INTERDISCIPLINARY
RESEARCH INSTITUTE
OF GRENOBLE

Scientific Newsletter

WINTER 2021

Editorial

Dear Colleagues,

Like every year-end at such a time, I am pleased to accompany the publication of the Irig scientific letter with a few words. The main purpose is to share with you the elements that seem to me to have marked the year that is ending. Unfortunately, it is difficult not to start by mentioning the health crisis we are going through, with a new wave of infections whose magnitude is still difficult to grasp. We are facing an event that disrupts our daily life and weakens many mechanisms and balances on a global scale. Each of us is facing this situation individually while the communities are constantly trying to adapt in order to find the best compromise between maintaining our activities, whether professional, cultural or sports, and the necessary caution in the face of the pandemic. In such a context, it seems to me that we can, because of our scientific culture, play a particular role by trying to speak as objectively and rationally as possible, a speech that is both humble and full of hope inspired by the confidence we have in the advances that will be made to strengthen our preventive and therapeutic arsenal against SARS-CoV2. As you may know, several IRIG teams are brilliantly involved in these advances.
The past year has been marked by numerous outstanding scientific results, such as those you will discover in this letter. These results make the IRIG laboratories actors in major issues for the planet and its inhabitants; in this way, they give sense to our activity, whether it is in the field of research or support to research. This activity must be carried out in a favorable environment, in which each and every one of you is offered the capacity to fully develop in your work. As I write this, I am fully aware of the work that remains to be done. The year 2022 will be resolutely turned towards this objective, with in particular the pursuit of the action that has been undertaken on the analysis of psycho-social risks and the resumption of reflections and initiatives with a view to ensuring that the IRIG becomes an increasingly shared project.
Many of you would like the institute's laboratories to be grouped together in a limited number of buildings in order to enhance user-friendliness, equipment sharing and interaction between disciplines. Responding to this expectation is one of the priority objectives of the IRIG board. A dynamic has been launched thanks to the support of the CEA's general management, of the CEA/DRF division and of the CEA/Grenoble center. Renovation work on buildings 10.05 and C3 has already made it possible to bring together a large part of the Nano-Physics Department and the Institute's support teams, respectively. The general assembly of IRIG staff to be held on January 31 will be an opportunity to present an assessment of these actions, as well as the prospects that should open up to us thanks to the project that IRIG has submitted under the new State-Region Plan Contract (CPER).

The year 2022 is fast approaching. I hope that this new year will allow our community to continue to grow; each of us can work at his level to move in this direction. This year will be special for me as I have decided to stop my professional activity during the second semester. A new management team of the IRIG will therefore be put in place. I have no doubt that this change will bring a new impetus to the construction of this very beautiful object that is IRIG. I will obviously put all my energy in the coming months to prepare this transition while continuing my current missions, listening to you.

I wish you a merry Christmas and a very nice holiday season!

Jérôme Garin, Head of the Interdisciplinary Research Institute of Grenoble

At the front page of IRIG

Towards tailored, biosourced biocides

Design of tailored biocides, *i.e.* depending on their use, capable of releasing the necessary dose of metal ions while avoiding the untimely release of toxic ions into the environment.

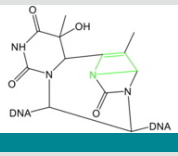
READ MORE

Thierry Rabilloud
LCBM
J Colloid Interface Sci., 2021 and *Environmental Science: Nano*, 2021

Phototoxicity: A simple solution for a complex exposure

Build on a data processing method developed for optimizing cancer drug combinations to account for synergies and antagonisms in DNA responses to UVB and UVA.

READ MORE

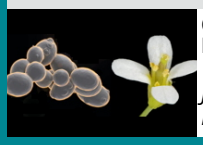


T. Douki & A. Buhot
Symmes
J Photochem Photobiol B, 2021 and *Photochem Photobiol*, 2021

Uranium uptake in plants and yeast

For the first time, work describes the pathways of uranium entry in two model eukaryotic organisms: the plant *Arabidopsis thaliana* and in the yeast *Saccharomyces cerevisiae*.

READ MORE

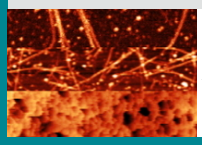


C. Alban & S. Ravanel
LPCV
Journal of Hazardous Materials, **a** and **b**, 2022

The incredible resistance of tardigrades to environmental stress

The transition from the soluble monomer state to the gel form of an intrinsically disordered tardigrade protein, could account for the protective role in the tardigrade response to environmental stress.

