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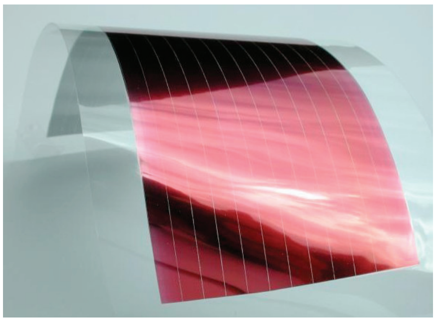
Inspired by genetics, chemistry finally takes hold of its own code

Through the fundamental work carried out by a team from the University of Geneva and the NCCR Chemical Biology, chemists may be able to attain more complex supramolecular structures.

Nature proves every day that it is both complex and efficient, and even that its complexity contributes to its efficiency. Organic chemists—chemists who work on carbon-based molecules—are envious of it; their conventional tools confine them to simpler achievements. Thanks to the work of Professor Stefan Matile's team from the University of Geneva (UNIGE), these limitations could become a thing of the past. His publication in the *Nature Chemistry* journal indeed offers a new kind of code to chemists, allowing them to access new levels of complexity.



An example of an organic photovoltaic cell.
Photo: DR

Stefan Matile opts for sincerity. For him, if organic chemistry is often fond of simplifying its functional systems, it is because it is mostly impossible for it to construct and manage molecular architectures as complex as those produced with tremendous efficiency in nature. "It's a fact", says the UNIGE professor and NCCR Chemical Biology member, "that we are far from being able to match the genius of nature."

Where the complexity arises

The specialist attributes the genetic code to this genius of nature. "It is rather simple because it is based on four foundations—adenine, cytosine, guanine, and thymine (A, C, G, and T). The double helix structure of DNA is also quite simple. The complexity arises mainly from the cell's transfer of this information from one stage to the next."

Stefan Matile has long believed that a code also exists in organic chemistry and must be discovered, which he is convinced he has achieved with the assistance of his colleague, Edvinas Orentas.

"I must admit that this work is extremely complicated, fundamental, and theoretical," the professor continues. "But I also think it's quite revolutionary, especially if we are able to implement it on a practical level."

Laying the foundation

In fact, thanks to him, organic chemists may be able to stop laboriously constructing their functional systems, atom by atom, link by link. The code would allow them to write two-dimensional maps, a relatively simple and manageable challenge. The complexity of three-dimensional systems would then be created by transcribing this scheduled information; a transcription that, with supporting proof, has a reliability of 97%, so close to perfection. A powerful way to approach the complexity of nature.

From now on, Stefan Matile's group will try to put this code into practice to produce surface materials like the ones used to make organic solar cells, which mimic the processes at work during photosynthesis. “We don’t yet know if it will work exactly as we expect, but the adventure promises to be exciting.”

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