

Scientific Newsletter

AUTUMN 2023

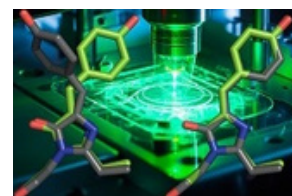


At the front page of IRIG

Fluorescent proteins switch in the cold

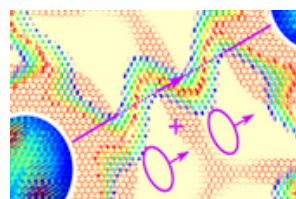
Biological molecules can be observed at the nanoscale with fluorescence nanoscopy. Researchers at IRIG develop this technique at cryogenic temperature. To this aim, they study how fluorescent proteins markers behave at very cold temperatures. They deciphered how the fluorescent protein rsEGFP2 works under cryogenic conditions. They devised an upgraded cryo-microscope that they now aim to make available to the scientific community.

Dominique Bourgeois | IBS | *Journal of the American Chemical Society*, 2023



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Helical dislocations give an additional twist to graphene

The physics of magic angle twisted bilayer graphene is revisited with dislocation concepts. This allows to rationalize twisting induced symmetry breaking and many other observed features. This work is conducted by IRIG in collaboration with University of Illinois Urbana-Champaign.

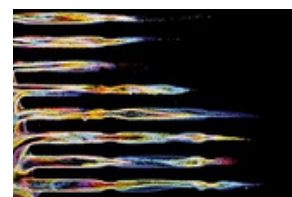
Pascal Pochet | MEM | *Extreme Mechanics Letters*, 2023

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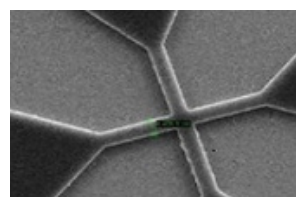
Migratory cells infiltrate tissues

50-micron-wide cells that manage to squeeze into channels 10 microns or even 4 microns in diameter! Researchers at IRIG have revealed that these cellular contortions, by the way of spectacular deformations of the nucleus, originate from a key element of their cytoskeleton: microtubules.

Manuel Thery | LPCV | *Nature Materials*, 2023



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Electron gases for magnetization control

New generations of memories are developed for logic and artificial intelligence devices with very low energy consumption. This responds to environmental concerns, and to the fact that the energy consumption of chips and the resulting overheating limits their performance. One possible approach is to develop spintronic devices that use currents to control the direction of magnetization. Researchers at IRIG have demonstrated that two-dimensional electron gases can provide this control with new functionalities

Jean-Philippe Attane | SPINTEC | *Nature Communications*, 2023

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Bacteriophages as diagnostic tools

Bacteriophages are viruses that parasitize bacteria. Harmless to humans, they are used in some packaging or dressings to inhibit bacterial proliferation. Researchers at IRIG, in collaboration with LETI/DTBS, have developed bio-active surfaces functionalized with bacteriophages, which detect pathogenic bacteria such as *Staphylococcus aureus*.

Yoann Roupioz | SyMMES | ACS Biomaterials Science & Engineering, 2023



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New cryogenic exchangers for HL-LHC at CERN

CERN in Geneva wanted to increase the luminosity of the Large Hadron Collider (HL-LHC) to boost the number and energy of particle collisions. Researchers at IRIG have taken up the challenge of designing and building new high-performance, compact 1.8 K cryogenic heat exchangers for new superconducting magnets. They will be installed in the LHC tunnel soon.

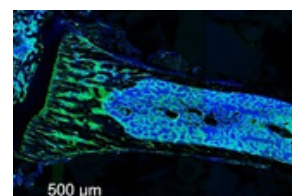
Bernard Rousset | DSBT | Cryogenics, 2022

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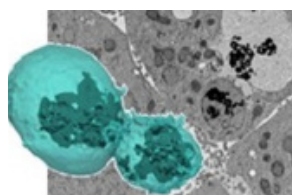
Tamoxifen activated CreERT2 recombinase is toxic for young mice

Mice are widely used as a model to study human diseases or to decipher gene activity or function *in vivo*. However, the misguided use of genetically modified mice could impair the interpretation of the results. For example, researchers at IRIG have shown that injecting tamoxifen into CreERT2 mouse resulted in unexpected toxicity and mortality.

Claire Bouvard | Biosante | Scientific Reports, 2023



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Understanding the metabolism of silver nanoparticles in the liver using a 3D hepatocyte model

Silver nanoparticles are efficient biocides massively used in consumer products and medical devices. Researchers at IRIG made use of an original 3D cellular model to study the fate of silver nanoparticles in the liver.

Aurelien Deniaud and **Giulia Veronesi** | LCBM | Environmental Science Nano, 2023

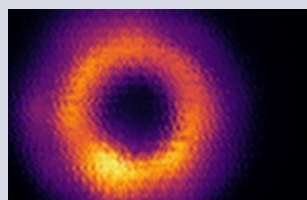
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Other scientific news of the laboratories



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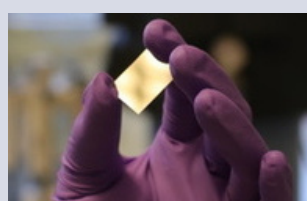
Purcell-enhanced zero-phonon emission for color centers in silicon microrings

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Quantum physics in every day life

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Preventing bacteria from settling and proliferating on the International Space Station (ISS)

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Press releases – Prizes – Others



Samuel Fauvel – Prize for the best oral communication at the Société Chimique de France annual congress

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Alexandra Yeromina – Best poster award at the NaNaX10 conference by the Royal Society of Chemistry

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