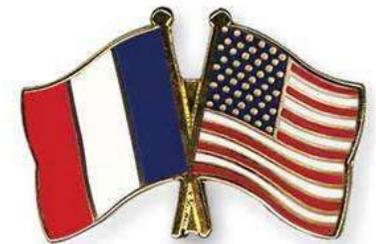


## Postdoc Opportunities in France

Olivier VACUS, Scientific Director of the CEA's Military Applications Division

Stockpile Stewardship Academic Program Symposium

June 11<sup>th</sup>, 2025, Chicago



# DAM centers in France ...



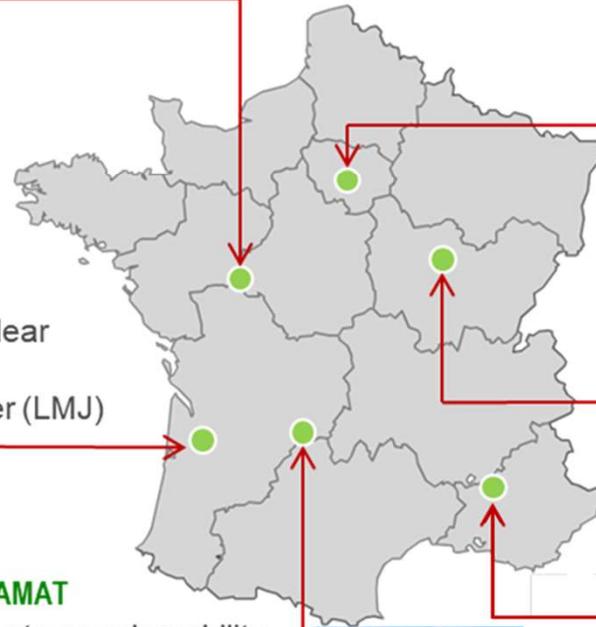
## LE RIPAULT

- Non-nuclear materials



## DAM ÎLE-DE-FRANCE

- Physics package conception and guarantee
  - Basic physics
- High performance computing
  - Treaty monitoring
  - Nuclear engineering



## CESTA

- Architect of nuclear warheads
- Megajoule Laser (LMJ)



