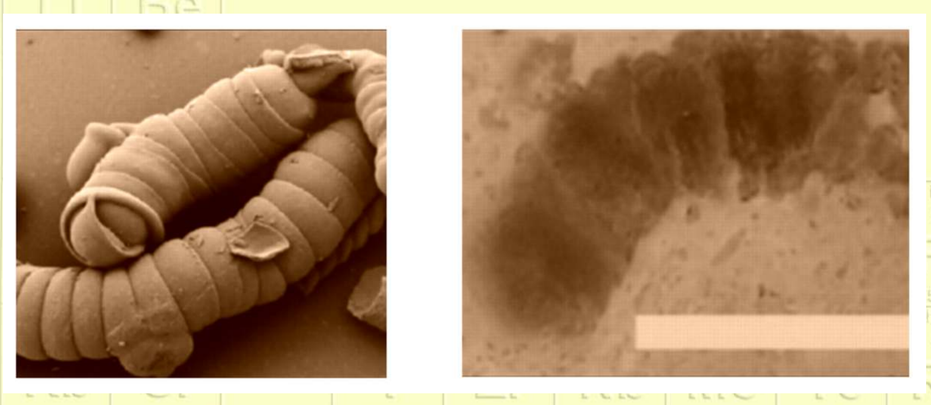
Editors: M. Gómez i J. Sales. Disseny: R. Bosque. Correspondència: noticies@qi.ub.es

Fòssils d'origen inorgànic

A new report adds to the controversy over the origin of the world's oldest known fossils [*Science*, **302**, 1194 (2003)]. Juan Manuel García-Ruiz at Spain's University of Granada; Stephen T. Hyde at Australian National University, Canberra; and coworkers found that filaments self-assembled from $BaCl_2$ and alkaline sodium silicate solutions at mildly hydrothermal temperatures (left) closely resemble the approximately 3.5 billion-year-old microfossil filaments from the Precambrian Warrawoona chert formation in Western Australia (right).

Many scientists had concluded that the microfossils originate from cyanobacteria. But because García-Ruiz and Hyde's group synthesized filaments under conditions similar to the ambient surroundings of 3.5 billion-year-old Western Australia, they speculate that the microfossils may not have formed biogenically. Furthermore, they suggest that particulate carbon residue--generally thought to derive from polyaromatic hydrocarbons and considered proof of biological origin--may actually come from high-temperature reactions of iron carbonates and water.



El ferro dels musclos, un superadhesiu

Marine mussels affix themselves to surfaces with a protein-based, cross-linked adhesive. Studies with mussel glue, extracted protein and peptide models show an $Fe(DOPA)_3$ (DOPA : protein-bound 3,4-dihydroxyphenylalanine) cross-link, which is key for the generation of this biological material [J.J. Wilker and coworkers, *Angew. Chem. Int. Ed.*, **43**, 448 (2004)].

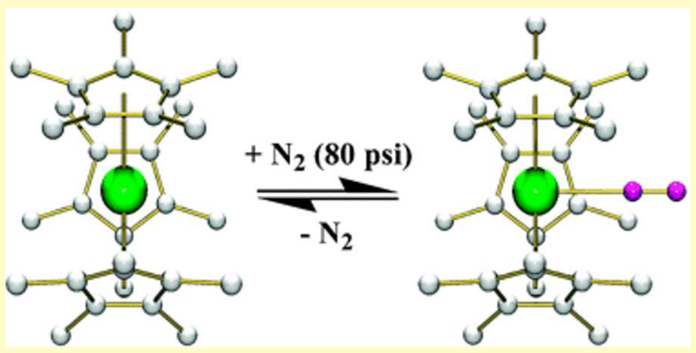
Mussel glues present the first identified case in which transition metals play an integral role in the generation of a noncrystaline biological material. The impressive properties derived from metal-protein interactions may prove to be a prevalent theme in marine biomaterials such as those of coral reef structures, kelp adhesives, and barnacle cements.

L'urani fixa el nitrogen

A new twist on the chemistry of uranium and dinitrogen (N_2) has been revealed by researchers at the University of California, Irvine. They have found that a simple complex of uranium, $(C_5Me_5)_3U$, can be forced, under pressure, to take on what for an actinide is an unlikely ligand -neutral N_2- and bind it end-on [W.J. Evans and coworkers, *J. Am. Chem. Soc.*, **125**, 14264 (2003)].

Terminal end-on binding of N_2 to transition metals is well documented, but it has never before been observed in complexes of an f element. In the three uranium-N_2 complexes reported previously, either two uranium atoms or a uranium and a molybdenum atom are bridged by the anionic $(N_2)^{2-}$ ligand.

The work could help lead to insights into nitrogen fixation.

