CNRS in ASEAN 2023

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European and International cooperation department

The CNRS (French National Centre for Scientific Research) is part of the worldwide fundamental and applied research landscape, and its activities across the scientific spectrum make it the largest research organisation in Europe.

International projects and partnerships are essential for cutting-edge, competitive research.

These are top priorities for the CNRS. The indicators tracking the international development and activity of the Centre are many and varied, and each one points to the strong international recognition of the establishment. Every year, almost 30% of its newly recruited researchers come from abroad, alongside almost 5,000 students, post-doctorates, researchers, and professors brought into its laboratories. Moreover, out of 55,000 publications every year, more than half are co-signed with at least one international partner. All CNRS assignments and projects are designed to increase the Centre's international outreach and cement its position as a leader in research and innovation. The DEI, the office dedicated to the CNRS international cooperation strategy, is the natural spearhead for these efforts. It is both very close to the Presidency of the CNRS in Paris, and also to strategic research hubs around the world, with offices representing the Centre in ten cities: in Beijing, Brussels, Melbourne, New Delhi, Pretoria, Rio de Janeiro, Singapore, Tokyo, Washington, and Ottawa.

The DEI also draws on a network of scientific advisers and attachés in French embassies and consulates around the world and works with the relevant ministries in this field: in particular, the MESR (Ministry of Higher Education, and Research) and the MEAE (the Ministry for Europe and Foreign Affairs).

They help the CNRS in developing its strategies for international and European cooperation, from implementation to oversight, and act as a coordinator for the actions associated with them. Thanks to their presence in the field, the regional offices are a core pillar of the CNRS international policy and strategies. They provide expertise, advice and play a supporting role for the CNRS scientific partners. The opening of its last two offices in Melbourne (2021) and Ottawa (2022) marks a new step forward for the CNRS as it increases its cooperation with its international partners. In both of these cases, the projects associated with these two new offices offer an illustration of how far the CNRS is ready to go in the most strategic scientific fields of today, from quantum and climate science to energy transition, environmental protection and remediation as well as artificial intelligence, to name but a few areas.

This booklet offers a perspective on the partnerships and cooperation developed by our researchers with their partners in ASEAN and with other members of the French research ecosystem. It showcases the flagship projects supported by the CNRS, as well as the programmes operated by CNRS@CREATE, the first CNRS subsidiary abroad.

10
CNRS Regional Representative Offices in the world

80
International laboratories around the globe

1st
Beneficiary institution of the European H2020 and Horizon Europe frameworks

OVERVIEW: CNRS Director in ASEAN

Dominique Baillargeat
Regional Director - CNRS Representative Office in ASEAN &
Scientific Executive Director - CNRS@CREATE

Since its establishment in Vietnam in 2007, followed by its move to Singapore in 2014, the CNRS representative office in ASEAN has played a crucial role in fostering numerous collaborative projects with colleagues and entities across Southeast Asia.

Despite the challenges posed by the pandemic, with nearly 800 researcher visits to the region since 2022, the exchanges have gradually reached the levels that existed before the global health crisis.

Looking back at the dynamic and eventful year of 2023, we are proud to see how our laboratories, projects, networks have collectively achieved significant milestones.

In Singapore, both our International Research Laboratories Cintra on nanotechnologies and MajuLab on Quantum Physics have been renewed for an additional five years, while IPAL, specializing in AI, celebrated an impressive 25 years of groundbreaking contributions to its field.

Thailand witnessed the launch of a new laboratory in July, HealthDEEP, that is embarking on a mission to unravel the intricate connections between biodiversity and human health. As well as serving as a pivotal center for training, its aim is to become a platform for dialogue with policymakers.

Our relationship with Vietnam has also flourished, with 2023 marking the 50th anniversary of Vietnam-France relations and the 40th anniversary of CNRS collaborations with the Vietnam Academy of Science and Technology. The launch of a new VAST-CNRS Sciences school on "Chemistry for Hydrogen Production and Li-ion Battery" last October further cemented these ties, with a possible research project in the making and another school already in preparation for 2024.

Finally, this year witnessed several esteemed visits, including those from CNRS CEO, Mr. Antoine Petit (once in Thailand and Vietnam, twice in Singapore), and French Minister of Higher Education and Research, Mrs. Sylvie Retailleau (both in Thailand and Singapore).

These visits provided invaluable opportunities for discussions, showcased the work and impact of our researchers in ASEAN, and highlighted the breadth of topics covered in our dynamic partnerships.

To support and structure these ambitious partnerships and initiatives, the CNRS office in ASEAN maintains a steadfast presence in the region indeed, through the structuration of seven laboratories, six international research projects, and five international research networks. In addition to those, the first international subsidiary of the CNRS established four years ago in Singapore, CNRS@CREATE, continues to evolve, developing diverse projects that not only benefit and energize our existing labs but also contribute to the thriving research landscape. Research areas now encompass Quantum Gates, Social Sciences for Health, Cell Therapy, AI-assisted Organoïd Growth, Engineering Biology, and Hybrid AI.

