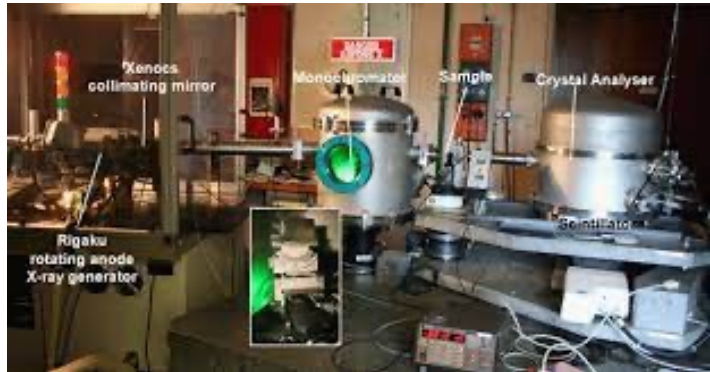




Thomas Zemb
 Staff scientist at CEA (1979-)
 Research Director and Pr. INSTN (1992-)

Positions at CEA:

- ❑ 1985–1989: Visiting scientist at ANU Canberra
- ❑ 1995: Creation of the Saclay Colloid group (now “LIONS”)
- ❑ 1995: Head of Service de Chimie moléculaire, Laboratoire CNRS–CEA “Claude Fréjacques” and nomination as a Full Professor in colloidal chemistry at Institut National des Sciences et Techniques Nucléaires (INSTN)
- ❑ 2004–2015: Founding Director of the Marcoule Institute for Separation Chemistry



Bonse-Hart et Huxley-Holmes cameras assembled and used at CEA Saclay (1991–2019)



My two laboratories in Canberra (@RSPS and RSC) Australian National University (ANU) 1985–1989



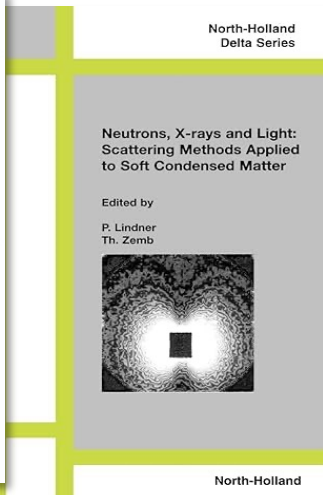
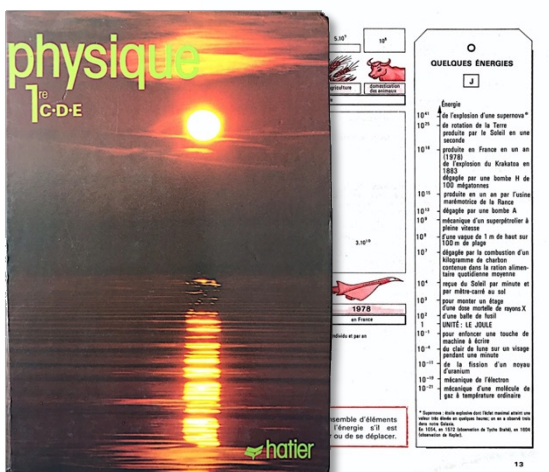
Institut de **Chimie Séparative** de **Marcoule** Foundation as FRE 2629 CEA/CNRS/UM and ENSCM in 2004, opening of the experimental facilities in 2010, and founding Director till 2015

Awards

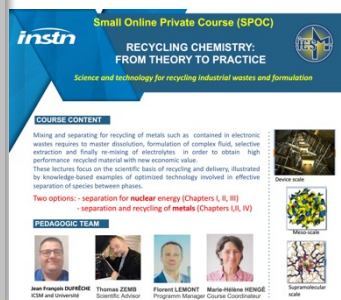
- ❑ SFC Physical Chemistry prize (1985)
- ❑ Paul Pascal Prize Academy of Science (2003)
- ❑ ECIS–Rhodia Price (2003)
- ❑ Humboldt Gay–Lussac Price (2009)
- ❑ Thomas–Graham medal (2013)
- ❑ Overbeek ECIS Gold medal (2015)
- ❑ SIS Kash Mittal prize (2024)

Books

School books and textbooks for students using X-ray, neutron, or light scattering



and Specialized Open Course INSTN/UM “Recycling Chemistry”



Humboldt-fellow at FUB (2024)



Fundamental colloidal science

At UMR Claude Fréjacques (1979–1985)

Demonstration by SAXS/SANS & Rayleigh/quasi-elastic light of the structure of the o/w interface of direct and inverse micelles.

At the Australian National University (1985–1989)

Investigation and understanding of the electrical anti-percolation phenomenon observed in many microemulsions and general explanation by the stacking constraints of molecular films.

