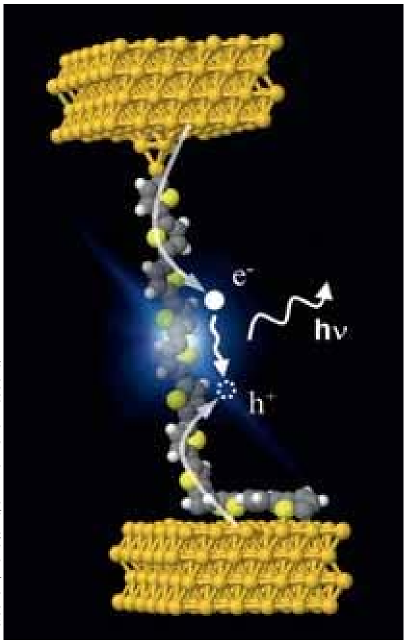

→ Artist's rendering of the electroluminescence of a single molecular polythiophene wire suspended between the tip and the surface of a scanning tunneling microscope.

Physics

Single-Molecule LED

BY BRETT KRAABEL

→ **By creating the first-ever single-molecule light-emitting diode (LED),**[1] Guillaume Schull and his colleagues at the IPCMS[2] have made significant headway toward molecular computing.

LEDs are ubiquitous devices that emit light only when an electrical current flows through them in a specific direction. Single-molecule LEDs could be one of the building blocks for future molecular computers, which would use single-molecule transistors, diodes, and other molecular components, paving the way for staggering improvements in miniaturization and power consumption.

The discovery was made accidentally, while Schull and his colleagues were studying the properties of a single polythiophene molecule stretched between a substrate and the tip of a scanning tunneling microscope. This molecule was chosen because it is long-chained and emits easy-to-detect red light. The researchers observed that polythiophene emitted light only for current flowing from the tip of the STM to the substrate, whereas almost no light was emitted for current in the opposite direction. "We had built a single-molecule LED," enthuses Schull.

With his team, he had not only created the first-ever single-molecule LED, but also developed a fabulous tool to study and manipulate individual molecules. Schull now plans to use it to look at the interface between single molecules and metallic leads—a vital connection for molecular computers. This technique opens a host of other research possibilities into single-molecule components, making the future of molecular computing very bright indeed.

01. G. Reecht et al., "Electroluminescence of a Polythiophene Molecular Wire Suspended between a Metallic Surface and the Tip of a Scanning Tunneling Microscope," *Phys. Rev. Lett.*, 2014. DOI: http://dx.doi.org/10.1103/PhysRevLett.112.047403.
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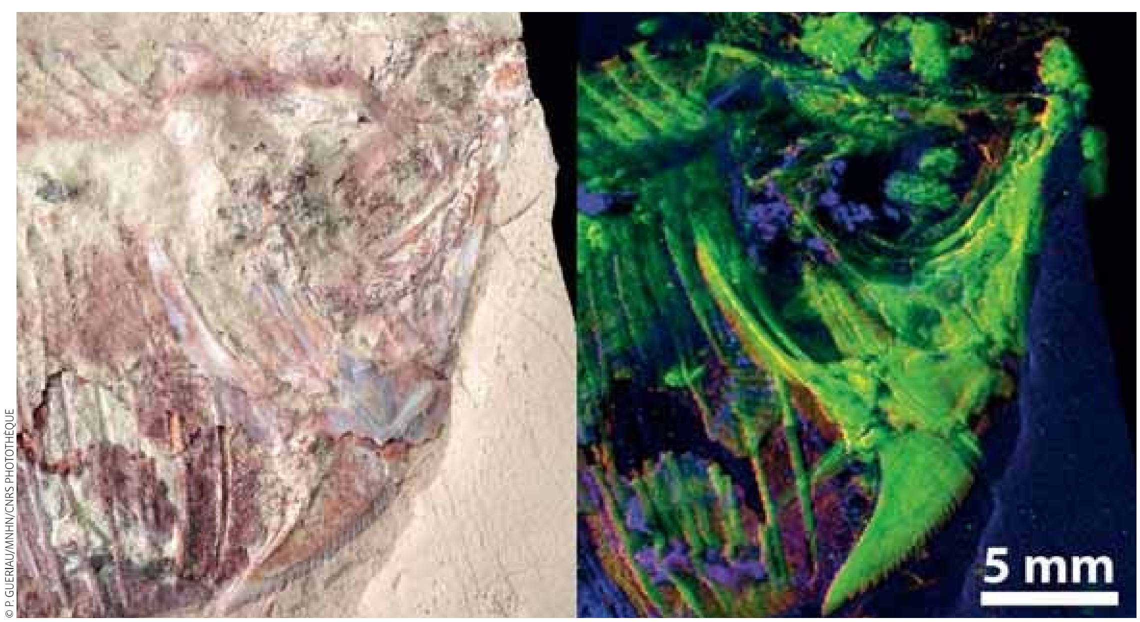
Paleontology

Rare Earths to Reconstruct Fossils

BY MARK REYNOLDS

→ **Few things look good after spending 100 million years crushed under tons of sediment and rock.** Some fossils are unearthed so mashed up that reconstructing their original form is almost impossible. Scientists at the IPANEMA laboratory[1] south of Paris have devised an unusual method to create a picture of these fossils in their youthful glory: a synchrotron beam.[2]

Fossilization occurs when a living organism is buried under sediment. Although soft tissues like muscle and skin usually do not last long enough to be preserved in the way bones are, they can, in rare conditions, be mineralized and thus fossilized. Fossils are often extremely flattened and even bones can be compressed and rearranged by the geological pressures they are under, making it hard to reconstruct their original shape.



→ Skull and vertebrae of a fish dating back 100 million years (left), and the image obtained using an X-ray fluorescence beam from a synchrotron (right) showing the distributions of iron (blue) and two rare earths: neodymium (red) and yttrium (green).