## VALDUC

- Nuclear materials
- EPURE



## GRAMAT

- Systems vulnerability and conventional weapons efficiency



## INBS PN CADARACHE

*(no student)*



# ... to enjoy a postdoc experience



LER

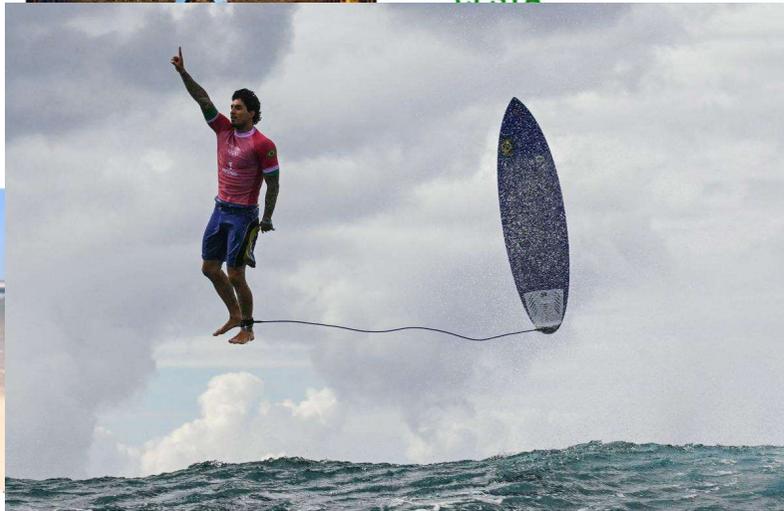
- No



• FIG



CESTA



# CEA and CEA's Military Applications Division



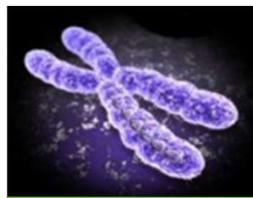
## CEA

Defense  
&  
Security



Nuclear and  
renewable  
energies

Technological  
research for  
industry

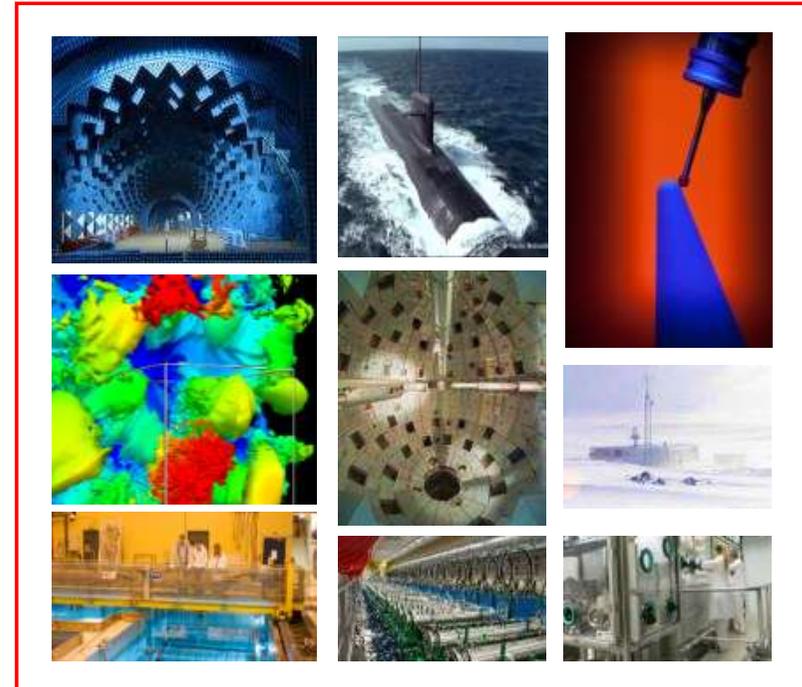


Fundamental  
research  
(physical sciences  
and life sciences)

- 4 Operational Divisions
- 9 Centers
- 9 Administration Divisions

**17 100 staff**

## DAM



- 5 Program Directorates
- 5 Operational Directorates (Centers)
- 5 Administration Directorates

**4 990 staff**

# CEA/DAM missions

« CONTRACTING  
AUTHORITY »



**NUCLEAR WARHEADS**

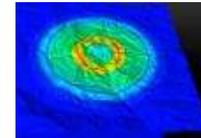
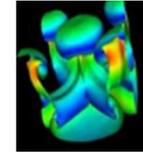
**NUCLEAR PROPULSION**

**NUCLEAR MATERIALS**  
(weapons and nuclear propulsion)

**SECURITY AND NON-PROLIFERATION  
OF NUCLEAR WEAPONS**

**CONVENTIONAL DEFENSE**

**TECHNOLOGY TRANSFER IN  
DEFENSE AND INDUSTRY**



# CEA/DAM Organization



« CONTRACTING AUTHORITY »