READ MORE

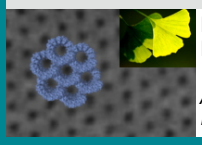


Martin Blackledge
IBS
Angewandte Chemie International Edition in English, 2021

Nature of *Ginkgo biloba* opens doors to the nanoworld

The development of a functionalizable cell-like multilayer support with patterns smaller than 10 nm was made possible by the use of a plant protein.

READ MORE

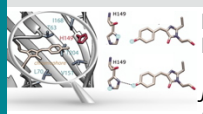


PH Elchinger - Symmes
R. Dumas - LPCV
ACS Applied Nano Materials, 2021

Zooming on the environment of the chromophore of a fluorescent protein by NMR spectroscopy

This work introduces NMR in the study of fluorescent proteins as a new tool to probe the populations and dynamics of the different conformations of the chromophore under a variety of physiologically relevant conditions.

READ MORE

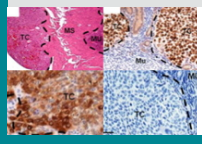


Bernhard Brutscher
IBS
Journal of the American Chemical Society, 2021

How does NLRP7 protein contribute to placental tumor cell camouflage?

This work suggests that the NLRP7 protein could be considered as a therapeutic target to treat gestational choriocarcinoma, a very aggressive cancer. Clinical studies will test this hypothesis.

READ MORE



Nadia Alfaidy
Biosanté
Cancers (Basel), 2021

World-leading technology for NMR and DNP analysis

Dynamic Nuclear Polarization increases the sensitivity of conventional solid-state NMR by several orders of magnitude. After more than ten years of research and development, scientific results previously unattainable with even the best prototypes have been obtained.

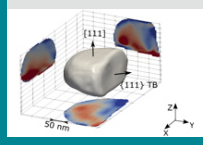
READ MORE

Éric Bouleau - DSBT
Gaël De Paëpe - MEM

3D X-ray imaging to scan the car catalytic converter

Coherent X-ray diffraction imaging and the development of a neural network algorithm made possible the automated characterization of deformations in platinum nanoparticles.

READ MORE

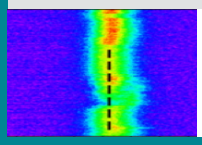


Marie-Ingrid Richard
MEM
Nature Communications, 2021 and *npj Computational Materials*, 2021

The spectrum of holes haunts qubits

Usually, quantum engineering designs quantum bits with semiconductor components, exploiting the properties of superconducting elements or electrons. Here a very promising alternative is presented which uses holes instead of electrons.

READ MORE



Xavier Jehl & Romain Maurand
Pheliqs
Physical Review Applied, 2021

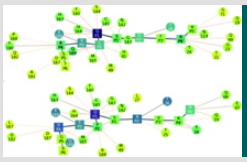
A novel spintronic element for neuromorphic circuits

Development of a new type of compact memristor capable of mimicking the behavior of a synapse using the tools of spintronics.

READ MORE

Lucian Prejbeanu
Spintec
Nanoscale, 2021

Other scientific news of the IRIG laboratories



Towards the discovery of peptides that inhibit the main protease of SARS-CoV-2

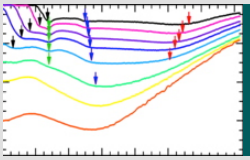
READ MORE

The European PPI4HPC project echoes high-performance computing at CEA for the modelisation of complex molecular assemblages

READ MORE

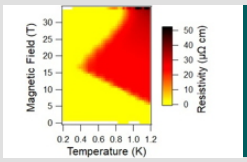
4th BIOMAT congress 2021 & 1st BIOMAT Young Scientists's Day

READ MORE



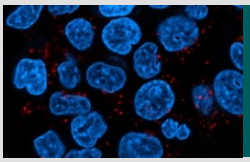
Fermi-surface instabilities in the topological superconductor UTe_2

READ MORE



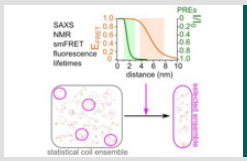
Magnetic field-reinforced superconductivity

READ MORE



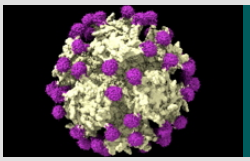
Lipophilic copper chelators encapsulated in lipid nanovectors: A lead against Wilson's disease?

