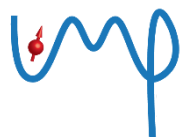


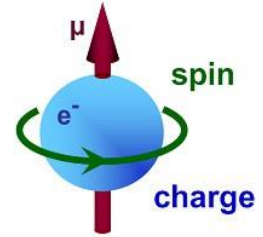
## Journée annuelle LabEx NanoSaclay

*Vincent Cros (Unité mixte de Physique, CNRS, Thales, Univ. Paris-Saclay)*



«Conventional electronics has forgotten the spin of the electron »

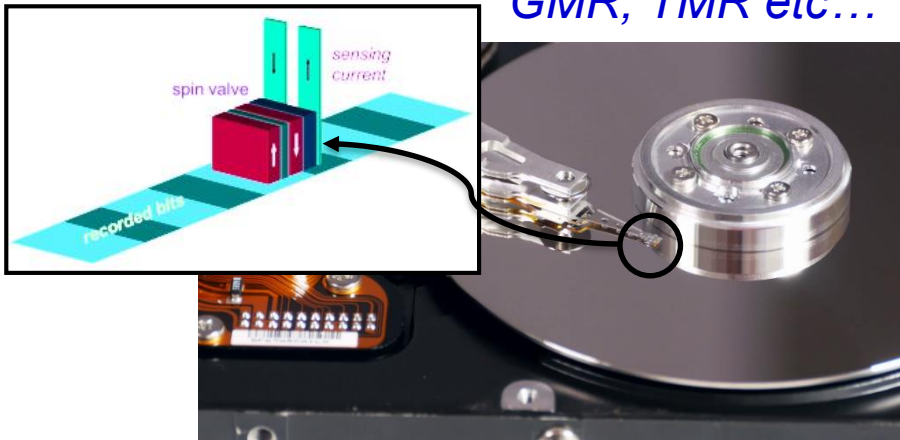
→ **SPINTRONICS**



❖ From fundamental research to applications in record time...

Magneto-resistive effects → Reading

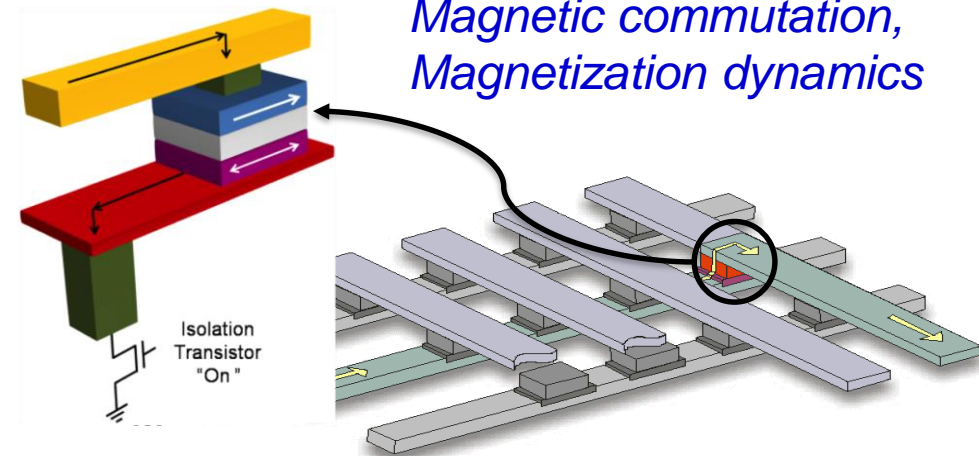
*GMR, TMR etc...*



*Magnetic sensors, HDD read heads*

Spin transfer effects → Writing

*Magnetic commutation,  
Magnetization dynamics*



*Non-volatile memories (STT-MRAM)*

→ Toward **new breakthrough applications** in Information & Communication

*Technologies : rf spintronic devices, energy harvesting devices, neuromorphic hardwares  
spintronic systems etc...*

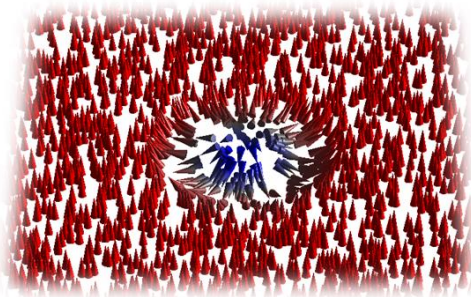
**New materials** : *ferrimagnetic or antiferromagnetic films, 2D and 3D topological materials, magnetic insulator thin films, etc...*