« PRIME CONTRACTOR » : warheads & materials recycling

*A goal of sovereignty*

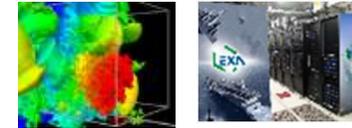
NUCLEAR WARHEADS



Non-nuclear materials



Physics **package** design and guarantee



NUCLEAR PROPULSION

LE RIPAULT

NUCLEAR MATERIALS

Architect of Nuclear warheads



DAM ÎLE-DE-FRANCE

SECURITY AND NON-PROLIFERATION

CESTA

Nuclear materials

VALDUC

CONVENTIONAL DEFENSE



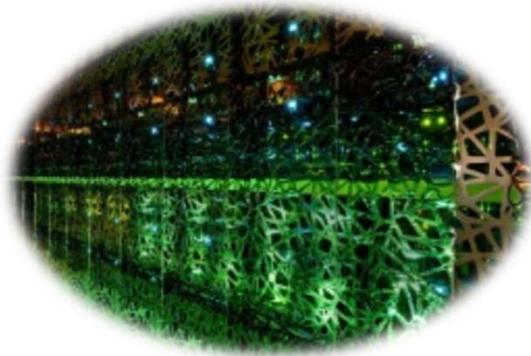
GRAMAT



INBS-PN CADARACHE



# Students at CEA's DAM



5000 employees

56% researchers/engineers

- ▶ 35% Ph D
- ▶ 65% engineer



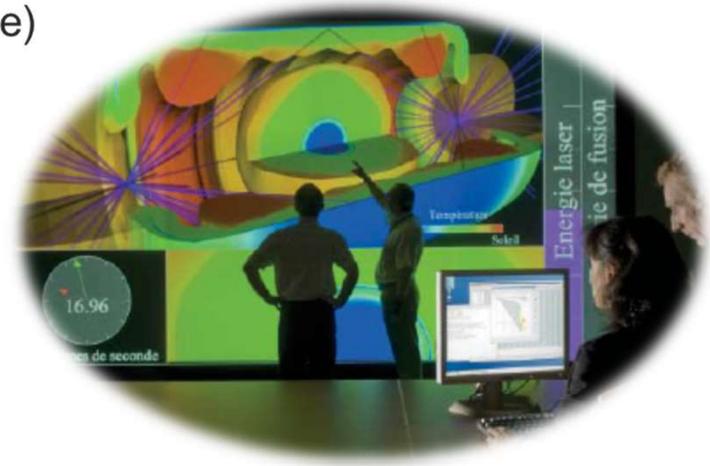
**700 students**

Apprentices and trainees  
(From high school to master's degree)

