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CNRS Organic Chemistry Lectures at Science Tokyo

Distinguished Speakers

Title: Gold(I)-Catalysis: New Asymmetric Methodologies and Applications in Total Synthesis of Natural Products

Prof. Dr. Arnaud Voituriez

CNRS, ICSN, Paris, France

Title: Selective Functionalization of Alkynes for Direct Access to Original Heterocycles

Prof. Dr. Morgan Donnard

CNRS, LIMA, Strasbourg, France

Title: Towards Sustainable Alternatives: Strategies for Fluoroalkylated Building Blocks in Industrial Applications

Prof. Dr. Frédéric Leroux

CNRS, LIMA, Strasbourg, France

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Time: 15:30 - 18:00

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Gold(I)-Catalysis: New Asymmetric Methodologies and Applications in Total Synthesis of Natural Products

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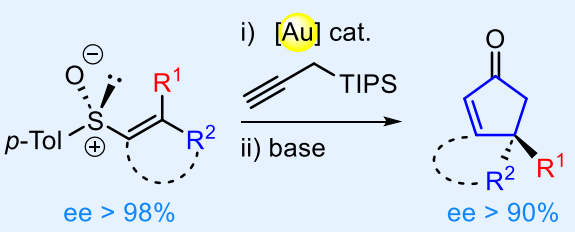
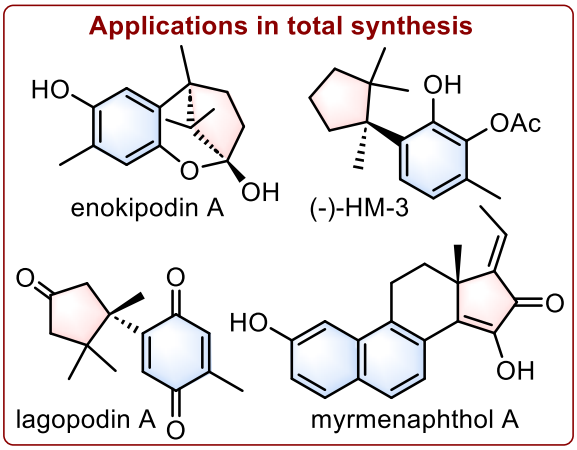
Homogeneous gold catalysis has emerged as a powerful method in organic synthesis due to the unique ability of cationic gold complexes to activate unsaturated bonds. In recent decades, gold(I)-catalyzed reactions have been widely applied to access complex molecular frameworks, including in the total synthesis of natural products.

Recently, we have developed the synthesis of cyclopentenones with C4-quaternary stereocenters through a stereospecific gold-catalyzed sulfonium [3,3]-sigmatropic rearrangement of vinyl sulfoxides. The application of this simple asymmetric methodology allowed the total synthesis of seven natural sesquiterpenoids, including hitoyopodin A, lagopodin A, isocuparene-3,4-diol and enokipodin A and B.[1a-d] This methodology has also been extended to the use of allenyl ketones or allenoates.[1e]

In addition, we have also developed a methodology for the transformation of cyclic vinyl sulfoxides into complex chiral polycylic cyclopentenones. Indeed, the synthesis of benz[*e*]inden-2-one derivatives with quaternary centers was achieved with good yields (51-78%) and excellent enantioselectivities (90-99% ee).[2] Implementation of this asymmetric transformation allowed us to perform the total synthesis of myrmenaphthol A, a natural product isolated in 2019 from a Hawaiian sponge of the genus *myrmekioderma*.[3]



- *[3,3]-Sigmatropic rearrangement of sulfoniums*
- *Formation of quaternary stereocenters*
- *Stereospecific rearrangement*
- *Broad substrate scope (>40 examples)*



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Selective Functionalization of Alkynes for Direct Access to Original Heterocycles

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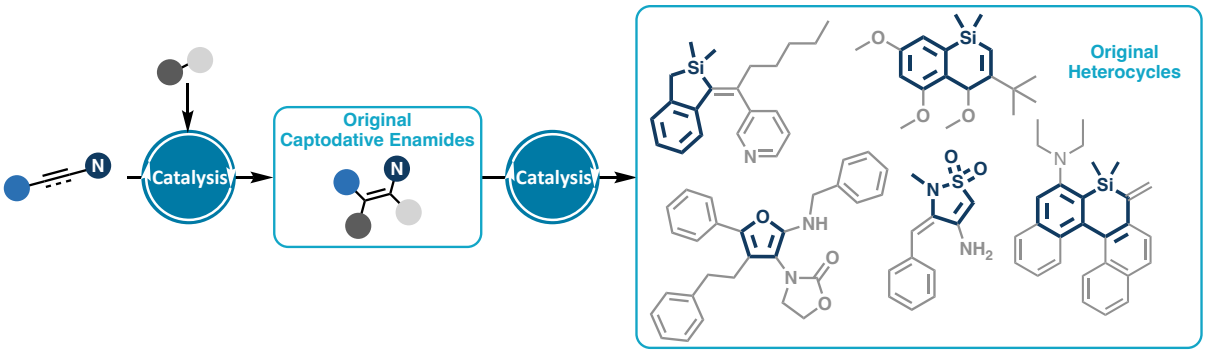
Today, there is a real need for original chemical structures in various fields such as pharmaceuticals, agrochemicals and materials. What's more, these new structures need to be synthesized efficiently in a very limited number of steps. In this talk, we will present a new family of highly functionalized building blocks based on captative enamides, opening up a wide range of applications in synthetic chemistry, particularly in heterocyclic synthesis. We will present the selective and efficient synthetic routes we have developed to access them, followed by our first applications of these building blocks to obtain totally novel heterocycles, including unprecedented silacyclic fluorophores.



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Towards Sustainable Alternatives: Strategies for Fluoroalkylated Building Blocks in Industrial Applications

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Fluorinated groups are ubiquitous in bioactive compounds because they can significantly improve their physicochemical properties. For example, the lipophilicity of a molecule can be adjusted by introducing appropriate fluorinated chains. The metabolic stability and potency of active ingredients can also be significantly impacted by the introduction of fluorinated groups.[1]

For many years, our research has focused on the synthesis of functionalized heteroarenes bearing emerging fluorinated substituents. One of our approaches was based on the use of fluoroalkylated amine reagents (FARs) as efficient and versatile tools for the regioselective introduction of fluorinated substituents.[2]

More recently, we have developed strategies towards SO_2F_2-mediated fluoroalkylation based on the activation of fluorinated alcohols,[3] allowing the *N*-, and *O*-polyfluoroalkylation to access valuable building blocks in the life sciences.

On the other hand, we have recently developed the direct deprotonative functionalization of the difluoromethyl group to access valuable difluoromethylene-containing compounds.[4]

Here we will present our recent results in these areas.

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