**New concepts** : *use of topological spin textures, propagation of magnetic excitations, manipulation of pure spin currents etc...*

**+ interfacial properties and physical effects at interfaces**

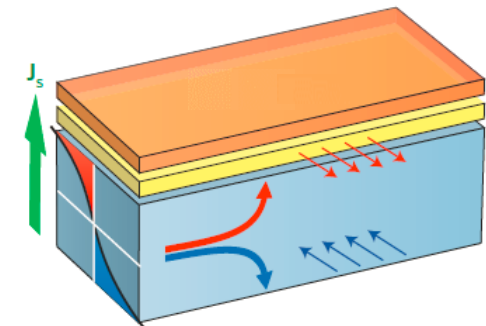
## TOPOLOGICAL SPINTRONICS:

*Use of the topological charge as a support of information*

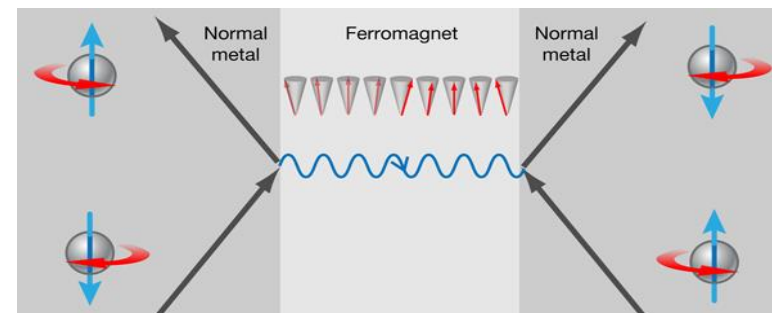
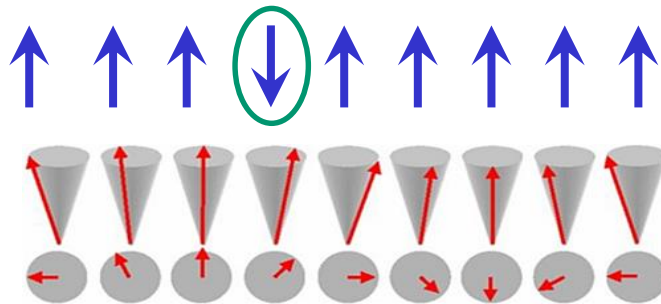


## SPIN ORBITRONICS :

*Efficient conversion between a charge current and a pure spin current*



**MAGNONICS** : *Use of elementary magnetic excitations: the magnons*

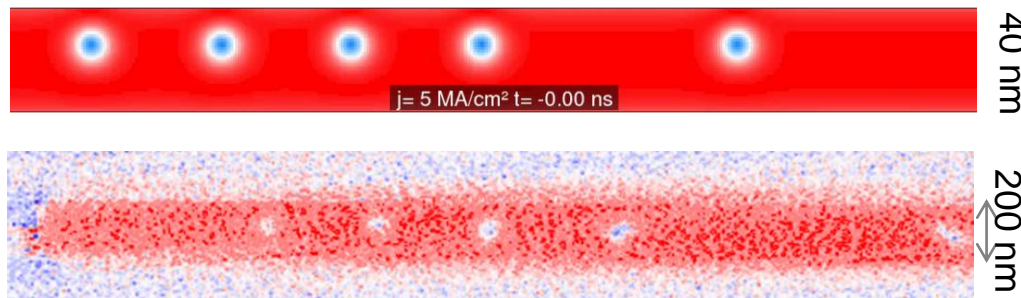




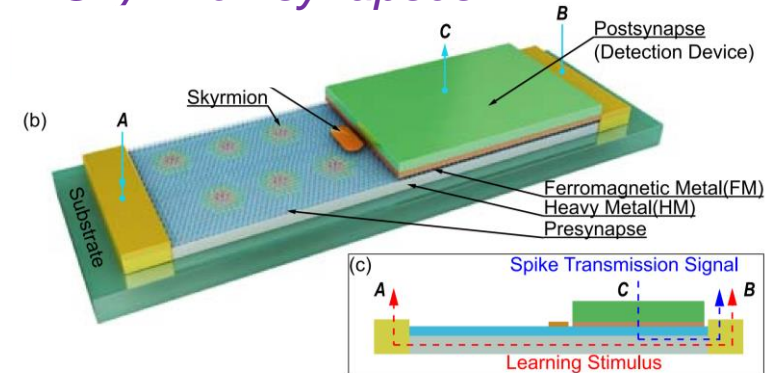
**Denser, faster, less energy consuming, multi-functional ...**