Looking ahead to 2024, it is evident that the significant challenges we face are not confined to national borders and must be addressed at the regional or even global level. Our ambition is, therefore, to accompany the development of new projects or the expansion of existing ones that transcend borders and align with a broader vision. This is particularly evident in the aspirations of the laboratory HealthDEEP, which aligns seamlessly with the One Health ASEAN initiative, and the project to develop a marine biology network across the entire Indo-Pacific region by CNRS Biology in the coming years.

Through these initiatives, we are committed to advancing research and continuing to elevate the CNRS name as a beacon of scientific excellence in the ASEAN region and beyond.

What is the CNRS?

The Centre National de la Recherche Scientifique (National Center for Scientific Research) is a public body under the authority of the French Ministry of Higher Education and Research.
Founded in 1939, the CNRS is the largest fundamental research organization in Europe. It carries out research in all fields of knowledge through ten thematic institutes.

With over 33,000 staff (40% of whom are women) spread out over 1,100 laboratories, the CNRS is the second largest research institution in the world in terms of number of scientific publications, registering more than 55,000 publications in 2022. The CNRS also comes fourth in the international scientific ranking Nature Index. With a budget of nearly 4 billion euros, the CNRS counts 240 joint CNRS/industry joint research structures and nearly 100 start-ups created each year.
CNRS researchers have been awarded 23 Nobel Prizes and 13 Fields Medals.

More than
55,000
Publications in 2022

Nearly
4
Billion euros budget

2nd
Largest research institution in the worls in terms of number of scientific publications

More than
33,000
Staff members

More than
1,100
Laboratories

CNRS: A key player in global science

The CNRS is a key player in global science. More than 65% of our publications are co-signed with at least one foreign institution and each year, almost 30% of our newly-recruited researchers come from outside of France.

The CNRS has an ambitious scientific policy that involves setting up collaborative research all over the world. And it has five objectives:

- **conduct scientific research,**
- **transfer research results,**
- **share knowledge,**
- **train through research,**
- **contribute to scientific policy.**

International Research Laboratories are a fantastic tool to carry out advanced research programs in all fields of knowledge with academic or industrial partners across the world. And they have become iconic of the internationalization of the CNRS. They supplement more than one thousand labs in France which are themselves open to the world.

Today our world faces immense challenges that cannot be tackled without science. The CNRS aims to help find solutions to these emerging issues. But this cannot be done alone. This is why we need to develop international strategic partnerships with universities and research centres in close relationship with stakeholders.

These international strategic partnerships are supported across the world by a network of 10 CNRS regional representative offices, as from December 2023. Located in Beijing, Brussels, Melbourne, New Delhi, Ottawa, Pretoria, Rio de Janeiro, Singapore, Tokyo, Washington, they play an essential role in the CNRS strategy, being a key player in global sciences.

65%
of publications co-signed with at least one foreign laboratory

30%
of our newly-recruited researchers come from outside of France

4th
in the Nature Index international scientific ranking table

CNRS International cooperation tools

Labs

International Research Laboratories are international schemes in which research work is jointly conducted around a shared scientific focus. They structure, within an identified location, the significant and lasting presence of scientists from a limited number of French and foreign research institutions (a single foreign partner country). International Research Laboratories are proposed by the scientific Institutes of the CNRS based on structured international collaborations. They involve a high degree of internationalization among the participating teams, as well as a strong concentration of research activity within a partner organization. These International Laboratories last 5 years, and can be extended several times.

Projects

International Research Projects are collaborative research projects established between one or more CNRS laboratories and laboratories in one or two foreign countries. They enable the consolidation of already established collaborations through short or medium-term scientific exchanges. Their purpose is the organization of working meetings or seminars, the development of joint research activities including field research, and the supervision of students. French and foreign teams must have already demonstrated their ability to collaborate together (for example through one or more joint publications). These programs last 5 years and can be extended for 5 more years.

Networks

International Research Networks aim at structuring an international scientific community around a shared theme or research infrastructure. It promotes the organization of international workshops and seminars or thematic schools organized by the network partners, in France and abroad. It brings together researchers from one or more French laboratories, including at least one CNRS laboratory, and from several partner laboratories abroad for a period of 5 years.

Emerging Actions

International Emerging Actions are “PI-to-PI” projects whose aim is to explore new fields of research and new international partnerships through: short-term missions, the organization of working meetings, the initiation of initial joint research work around a shared scientific project. These actions have a duration of 2 years.