READ MORE



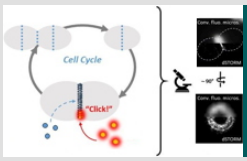
A new technique combining single molecule FRET, NMR and SAXS to describe intrinsically disordered proteins

READ MORE



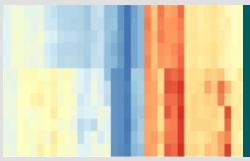
An exclusive licence on a patented vaccine technology developed at IBS

READ MORE



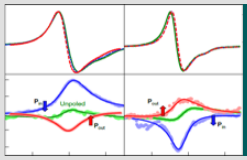
Click and Collect at High Resolution: A new strategy to unravel the secrets of bacterial division

READ MORE



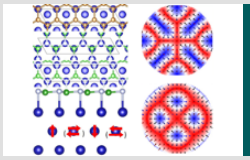
BMP9 and BMP10: They look similar but have different roles *in vivo*

READ MORE



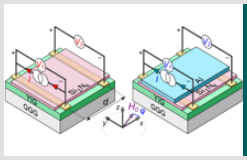
Room-temperature ferroelectric switching of spin-to-charge conversion in GeTe

READ MORE



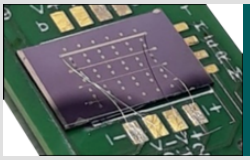
Dzyaloshinskii–Moriya Interaction and Skyrmion States at 2D Materials/Co Interfaces

READ MORE



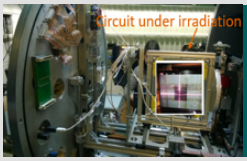
Spin diffusion length of thermal magnons

READ MORE



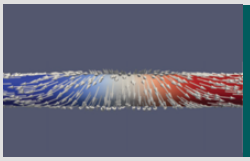
Penetration depth of Cooper pairs in antiferromagnets

READ MORE



Heavy ion irradiation effects on advanced Perpendicular Anisotropy Spin-Transfer Torque Magnetic Tunnel Junction

READ MORE



Time-resolved magnetic imaging of Œrsted-field effects in cylindrical nanowires

READ MORE

Press releases - Prizes

Andréa Dessen - Silver medal 2021 of the CNRS

READ MORE

Hélène Malet - Bronze medal 2021 of the CNRS

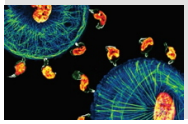
READ MORE

In 2021, IRIG celebrates science

fête de la Science 30 ans

READ MORE

Hematopoietic stem cells deform to differentiate



READ MORE

Hélène Béa and Jean-Philippe Attané named respectively Junior and Senior members of the Institut Universitaire de France

IUF institut universitaire de France

READ MORE

Biology and Biotechnology for Health
UMR_S 1292
CEA/Inserm/UGA
Biosante-lab.fr/en

Chemistry and Biology of Metals
UMR 5249
CEA/CNRS/UGA
www.CBM-lab.fr/en

Institut de Biologie Structurale
UMR 5075
CEA/CNRS/UGA
www.ibs.fr/spip.php?lang=en

Modeling and Exploration of Materials
UMR CEA/UGA
www.MEM-lab.fr/en

Quantum Photonics, Electronics and Engineering
UMR CEA/UGA
www.Pheliqs.fr/en

Cell & Plant Physiology
UMR
CEA/CNRS/UGA/Inrae
www.LPCV.fr/en

Low Temperature Systems Department
UMR
CEA/UGA
www.d-SBT.fr/en

Spintronics and Component Technology
UMR 8191
CEA/CNRS/UGA/G-INP
www.Spintec.fr

Molecular Systems and nanoMaterials for Energy and Health
UMR 5819
CEA/CNRS/UGA
www.Symmes.fr/en

irig.cea.fr

Interdisciplinary Research Institute of Grenoble
CEA-Grenoble
17 avenue des Martyrs
38054 Grenoble cedex 9

www.cea.fr/drf/irig/english/News/Newsletter

Head:
Jérôme Garin and Pascale Bayle-Guillemaud

Publishing Director
Jérôme Garin
Editor and electronic format
Pascal Martinez

Editorial Board:
Claude Alban, Nadia Alfaidy, Martin Blackledge, Éric Bouleau, Bernhard Brutscher, Arnaud Buhot, Gaël De Paëpe, Thierry Douki, Renaud Dumas, Pierre-Henri Elchinger, Alain Farchi, Xavier Jehl, Lucian Prejbeanu, Thierry Rabilloud, Romain Romand, Stéphane Ravanel, Marie-Ingrid Richard, Patrick Warin