## Skyrmion based devices:

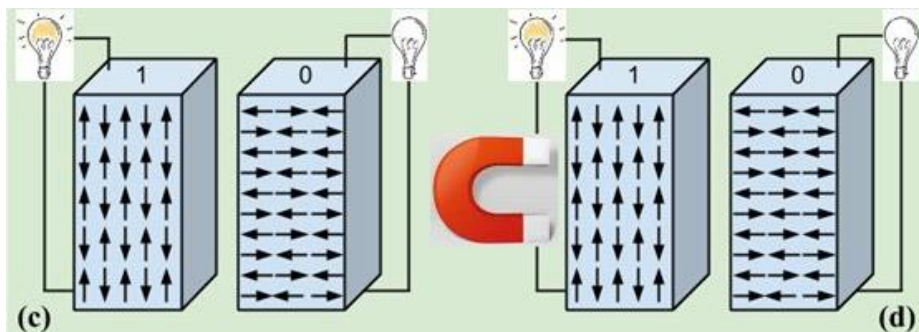
→ *Skyrmion Racetrack memory*



→ *Skyrmion synapses*

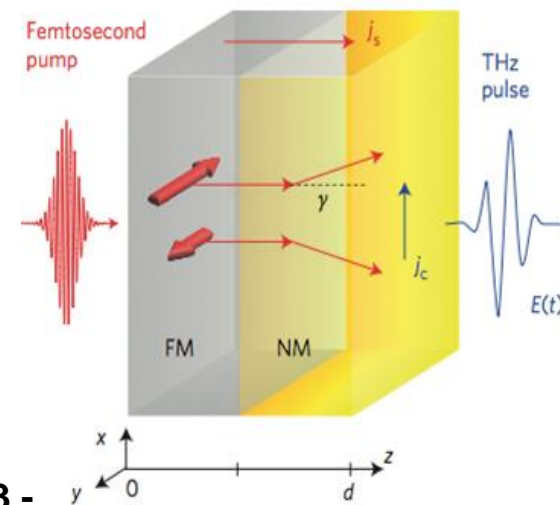


## Antiferromagnetic memories :



→ *Ultimate density, ultra-fast writing (ps)*

## THz spintronic emitters



→ *Broad band,  
large power,  
tuneable through  
magnetoelectric  
coupling*

- Two new PhD students supported by FG SPiCY
  - **Sali Salima (C2N/UMPHy)** : *Confined propagating spin-waves for data processing*, démarrage au 1<sup>er</sup> décembre 2021
  - **Sanjay René (SPEC)** : *Ultrafast spintronics* démarrage au 1<sup>er</sup> novembre 2021
- Other new PhD students in the FG SPiCY consortium
  - **Cyril Leveillé (SOLEIL/UMPHy)** : *X-ray scattering for chiral textures*
  - **Matthieu Grellier (UMPHy/SOLEIL)** : *3D spin textures in MML*
  - **Aya El Haj (Thales-UMPHy)** : *Magnonics*
  - **Katia Ho (Thales-UMPHy)** : *Complex dynamics in STNOs*
  - **Enzo Rongionne (Thales-UMPHy)** : *THz emission using interfacial spin-orbit interactions*
- New postdoc in the frame of FG SPiCY
  - **Titiksha Srivastava (SPEC/UMPHy)**



## Presentations by the 4 SPiCY PhDs

- Diana She (UMPHY/C2N/SOLEIL): *Topological insulators/magnetic systems for spin-charge conversion*
- Sujit Panigraphy (LPS): *Static and dynamic properties of skyrmions*
- Sali Salama (C2N/UMPHY): *Confined propagating spin-waves for data processing*
- Sanjay Rene (SPEC): *Ultrafast spintronics*