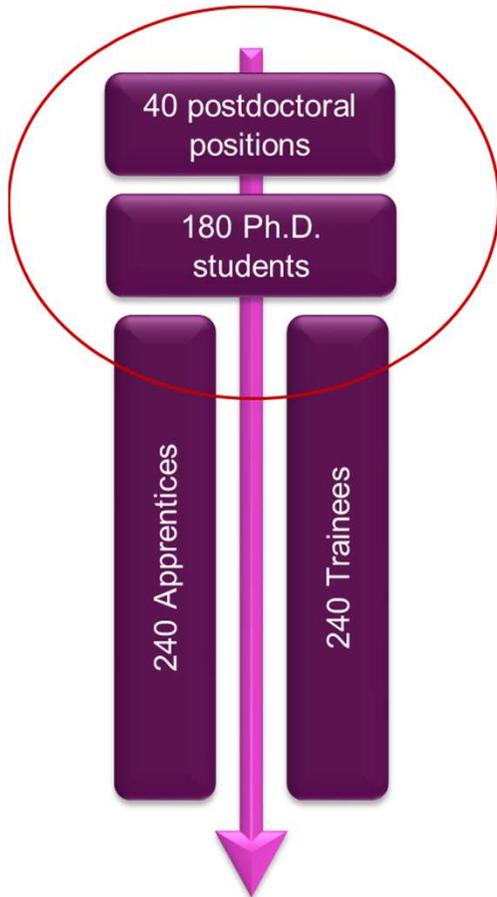


Doctoral students

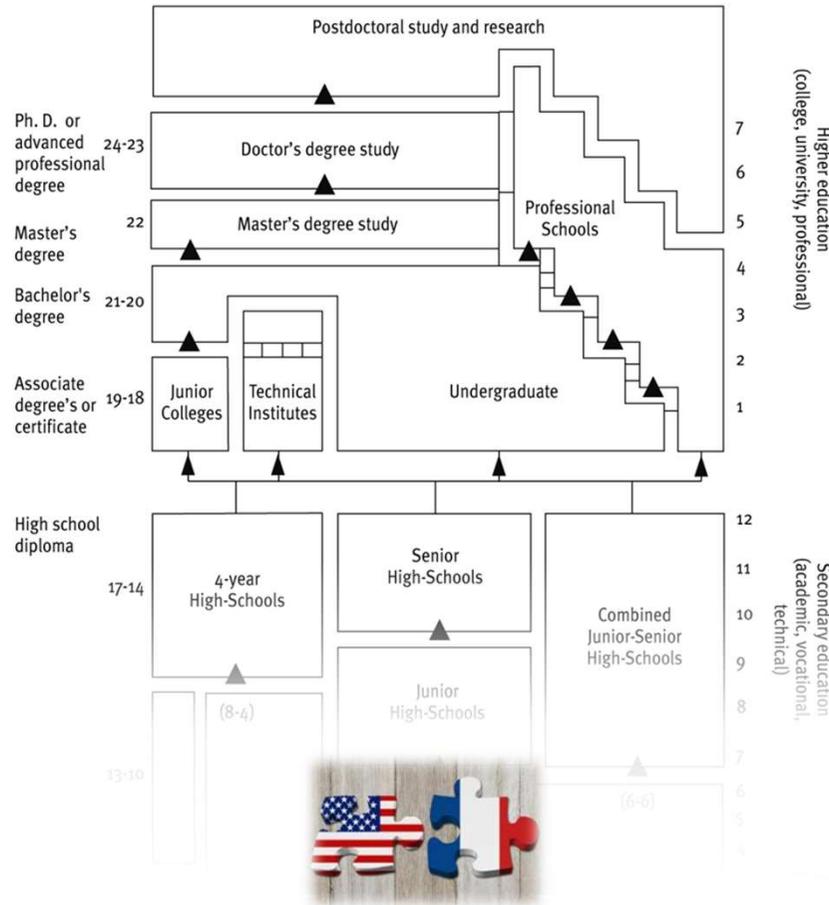
Postdoctoral students



# Students working and students hired per year at DAM



700 Students working at CEA's DAM



250 students hired

# DAM centers



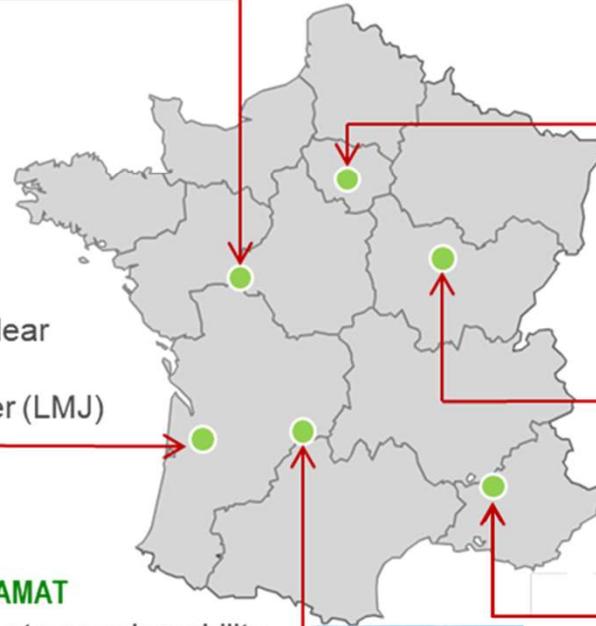
## LE RIPAULT

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## GRAMAT

- Systems vulnerability and conventional weapons efficiency

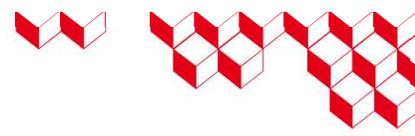


## INBS PN CADARACHE

*(no student)*



# French academic partners: LULI, CELIA, GANIL



## LE RIPAULT

- Non-nuclear materials

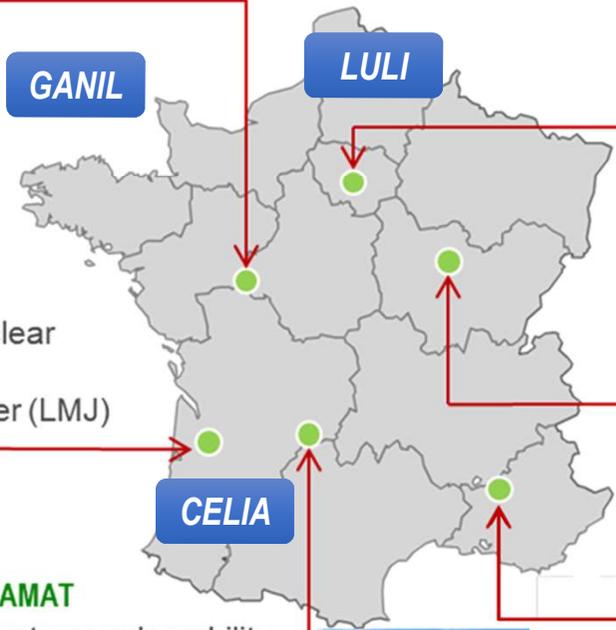
## DAM ÎLE-DE-FRANCE

- Physics package conception and guarantee
  - Basic physics
- High performance computing
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  - Nuclear engineering



