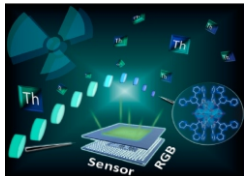


## Reporting on latest global developments in health, safety and environment

### Radiation detection based on a fluorochromic and piezochromic nanocluster

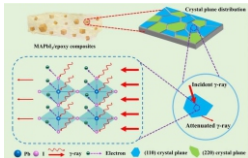


Th-101 is a Colorimetric ionizing-radiation-responsive material.

Integration of thorium cation and photoresponsive terpyridine carboxylate ligand gives rise to a thorium nanocluster, Th-101, which displays fluorochromic response and unprecedented piezochromic behavior among all actinide materials. The emission color of Th-101 exhibits a gradual transition from blue to cyan to green upon irradiation with accumulated dose, which renders colorimetric dosimetry of ionizing radiation based on a red-green-blue (RGB) concept.

*Dong and Fang. Light: Science & Applications (2023) 12:8*

### Radiation Shielding: MAPbI3/epoxy composites exhibit superior performance



Metal halide perovskites (MHPs) have been increasingly gaining attention as high performance, yet low cost radiation shielding materials. MAPbI<sub>3</sub> –Epoxy composites prepared by a simple method, employing a crystal plane engineering strategy, showed a high shielding performance against gamma rays in terms of a larger mass attenuation coefficient and linear attenuation coefficient compared to commonly used shielding materials. The long term stability of this composite with respect to moisture, irradiation and temperature needs to be studied for its possible diverse applications. Futuristically, these may serve as lead free MHPs for reduced environmental toxicity.

*Dong and Fang. Light: Science & Applications (2023) 12:8*

### Synthetic Hibernation: A tool to mitigate radiation induced toxicity?



In the recent times, hibernation has been proposed as possible mitigation against radiation based on studies that show that hibernators are resistant to acute high dose rate radiation exposure. Artificially induced hibernation, also termed as synthetic torpor was successfully demonstrated in rats with the results showing increased radio resistance. In an interesting study in arctic ground squirrels, it has been shown that radiation-induced genomic instability is avoided during torpor-arousal-cycles, by preventing DNA damage and promoting efficient DNA repair. Understanding this adaptive mechanism will be highly promising for future human space missions. Also understanding the mechanism of muscle preservation by hibernators might help astronauts to keep their strength and physical health.

*Anggraeini Puspitasari, Matteo Cerri, Akihisa Takahashi, Y. Yoshida, K. Hanamura, and Walter Tinganelli. Life. (2021), 11(1): 54.*

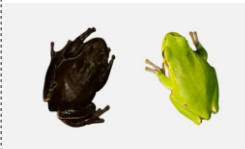
### Blue carbon as a natural climate solution



The Blue Carbon concept was introduced as a metaphor aimed at highlighting that, coastal ecosystems, in addition to terrestrial forests (coined as Green Carbon), contribute significantly to the organic carbon sequestration. Oceans provide a long term, nature-based solution to reduce CO<sub>2</sub> concentrations in the atmosphere. This is done by carbon that can be stored long term in the soils and vegetation of marine ecosystems, such as mangrove forests, salt marshes and seagrass meadows. Using natural and artificial radionuclides to measure the rates and origin of sediment accumulation, one can determine accurate carbon storage rates – known as carbon sequestration in vegetated coastal areas, allowing scientists to determine which Blue Carbon habitats are more efficient carbon sinks.

*P. Macreadie, M. Duarte de Paula Costa, T. B. Atwood, C. M. Duarte. Nature Reviews Earth & Environment, 2021, 2(12)*

### Unusual evolution of tree frog populations in the Chernobyl exclusion zone



More than ten generations of frogs have passed since the Chernobyl accident and a classic process of natural selection explains why the dark frogs are now the dominant type for the species within the Chernobyl Exclusion Zone. It is apparent that frogs with darker coloration, also present at the time of the accident, would have been favored by the protective action of melanin. Melanin's protective role extends to ionizing radiation too, as it has been shown with fungi. Melanin absorbs and dissipates part of the radiation energy. In addition, it can scavenge and neutralize ionized molecules inside the cell, such as reactive oxygen species. The dark frogs would have survived the radiation better and reproduced more successfully. Incidentally, Chernobyl has become a refuge for wildlife 3 decades after the nuclear accident. The diversity of wildlife has been documented by the TREE project of UK's centre for Ecology and Hydrology.

*Clément Car, André Gilles, Olivier Armant, Pablo Burraco, Karine Beaugelin-Seiller, Sergey Gashchak, Virginie Camilleri, Isabelle Cavalié, Patrick Laloï, Christelle Adam-Guillermin, Germán Orizaola, and Jean-Marc Bonzom. Evol Appl. 2022 15(2): 203–219.*