Our CNRS Representative Office in ASEAN

The CNRS Office in ASEAN is located in CREATE Tower and hosted by CNRS@CREATE. This Campus for Research Excellence And Technological Enterprise (CREATE) is an international research campus and innovation hub launched in 2017 by the National Research Foundation Singapore (NRF). It hosts several interdisciplinary research centers from top universities and institutions such as: HUJ, MIT, ETH Zurich, Cambridge University, Shanghai Jiaotong University, Berkeley University, TUM, Illinois, NTU, NUS and the CNRS.

Here is the address of the CNRS Representative Office in ASEAN:

CNRS Representative Office in ASEAN

c/o CNRS@CREATE Ltd

CREATE Tower, #08-01

1, Create Way Singapore 138602

Its regional Director is Dominique Baillargeat.

Other ASEAN countries with no current ongoing CNRS initiatives include: Brunei, Cambodia, Laos, Myanmar, the Philippines

CNRS cooperation with Singapore

CNRS@CREATE, the first CNRS' overseas subsidiary, acts as a program operator to build and conduct large transdisciplinary research programs. It is a trans-continental hub for research with unique opportunities for high quality faculties, researchers and postgraduate/postdoctoral students. Its scientific executive director is Dominique Baillargeat.
CNRS@CREATE is involved in several research projects listed below.

CREATE Interdisciplinary program

DesCartes program started in 2021, for 5 years, with a SGD 50 million budget. It gathers 80 investigators from France and Singapore, 17 partner institutions from France and abroad, as well as 4 partner institutions from Singapore. It also includes 10 industrial members and partners: EDF, Thales, ESI Group, SKF, CETIM MATCOR, ARIA Technologies, Naval Group, Azur Drones, Expleo and Immersion.

DesCartes program aims to develop disruptive hybrid AI to serve the smart city and enable optimized decision-making in complex situations for critical urban systems.

Hybrid AI will help us to support smart-city critical infrastructures: Smartly, Safely, Carefully, Responsibly.

Descartes is a cross disciplinary program involving STEM and non-STEM research with artificial intelligence at its core and expertises in:
AI, Engineering, Humanities, Data Science, Formal methods, Human Computer Interaction, Natural Language Processing, Social Sciences, Signal & Image Processing.

Intra CREATE Thematic Projects

INTERSECTION ON ENGINEERING AND HEALTH
CALIPSO Deep learning assisted approach streamlining the growth, 3D live imaging and quantification of organoid morphology with high content screening standards.
Started in October 2020 - 3,5 years.
Host institution CNRS@CREATE, in collaboration with NUS and NTU.

ScaNCells Engineering Scaffold-Mediated Neural Cell Therapy for Spinal Cord Injury Treatment.
Started in October 2020 - 4 years.
Host institution NTU, in collaboration with CNRS@CREATE, UCBL, A*STAR, NUS, SMART.

QUANTUM PHYSICS
NGAP Nanophotonic GAtes with exciton-Polaritons.
Started in October 2023 - 3 years.
Host institution CNRS@CREATE, in collaboration with Sorbonne University, Paris Sciences Lettres, NTU, NUS and A*STAR.

CITIES
EcoCTs Engineering biology for a circular bioeconomy — Towards urban sustainability.
Started in October 2020 - 3,5 years.
Host institution CNRS@CREATE, in collaboration with INRAE, Toulouse 3, INSA Toulouse, NUS and A*STAR.

SCIENCE OF SUSTAINABLE CITIES
SPACE Shaping Public Adaptive Capacity for Environmental infectious diseases.
Starting in April 2022 - 3 years.
Host institution CNRS@CREATE, in collaboration with Nanterre University, Reims-Champagne University, NTU, NUS, SUTD, SUSS, SMU and NEA.

Aside of CNRS@CREATE, CNRS international research partnerships with Singapore are listed below.

National University of Singapore — NUS http://www.nus.edu.sg/
Nanyang Technological University — NTU https://www.ntu.edu.sg/
Agency for Science, Technology and Research — A*STAR https://www.a-star.edu.sg/
National Research Foundation — NRF https://www.nrf.gov.sg

4 INTERNATIONAL RESEARCH LABORATORIES

CINTRA (Engineering): https://www.ntu.edu.sg/cintra
Laboratory based on NTU campus, CINTRA was established in 2009. CINTRA develops research activities on nano-electronics and nano-photonics technologies. FR: CNRS, Thales. SG: NTU.

MAJULAB (Physics): https://majulab.cnrs.fr/
The laboratory MajuLab was established in 2014. It works on Quantum Technologies, Quantum Computing, Photonics, Material Science. FR: CNRS, Université Côte d'Azur, Sorbonne Université. SG: NUS, NTU.

IPAL (Artificial Intelligence): https://ipal.cnrs.fr/
Laboratory between France and Singapore on Artificial Intelligence. FR: CNRS, UT3, INP Toulouse, CYU. SG: NUS, A*STAR.