GANIL

LULI



## CESTA

- Architect of nuclear warheads
- Megajoule Laser (LMJ)

## VALDUC

- Nuclear materials
- EPURE



CELIA

## GRAMAT

- Systems vulnerability and conventional weapons efficiency

## INBS PN CADARACHE

*(no student)*





# LULI stands for « Laboratoire pour l'Utilisation des Lasers Intenses »

LULI is a plasma physics research center operating three  
Laser facilities

---

LULI2000 dedicated to the study of  
High Energy Density Science



- kJ/ns laser coupled to a 60J/ps laser
- Facility open to the international community via a call for proposal`
- Member of the European laserlab network

Research Infrastructure Apollon  
dedicated to the extreme light study



- Multi PW, Multi beams
- Facility open to the international community via a call for proposal
- Member of the European laserlab network

Hera platform dedicated to  
Material study



- 200J x2 ns laser, a shot every 20', cm size focal spot
- Industrial and academic access via beam time purchase

# CELIA stands for “Centres d’études des lasers intenses et applications”



## CELIA : a research center on laser/matter interaction in Extreme regimes

- Located near Bordeaux and close to breathtaking seaside landscapes.
- About 90 people with 33 permanent researchers and 30 PhDs and Post-docs.
- About 70 publications / year, numerous National and EU grants awarded to CELIA’s physicists
- **Founded for providing an academic support to the nearby MegaJoule Laser facility**
- **Strong involvement in student training at Bordeaux University :**
  - ✓ Bachelor and Master degrees in laser technology
  - ✓ Master degree in Physics with EUR Light S&T
  - ✓ National gathering in Bordeaux of Master formations in Laser Plasma Physics
- **Strong involvement in industrial transfer :**
  - ✓ 5 start-ups created incl. Amplitude Systems 
  - ✓ 1 Labcom, several industrial maturation projects granted, about 3 patents / year
- **Strong involvement in international collaborations :**
  - ✓ MOU’s, IRP LUMAQ, Weizmann-CNRS partnership, Eurofusion projects, PI of experimental campaigns on large scale facilities (NIF, LMJ, LLE, ILE, ELI, GSI, LULI, CLPU, LCLS, EU-XFEL,...)

# CELIA stands for “Centres d’études des lasers”

## ➤ Four main scientific axes :

- ✓ Physics and technology of high average power, intense, ultrafast lasers
- ✓ Ultra-high repetition rate laser **processing** in burst mode
- ✓ **Attoscience** and Ultra-fast processes (as-fs) in atoms, molecules and condensed matter
- ✓ HDE and UHI **Plasma physics**: FCI, magnetized plasmas, Astrophysics, warm dense matter, particle acceleration

➤ **10 beamlines** : laser, XUV X-rays

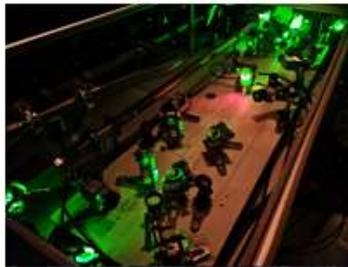
➤ **In house code dev. capabilities** : TDSE, TDDFT, 3D Hydro-rad, PICs, ....

## ➤ 3 Platforms open to access



CELIA is a member of the European Laserlab network

### Platform for UHI Physics : Plasma , HHG



**ECLIPSE** : 100 TW CPA, 800 nm  
150 mJ - 30 fs @ 10 Hz  
HCF P-compr. 10 mJ, 10 fs, 10 Hz  
2 x 1.5 J, 30 fs, Contrast  $10^9$ , 1 Hz