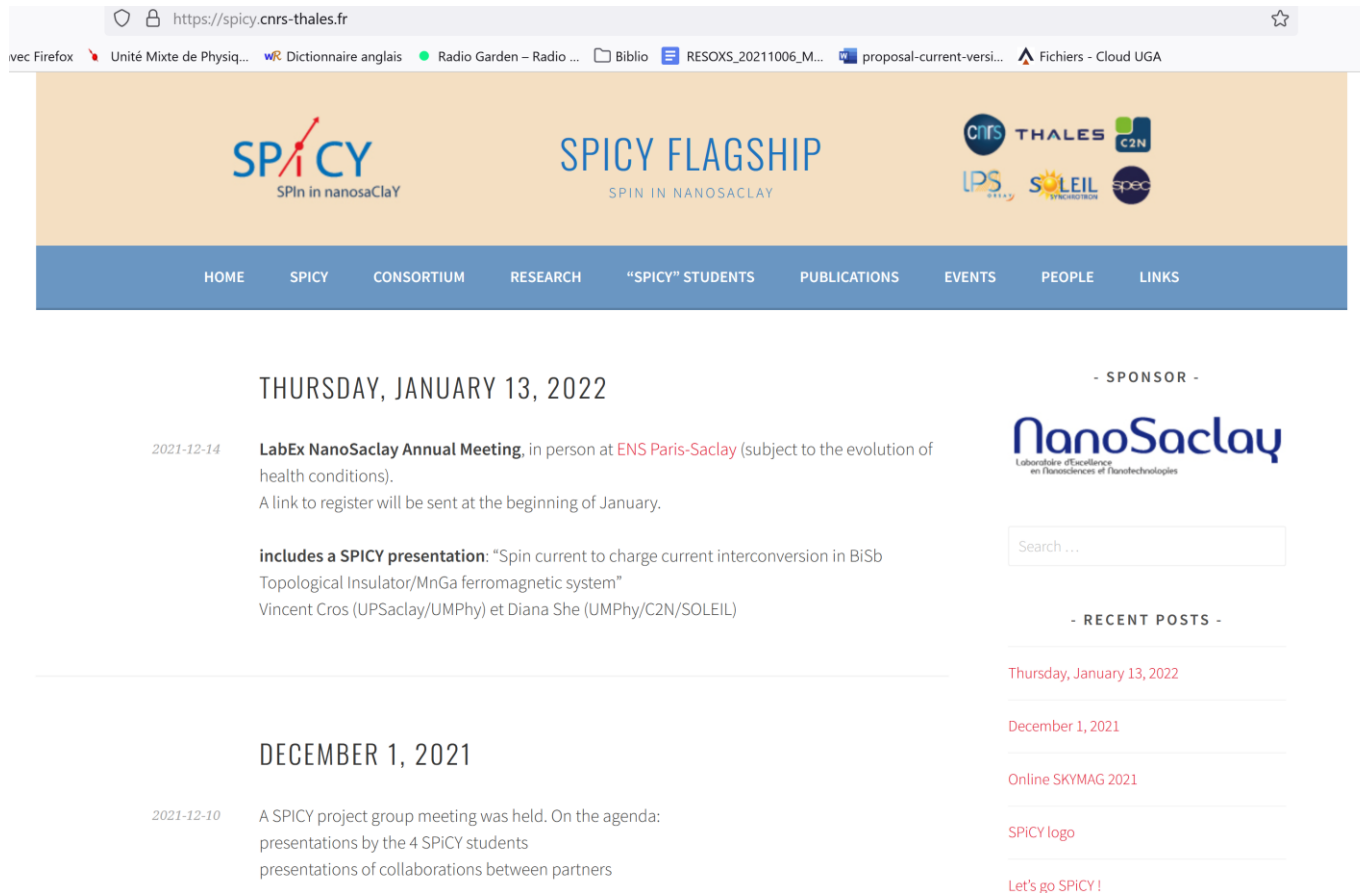
## Other presentations from SPiCY partners

- Zixin Li (SPEC) : *Skyrmions in AF + dynamics*
- Cyril Leveillé (SOLEIL/UMPHY/SPEC) : *Study of chiral magnetic textures by XRMS*
- Sajid Husain (UMPHY/LPS) : *Garnet and topological insulators for spinorbitronics*
- Titiksha Srivastava (SPEC/UMPHY/C2N) : *Resonant dynamics of skyrmion lattices*
- Matthieu Grellier/Nicolas Reyren (UMPHY/SOLEIL) : *3D magnetic textures in multilayers*

## 17:00-18:00 : Comité de pilotage

- Site web, **positionnement spintronique dans les PEPR, école spintronique SPiCY** etc..

- SPiCY website



- Publications

- 3 publications on arXiv (2021) + 2-3 others recently submitted