BMC² (BioMechanics): https://www.viasnofflab.com/
The laboratory BMC² (Biomechanics of Cell-Cell Contacts) is part of the Mechanobiology Institute (NUS). It was funded in 2014. It studies cell-cell adhesion, microfabrication of controlled environment for cell culture, biophysic of single molecules. FR: CNRS, ANR. SG: NUS, NRF.

3 INTERNATIONAL RESEARCH PROJECTS

SYNBIOECO (Biotechnology): Synthetic Biology for a Bio-inspired Economy. FR: TBI SG: NUS (SynCTI).

STRETCH-SMART (Materials): Heterogeneous STRETCHable Systems, MechAnical propeRTies and associated functionalities at small scales. FR: LSPM, PPRIME SG: NUS.

FIBERMED (Biotechnology): Specialty optical fiber based biosensing for medical applications. FR: XLIM. SG: SBIC A*STAR.

3 INTERNATIONAL RESEARCH NETWORKS

SINERGIE (Energy): French-SINgaporean network on renewable enERGIEs. FR: 25 laboratories in France: full list available on the SINERGIE's web page. SG: NTU. Industrial partner: ENGIE-Lab.

ASEAN China Norms (Social Sciences): China's Rise and the New Social Norms in Southeast Asia. FR: CASE, IFRAE. SG: NUS.

TranSocGen (Social Sciences): Transdisciplinary Network on Society and Genetics. FR: CNRS. SG: NTU. International partners: Full list available on the network's web page.

CNRS cooperation with Thailand

Chulalongkorn University http://www.chula.ac.th
Mahasarakham University https://inter.msu.ac.th/
Mahidol University https://mahidol.ac.th/
Kasetsart University https://ku.ac.th/
Chiang Mai University https://www.cmu.ac.th/en/
Vidyasirimedhi Institute of Science and Technology - VISTEC https://www.vistec.ac.th/

2 INTERNATIONAL RESEARCH LABORATORIES

IRASEC (Social Sciences): Institut de Recherche sur l'Asie du Sud-Est Contemporaine. French leading research institute dedicated to the study of Contemporary Southeast Asia (ASEAN countries and Timor Leste). FR: CASE, IPRAUS, IrAsia, IAO. TH: Chulalongkorn University.

HealthDEEP (Biodiversity): Health, Disease Ecology, Environment, and Policy (HealthDEEP) is a Franco-Thai laboratory focusing on biodiversity and its links with human health. FR: CNRS. TH: Mahidol University, Kasetsart University.

2 INTERNATIONAL RESEARCH PROJECTS

ChiraChem (Chemistry): Chiral chemical synthesis. FR: ISM, ISCR. TH: VISTEC.

SPECIFLY (Biology): Ecology and evolution of specialized pollination by flies. FR: CEFE. TH: Chulalongkorn University.

2 INTERNATIONAL RESEARCH NETWORKS

PALBIODIV-ASE (Biodiversity): Paleobiodiversity in South-east Asia. CNRS, CRP-UMR7207. FR: CR2P, ISEM, LEHNA, LGLTPE, LGENS, HNHP, ISYEB. TH: Mahasarakham University, Chulalongkorn University.

CREMA (Social Sciences): Creating & Mapping the Heritages of the Ordinary City. FR: IRASEC, AUSser, PRODIG. IND: IHT, Trisakti. MAL: Badan Warisan Malaysia, Penang Heritage Trust TH: Chiang Mai University, Chulalongkorn University. VN: PRX-Vietnam.

CNRS cooperation with Vietnam

Vietnam Academy of Science and Technology — VAST http://www.vast.ac.vn/en/
Vietnam Institute for Advanced Study in Mathematics - VIASM https://viasm.edu.vn/en/
Paris Region Expertise-Vietnam - PRX-Vietnam

1 INTERNATIONAL RESEARCH LABORATORY

FORMATH (Maths): Formath Vietnam Singapore. Fruitful collaborative links and networks around selected topics in mathematics. FR: LAGA, IMT, IDP, IJF, LJAD, I2M, LaBRI, LJL, IRMAR, LPP; MITSIC. VN: VAST, VIASM. SG: NUS, NTU.

1 INTERNATIONAL RESEARCH NETWORK

CREMA (Social Sciences): Creating & Mapping the Heritages of the Ordinary City. FR: IRASEC, AUSser, PRODIG. IND: IHT, Trisakti. MAL: Badan Warisan Malaysia, Penang Heritage Trust TH: Chiang Mai University, Chulalongkorn University. VN: PRX-Vietnam.

CNRS cooperation with Malaysia

University of Malaya www.um.edu.my
Badan Warisan Malaysia https://badanwarisanmalaysia.org/
Penang Heritage Trust https://pht.org.my/

1 INTERNATIONAL RESEARCH PROJECT

IFM NATPROLAB (Chemistry): International French Malaysian Natural Products Laboratory. FR: ICSN. MAL: University of Malaya.