### Platform for ultrafast processes study



**AURORE** : TW CPA, 800 nm  
8 mJ - 25 fs @ 1 kHz  
HCF P-compr 1 mJ, 7 fs

### Platform for attochirality and TR photoemission



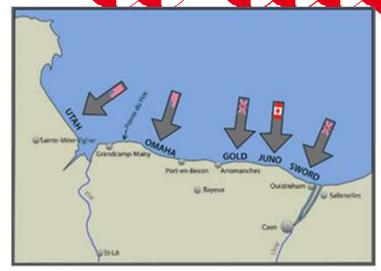
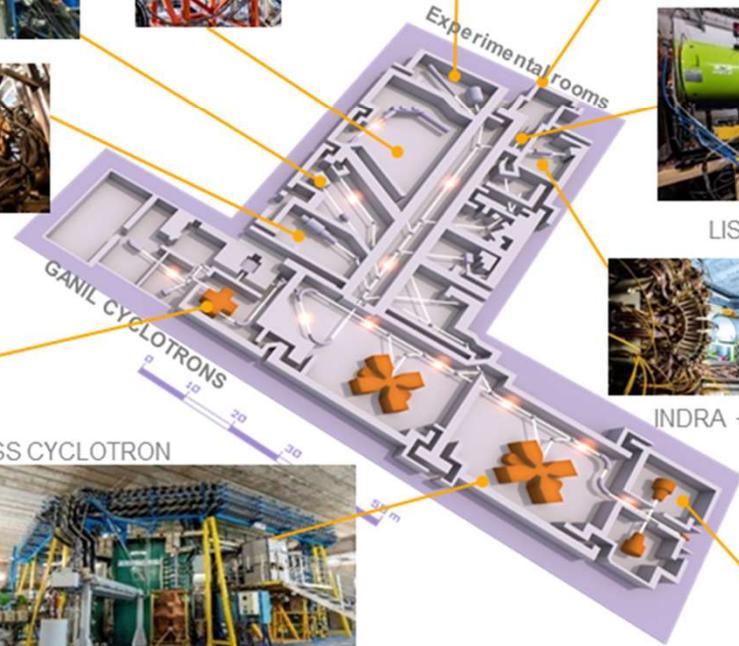
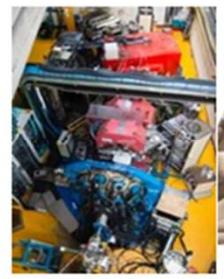
**Blastbeat** : 2x50 W, Yb, 1030 nm  
2 X 300  $\mu$ J - 140 fs @ 0.17-2 MHz  
HCF P-compr 515 nm, 100  $\mu$ J, <20 fs  
Complex polarization



**NOBEL PRIZE IN PHYSICS (2023)** awarded to ANNE L'HUILLIER and PIERRE AGOSTINI for their work on attosecond laser pulses at CEA.

# GANIL “Grand Accélérateur National d'Ions Lourds”

## GANIL cyclotrons and experimental equipment



- Stable Beams :  $^{12}\text{C}$  to U
- Energy : from  $<1$  MeV up to 95MeV/nucleon
- Up to 4 experiments in parallel

- Exotic beams produced by heavy ion fragmentation
  - In flight with LISE spectrometer
  - With ISOL method with SPIRAL1 target-source system, postaccelerated with CIME cyclotron

- State of the art equipment
  - LISE spectrometer
  - VAMOS spectrometer
  - $\gamma$  detection: EXOGAM, AGATA (2015-2021)
  - Charged particles: MUGAST, ACTAR TPC
  - Fragments: INDRA/FAZIA

GANIL  
laboratoire commun CEA/DRF spirall2 CNRS/IN2P3



# GANIL "Grand Accélérateur National d'Ions Lourds"

## SPIRAL2 LINAC and the new experimental rooms

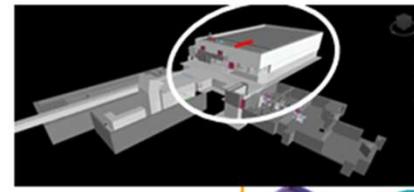


Experimental room NFS  
(Neutrons for Science)



Convertor room

Time of Flight room



Experimental room  
DESIR  
(Decay, Excitation  
and Storage of  
Radioactive Ions)