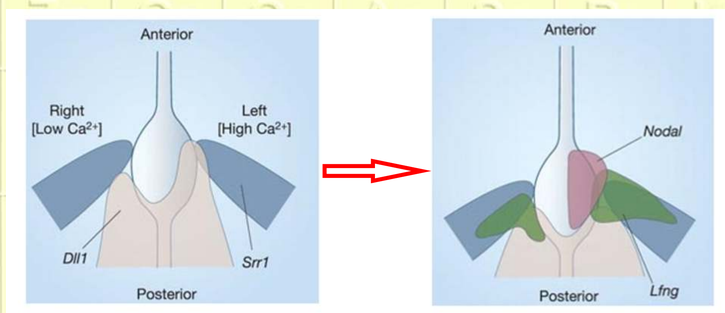


La concentració de Ca^{2+}, responsable de la nostra asimetria

In recent years, researchers have uncovered several molecular events that are involved in establishing left–right asymmetry as embryos develop. But the picture that has emerged from these studies contains significant gaps. Angel Raya, J.C. Izpurua (The Salk Institute for Biological Studies) et al. have revealed a link between an early, temporary asymmetry and later, stable patterns of asymmetric gene expression [*Nature*, **427**, 121 (2004)].

The earliest detected feature of left–right asymmetry that is common to all vertebrates is the expression of the growth-factor protein Nodal on the left side of the 'node'. In mice, Nodal expression has been shown to depend on a second signalling pathway, centred on the cell-surface-located receptor Notch. But how the Notch pathway becomes activated to trigger Nodal expression only on the left side of the node remains an open question.

The authors have uncovered a chain of events that lead from a left–right asymmetry in the electrochemical potential across the membranes of cells around the node, to the left-specific expression of Nodal. The first step in this cascade is a left-sided reduction in the activity of a membrane-spanning ion pump; this reduction results in membrane depolarization. Raya *et al*. find that this depolarization leads to a transient increase in the extracellular concentration of Ca^{2+} ions on the left of the node. And this in turn is necessary for left-sided Nodal expression - suggesting that it could be Ca^{2+} that modulates the affinity of Notch for its ligands. In support of this, the authors have discovered that ligand-dependent activation of Notch in cells is sensitive to Ca^{2+} concentration.

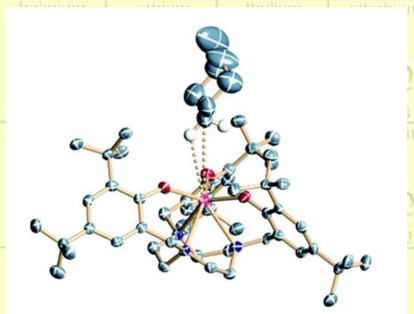


Un compost metall-alcà estable

Metal-alkane complexes are expected intermediates in catalytic C-H activation processes that lead to new C-C bond formation. These complexes have been examined in computational studies, but experimental data confirming such species are generally limited to fleeting spectroscopic sightings.Karsten Meyer and Arnold L. Rheingold and coworkers at the University of California, San Diego, now report X-ray diffraction results on a series of alkane adducts of a uranium(III) complex [*J. Am. Chem. Soc.*, **125**, 15734 (2003)].

The experimental data, supported by computational studies, make these complexes the first fully documented examples of stable metal-alkane coordination. The adducts are formed by recrystallizing a tris(hydroxybenzyl)triazacyclononane uranium complex with various alkanes. The X-ray results reveal the connectivity of the alkanes in the U(III) coordination sphere (shown here for methylcyclohexane).

The findings may provide new insight into C-H activation involving transition-metal catalysts.



Breus

- El Dr. Llordi Llorca, investigador del Departament, ha publicat el llibre *Pedres que cauen del cel* (Pagès Editors, Lleida, 2003), un interessant assaig sobre el paper dels meteorits al llarg de la història.
- S'ha publicat la versió catalana completa del *Tractat Elemental de Química* d'Antoine-Laurent Lavoisier (IEC / Editorial Pòrtic / Eumo Editorial, Barcelona, 2003).
- L'American Chemical Society, seguint indicacions del Ministeri d'Hisenda dels EEUU, ha deixat de publicar articles d'autors de Cuba, Iran, Iraq, Libia i Sudan (*Chem. Eng. News*, 24 nov. 2003, p.25; *Ibid*., 26 gen 2004, p.5).
- Els elements de nombre atòmic 113 (ununtri, Uut) i 115 (ununpenti, Uup) han estat sintetitzats per primer cop [V.T. Oganesian et al., *Phys. Rev. C*, **69**, 021601 (R) (2004)].

L'element número **14**, **silici**, va ser descobert l'any 1824 per J.J. Berzelius. El seu nom prové de la paraula llatina *silex*, que vol dir *pedra foguera*.