1 INTERNATIONAL RESEARCH NETWORK

CREMA (Social Sciences): Creating & Mapping the Heritages of the Ordinary City. FR: IRASEC, AUSser, PRODIG. IND: IHT, Trisakti. MAL: Badan Warisan Malaysia, Penang Heritage Trust TH: Chiang Mai University, Chulalongkorn University. VN: PRX-Vietnam.

CNRS cooperation with Indonesia

Indonesian Heritage Trust - IHT https://bppiindonesianheritagetrust.org/
Trisakti University https://trisakti.ac.id/en/home-english/

1 INTERNATIONAL RESEARCH PROJECT

SORE-MNP (Echo-Anthropolog): Sociality and reproduction: genetic and social transmission of social networks in crested macaques. FR: MNHN IND: IPB University.

1 INTERNATIONAL RESEARCH NETWORK

CREMA (Social Sciences): Creating & Mapping the Heritages of the Ordinary City. FR: IRASEC, AUSser, PRODIG. IND: IHT, Trisakti. MAL: Badan Warisan Malaysia, Penang Heritage Trust TH: Chiang Mai University, Chulalongkorn University. VN: PRX-Vietnam.

Upcoming renewals and new initiatives

Renewals: Laboratory BMC and International Projects STRETCHSMART and FiberMed
All three initiatives will be renewed in Singapore in 2024.

New initiative: International Project DNA Origami
This initiative, under CNRS Biology, will be officially launched in Singapore in 2024.

Interviews with some CNRS projects coordinators in ASEAN

International Research Laboratory MAJULAB,

Alexia Auffèves, CNRS DR.
Director of MajuLab
https://cnrssingapore.cnrs.fr/project/irl-majulab/

International Research Laboratory FVMA,

Marc Peigné, CNRS senior researcher (Institute Denis Poisson).
Project coordinator of FVMA
https://cnrssingapore.cnrs.fr/project/irl-fvma/

International Research Project CHIRACHEM,

Alexander Kuhn, Professor (Institute of Molecular Science, CNRS).
Project coordinator of CHIRACHEM
https://cnrssingapore.cnrs.fr/project/irp-chirachem/

International Research Network CREMA

Adèle Esposito, CNRS researcher, IRASEC.
Project coordinator of CREMA
https://cnrssingapore.cnrs.fr/project/irn-crema/

International Research Laboratory HealthDEEP,

Serge Morand, CNRS DR.
Director of HealthDEEP
https://cnrssingapore.cnrs.fr/project/irl-healthdeep/

Photo: Laboratory MajuLab, Quantum Matter research axis. Credits: Centre for Quantum Technologies.

MajuLab

> MajuLab has a privileged position to connect France to Asia.

The CNRS International Research Laboratory MajuLab is a collaboration between CNRS, NUS, NTU, CQT, Côte d'Azur University and Sorbonne University. Alexia Auffèves, CNRS DR and Director of MajuLab, tells us more about this laboratory and its collaborative scientific research.

When did you first start working with/in Singapore and how did you become MajuLab's new director?

Alexia Auffèves: My first visit dates back to summer 2010 when my collegue and friend Prof. Santos (UFRJ, Brazil) was visiting Prof. Kwek's group at CQT. In parallel, I met Prof A. Ekert (former director of CQT), and was also introduced to Dr. C. Miniatura via the director of Institut Néel Alain Fontaine. I totally fell for the place and quickly started developing projects, which concretized in a series of joint papers, one Merlion project and two Merlion workshops on quantum technologies, and a three weeks international school on quantum optics where we enjoyed lectures from top level scientists (Serge Haroche, Jacqueline Bloch, Steve Girvin...). All over these years I kept in touch with Christian Miniatura who, at some point, looked for a successor. Beyond my connections with Singapore, I also had a relevant experience as director of the Grenoble quantum centre during 5 years.

What are, according to you, the strengths of this laboratory?

MajuLab captures a history of trust between France and Singapore, with successful collaborations and an exceptional productivity in quantum science and technologies over more than 15 years. MajuLab has strongly contributed to the reputation of the CNRS in Singapore, which culminated with the creation of CNRS@CREATE. Now quantum technologies explode, and MajuLab is a connecting point between two vibrant quantum ecosystems: the French one, who launched its quantum strategy in 2021 and is consolidating it through the France 2030 initiative, and the Singaporean one, who fostered the first Centre for Quantum Technologies worldwide and kept deploying quantum strategies ever since! Beyond this privileged position of "quantum channel", I would say that MajuLab through its lab spirit can also bring new local connexions between scientists, who are more used to the "PI operating mode".

Tell us more about your ambitions for MajuLab 3.0: what do you want to achieve?