**High intensity beams :**  
 5 mA, 33 MeV protons  
 5 mA, 40 MeV deuterons  
 1 mA, <14,5 MeV/A heavy ions

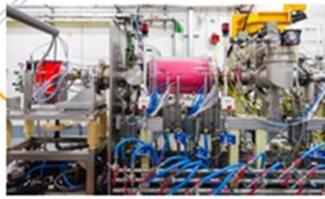


SPIRAL2 LINAC



Experimental room S3  
(Superconducting  
Separator Spectrometer)

**First beams: end 2019**  
**First NFS experiments: 2021**  
**Commissioning S3: 2024**  
**DESIR construction start: 2023**



ION SOURCE



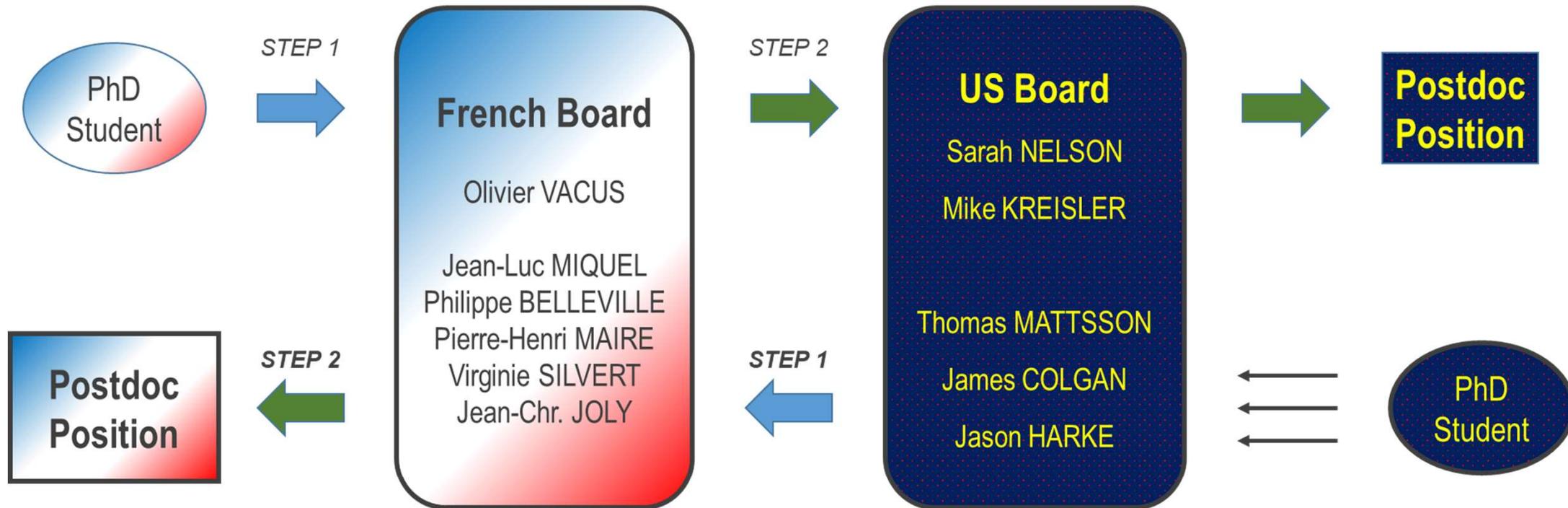
GANIL  
laboratoire commun CEA/DRF spirall2 CNRS/IN2P3