At the Small Angle Scattering Laboratory (created in 1989–1992) in the Molecular Chemistry Department

First detection of weak w/o aggregates at the origin of all liquid-liquid extraction and are not only supramolecular complexes of fixed stoichiometry.

At the LIONS laboratory (created in 1992–2003)

In the search for model solid surfaces enabling the study of ion separation, fortuitous discovery of the existence of giant "catanionic" colloids formed of solid bilayers of size and shape that can be controlled by formulation.

At the Institut de Chimie Séparative de Marcoule (2004–)

Management of activities linking the structure and thermodynamics of colloidal systems for separation. Thanks to the REE-CYCLE ERC, development of the "ienaic" approach in collaboration with J.-F. Dufrière. This has led to the multi-scale observation, understanding, and implementation of hydrotropes for sober extraction without surfactants, but also without solvents or even extractants.

Projects in progress in 2024

Highly hydrophilic surfactants forming direct micelles without water and their applications, direct micelles with Univ. Regensburg, pheromones, and aerosols with MPIKG Potsdam and Université de Tours, and anti-viral nanoparticles with Freie Univ. Berlin.

Design, construction, and usage of original instruments adapted to study colloids

In the small-angle X-ray laboratory at Saclay (1988–1992)

Design and construction on a single rotating anode source of two original X-ray cameras with a dynamic range of three decades in scattering angle and 4 decades in absolute intensity for use on numerous colloidal systems, including the first detection of weak aggregates responsible for extraction as implemented at La Hague & application of the same optics in the APS Soleil (initial configuration of the ID02 line).

In the LIONS group (1992–2003)

Development of a complete osmotic pressure platform covering seven decades: equation of state of latex, catanionic systems, swelling by impregnation of wood, control of mixed phospholipid and glycolipid membranes.

ICSM (2004–2015)

Development of an optically isolated instrumented apparatus and sonochemistry.

ERC REE-CYCLE (2013–2019)

On-line X-ray fluorescence measurement device for milli-fluidic extraction (with Jean-Christophe Gabriel).

Projects in progress in 2024

Development of a Rayleigh quasi-elastic scattering DLS device coupled to a turbidimeter and a reflectometer with an industrial company (Cordouan instruments), and gentle centrifugation coupled to a fast mixer used close to a critical composition with ENSIACET (Toulouse).

Practical applications resulting from research chemistry since 1990

Catanionics

Co-crystallisation developed and patented for anti-corrosion protection in saline environments and the reduction of aqueous friction (abandoned in 2008) and which subsequently proved to be effective as the basis for patents for make-up removers for L'Oréal and also to be crucial for the optimization of formulations introducing cationic lipids into lipid nanoparticles of mRNA vaccine vectors.

Uranium nanoparticles

The study of diagrams containing uranyl cations and structural agents has made it possible to propose new ways of synthesizing controlled uranium nanoparticles, with the possibility of obtaining more homogeneous mixtures before ceramisation.

Weak molecular aggregates for fine separation

Patents covering synergies and the use of hydrotropic modifiers in the liquid-liquid extraction of metals, currently being extended to extraction from biomass. In particular, the use of hydrotropes in extraction formulations opens up prospects for faster, more efficient processes that minimize the effluents needed for metal recycling, as well as for the future fast neutron cycle.

Project in progress

Catanionic nanodisks as low cytotoxicity anti-viral agents...

carried out in colloidal separation

My activity as a staff scientist (1979–1985) at CEA, in research, instrumentation, and applications was preceded by ten years of varied initiations into experimental practice and teaching

Nuclear physics laboratory technician at Kronenbourg: induced radioactivity on a van de Graaf accelerator (1969) with Prof. P. Sens; EPR technician supervised by Francis Perrin on mobility in porous materials for storage (1971); Diplomarbeit at ETH Zurich on activation analysis via alpha emitted by fusion (D,T) produced by a laboratory accelerator with Prof. P. Marmier (1973); installer and technician at the Palais de la Découverte: setting up of the EPR system (1971). P. Marmier (1973); fitter and technician at the Palais de la Découverte: set-up of the computerized stand explaining the photoelectric effect for the Einstein centenary exhibition (1975); DEA in enzymology at the Institut Pasteur (H. Buc) (1974), military scientist of the contingent in neutronics (1977) and 3rd cycle thesis in Biophysics at the Institut Curie (1978) on the fluorescence of DNA bases detected by photon counting with Prof. M. Duquesne (1978); Full-time associate professor in secondary education from 1976 to 1979 (teaching BTS electrical engineering at the Lycée Technique du Bâtiment in Paris and technology at the ZEP Henri Barbusse secondary school in Ivry-sur-Seine) and teaching practical work in optics and electronics in preparation for the agrégation (ENS St Cloud).