My goal is that MajuLab becomes "the" French - Singaporean quantum centre. Concretely, it means being clearly spotted as a strength and as an opportunity by the French and the Singaporean quantum ecosystems, to create synergies and develop partnerships. In terms of actions, this requires consolidating bounds with the network of French quantum centres, with clear and tailor-made schemes for long term stays of students and scientists, and opportunities to raise funds from both the public and the private sectors in France and Europe: this is mandatory to attract talents. On the Singaporean side, this goes with enrolling PIs in new collaborations and connecting them to new networks, in particular to hire brilliant students from the old continent. Finally, MajuLab has a privileged position to connect France to Asia and Australia.

What types of applications do your research activities lead to? For what purposes?

I am an expert in quantum energetics: I am interested in the laws governing the flows of energy, entropy, information and irreversibility at quantum scales. This fundamental research has important applications to understand and optimize the energetic efficiency of quantum technologies — a topic which has remained in a blind spot of most quantum strategies so far. Yet ,in a world where the finiteness of resources is more and more obvious, the resource cost of new technologies must be taken into account while designing them — even if they still sound futuristic! Investments in quantum are not futuristic at all! This conviction led me to launch the Quantum Energy Initiative in August 2022 with my co-workers Olivier Ezratty, Robert Whitney and Janine Splettstoesser. This initiative aims to structure an international, interdisciplinary research line to address these questions. The first workshop of the initiative was organized in Singapore in November 2023 with the support of the CQT and the Singaporean Quantum Engineering Program, and many MajuLabians in the organizing committee! In parallel, I have recently initiated and become the Chair of the IEEE working group "Quantum Energy Initiative", whose first project will be to develop a standard of energetic efficiency for quantum computing

Alexia Auffèves (front, middle), and several MajuLab researchers, near the offices of the laboratory on the NUS Campus. February 2023. Credits: CNRS Representative Office in ASEAN.

Illustration of the Quantum thermodynamics, energetics and resources research axis. Credits: CQT

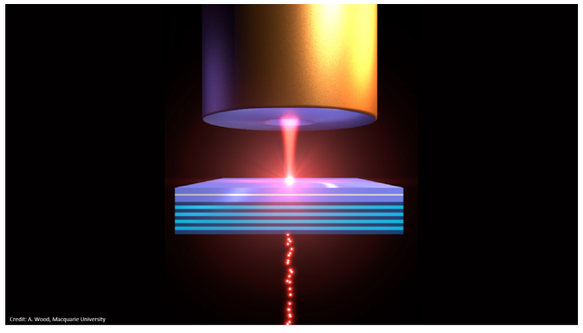

Illustration of the Quantum Controlled Systems research axis. Credits: A. Wood, Macquarie University

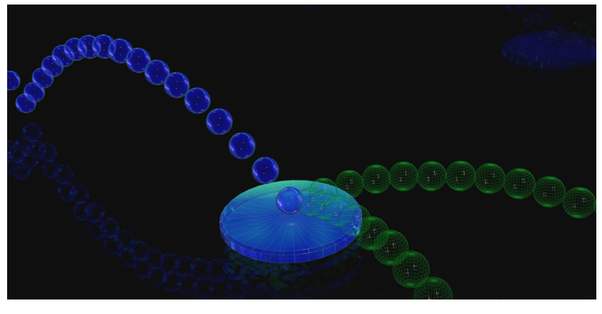

Illustration of the Quantum information science research axis. Credits: CQT

FVMA

> This laboratory is a powerful catalyst for collaboration.

The CNRS laboratory FVMA (France-Vietnam in Mathematics and its Applications), plays a role in bridging top researchers and labs from CNRS, VAST and VIASM into fruitful collaborative links and networks around selected topics in mathematics. Marc Peigné, Senior researcher at CNRS, tells us more about this initiative.

Could you provide an overview of your research's general context in Vietnam within this laboratory?

Marc Peigné: FVMA, established in 2023, carries forward the initiatives of our previous project Formath Vietnam (LIAFV) and is a product of the enduring collaboration between French and Vietnamese mathematics schools. Despite the various challenges, the education and research system in Vietnam has maintained consistent ties with the French system.

For several decades, Vietnam has maintained a high standard of basic training in mathematics. In the 1980s, the predominant influence on Vietnamese mathematics was that of the Soviet school. Moving into the 1990s, Vietnamese and French colleagues in France, under the umbrella of "Formath Vietnam" embarked on consolidating scattered collaborations between the two countries. This collaborative effort, supported by the CNRS, the AUF (Agence Universitaire de la Francophonie), and the Embassy of France in Vietnam, aimed to attract gifted students in basic sciences who were intrigued by new economic opportunities. The program «Formath Vietnam» not only facilitated the development of scientific cooperation but also diversified the mathematical fields covered in Vietnam.