NEWGAIN  
NEW GANIL INJECTOR



# Eric Bauge program: how to get a postdoc position?

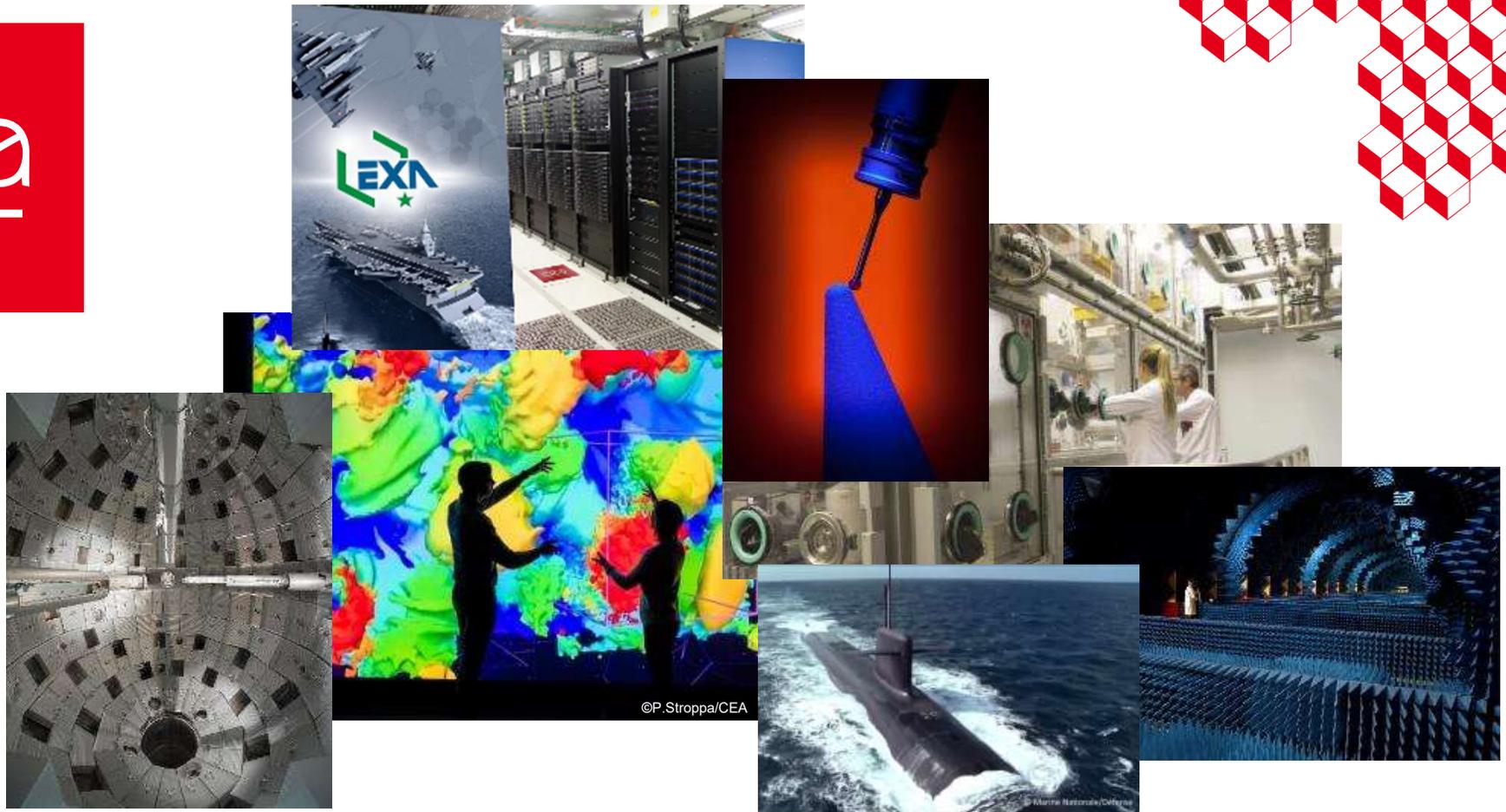
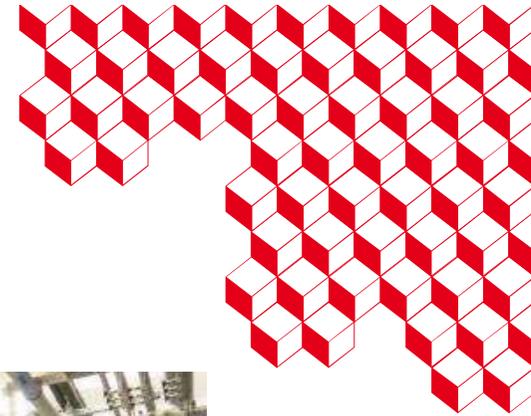
**contact your “national” board to apply!**



→ STEP 1 for US students, files (CV+letter) must be first submitted **to a member of the US board**

(in any case, the PhD has to be defended before the beginning of proposed postdoc time)

→ If the US board transfers the files to the French board for STEP 2, answers are generally given 6 weeks later



*Thank you for attention, enjoy the symposium*