Today, the collaboration between France and Vietnam thrives through highly structured networks in each country. On the French side, various actors, including universities, large state agencies and engineering schools all participate. The CNRS, through the Insmi, plays a unifying role in coordinating these efforts. On the Vietnamese side, the VIASM (Vietnamese Institute for Advanced Study in Mathematics) and the mathematics department of the VAST (Vietnamese Academy of Science and Technology), both situated in Ha Noi, act as coordinators between France and the numerous universities across Vietnam, spanning from the North to the South.

Can you provide additional details about the narrative behind FVMA?

The «Laboratoire International Associé Formath Vietnam» (LIAFV) was established in 2011 and renewed in 2015, building upon the efforts initiated by a previous international project. Between 2011 and 2018, the scientific collaboration witnessed significant developments, resulting in:

- a notable increase in the number of PhD theses submitted in France by Vietnamese students,
- a substantial number of these students returning to Vietnam to contribute to the academic system (as detailed below),
- a considerable volume of joint publications, many of which received partial support from the LIAFV,

the execution of various activities, including workshops and congresses.

The LIAFV actively supported endeavors at the Vietnamese Institute of Advanced Studies in Mathematics (VIASM) in Hanoi, providing valuable assistance to high-level scientific collaborations. To enhance coordination and prevent dispersion, these collaborations were categorized under four main topics:

- AGT-DM: Algebra, Geometry, Topology, and Discrete Mathematics.
- Analysis and applications, scientific computing.
- Optimization and control.
- Probability, Statistics, Finance.

Over time, the LIAFV progressively shifted its focus towards the practical applications of mathematics. This emphasis will continue to be a priority for the lab FVMA in the coming years. The master's program in Ho Chi Minh City holds a distinctive role in fostering direct interactions between mathematics and the «real» world. This year, a few events centered on highly applied themes were organized by VIASM and strongly supported by FVMA, including the «Summer School in Mathematical Biology 2023» in July, featuring two French principal lecturers, B. Perthame and H. Zaag, and the «International Conference on Mathematical Modelling for Climate Change and Environment» that took place in October.

What are your aspirations for this new phase?

There are longstanding and fruitful exchanges between our two countries in various fields of mathematics, from algebra to probability theory, as mentioned above. It is evident that these collaborations must continue to evolve. Over the last decade, Formath Vietnam also emphasized the significant importance of developing cooperation in applied mathematics, and this will remain a priority for the new lab FVMA. In this context, the main objectives are to advance modeling, probability, and statistics, in connection with the opportunities presented by new technologies such as AI and data sciences. This rationale explains the inclusion of the letters 'MA' in the laboratory name.

Antoine Petit, CEO of CNRS, during his visit to the Vietnam Institute for Advanced Study in Mathematics (VIASM) where FVMA offices are situated. 27 November 2023, Hanoi, Vietnam. Credits: VIASM.

Now, let's also recall that, for many years, collaboration between our two countries has been manifested in training initiatives: master and PhD programs, as well as master internships in France. This was encapsulated in the acronym 'Formath' (formation). Notably, consider the success of the master's program in applied mathematics in Ho Chi Minh City, in collaboration with several partner universities in France: in about fifteen years, more than 150 PhD theses have been defended by students from this master's program, some of whom now hold academic positions in Vietnam.

While the primary mission of the lab focuses on research activities, it is evident that training, particularly through research, is at the core of its missions. For this purpose, FVMA will continue to promote the development of conferences, summer schools, and will also support CIMPA schools, with a special focus on emerging themes and interactions between mathematics and the 'real' world.

Over the years, how have your collaborations with Vietnam developed or changed?

In recent decades, there have been initiatives such as international conferences and intensive schools (at the master's and PhD levels) held in Vietnam, featuring significant participation from French mathematicians. These actions encompass co-advised PhD programs, travel support, and student internships in France. Formath Vietnam has facilitated numerous medium and long-term exchanges of researchers in both directions, serving as the core of mathematical research activity, and these exchanges are expected to persist in the future. Due to the COVID-19 crisis and concerns about global warming, the number of research trips has decreased in recent years. Presently, there is a shift towards avoiding short stays and prioritizing longer stays of several weeks, fostering in-depth exchanges through mini-courses and seminars.

These initiatives are particularly active in Hanoi, various partnersi are fully engaged in this program, and the Vietnam Institute of Advanced Studies in Mathematics (VIASM) plays a pivotal role in this collaboration. Universities in the central and southern regions of Vietnam (with the assistance of ICISE, though not exclusively) have also shown increased involvement over the years, participating in workshops, conferences, and research travel. However, in these parts of Vietnam, interactions with French colleagues have been comparatively limited, and the range of developed topics is less extensive.

Finally, how does your laboratory work on a daily basis?

The creation of the new lab, coinciding with the resumption of international exchanges after the pandemic, provides an opportunity to reorganize the laboratory's operations in close collaboration with Vietnamese partners. Regular online exchanges among members of the scientific committee are organized to decide on upcoming events. A website is currently under development, which will contain all the information and useful links for fostering collaboration and exchanges between our two countries

CHIRACHEM

> We jointly develop new high performance materials.

The CNRS Project CHIRACHEM is based in Thaïland and focuses on chirality. Alexander Kuhn, Professor at the Institute of Molecular Science (University Bordeaux, CNRS, Bordeaux INP) as well as Adjunct Professor at VISTEC, gives us his insights.

Can you explain the general context of your research in Thailand within CHIRACHEM?

Alexander Kuhn: The present CNRS project is built on a long-lasting cooperation that I already had with several members of VISTEC. Actually, the current president of VISTEC, Prof. Jumras Limtrakul, was my initial scientific contact in Thailand, while he was still working at Kasetsart University in Bangkok. Our first joint publications are going back to this period (2008). Once he became President of VISTEC in 2015, the collaboration was successfully continued, essentially with Dr. Chularat Wattanakit as a scientific contact point. This was facilitated by the fact that she actually had obtained her PhD in the frame of a co-tutelle thesis under the joint supervision of Prof. Limtrakul and myself, before becoming herself an independent young group leader at VISTEC.

Tell us more about this International Project, and its core concept: chirality.

One of the fundamental and most fascinating aspects of life is the homochirality of biological molecules. This means that most chiral biological molecules exist in only one of two possible mirror-image forms. It has the important consequence that the biological and pharmaceutical activity of chiral molecules is directly related to their handedness, which means that the two different enantiomers of a molecule often exhibit dramatically different effects. CHIRACHEM is focused on different aspects of chirality, based on various chemical processes, ranging from enantioselective sensing to separation and chiral synthesis synthesis.

What types of applications do your research activities lead to?

The selective detection, separation and synthesis of chiral molecules is of major importance because the two mirror image versions of a given chiral molecule have drastically different biological properties. Therefore, recommendations and regulations concerning the commercialisation of chiral molecules as pharmaceutically active ingredients are getting more and more restrictive, requiring enantiopure forms. Our project is addressing exactly this topic, as we try to find new alternative ways either to separate mixtures of both enantiomers (so-called racemates) or to synthesize them in a very selective way. Our studies will provide the pharmaceutical industry with low-cost routes to enantiopure compounds.

What are the benefits of such a Thai-French research collaboration on that subject?

There is a clear synergy effect of this Franco-Thai research collaboration. On the one side, VISTEC is a recognized center of excellence, as it has managed within only a few years to become the N° 1 University in Thailand in chemistry, and it is also very well positioned in other topics. Especially our leading Thai collaboration partner, Dr. Chularat Wattanakit, is a very successful chemist with an outstanding track record. Her research focuses on materials chemistry and heterogeneous catalysis. She is interested in designing hierarchical bifunctional zeolite nanosheets and hierarchical hybrid zeolite composites, and we clearly can benefit from her important know-how in these topics for developing our chiral porous metals. On the other hand, the French group is internationally recognized for its original activities in the field of electrochemistry, which allows us to jointly develop these new high performance materials with respect to chiral recognition.

What are your ambitions for CHIRACHEM?

We have developed during recent years of our collaboration chiral encoded mesoporous metals, which combine the benefits of a high active surface area and chiral discrimination, and exhibit remarkable chiral recognition properties. In the frame of the CHIRACHEM project, we want to explore an extension of this philosophy by opening up the concept not only to other metals, but also other porous materials which can be used for enantioselective detection, separation and synthesis. Together with two other partners, from VISTEC (Prof. Adrian Flood) and from the University of Rennes (Dr. Gabriel Loget), we study the use of such materials for heterogeneous catalysis, deracemisation, electroseparation and (photo)electrocatalysis. A close interaction between all partners is essential for an efficient progress of the whole project, and this is guaranteed by a systematic exchange of PhD students, post-docs and permanent scientists. Our long-term vision is to establish a joint Franco-Thai laboratory where we can work together on these ambitious research topics

On the left, Dr. Chularat Wattanakit presenting a poster detailing CHIRACHEM's French-Thai collaborative project during its inaugural launch in June 2022. On the right, some of VISTEC's students presenting their lab and ongoing work. Credits: CNRS Representative Office in ASEAN.

A group photo of all the participants during CHIRACHEM's kick-off event in VISTEC (June 2022). Since its launch, the project has also received one of the ASEAN Prix Tremplin for bilateral research cooperation (May 2023). Credits: VISTEC Communication team — Project CHIRACHEM.

CREMA

> Spaces of everyday life can be valued as cultural heritage.

The International Research Network CREMA (Documenting & Mapping the Heritages of the Ordinary City) examines, in a comparative perspective on the scale of South-East Asia, the processes by which associative and professional actors, in synergy with communities of inhabitants, attribute heritage values to the places of everyday life (residential and commercial districts) that make up the "ordinary city".

Could you provide an overview of the broader context of your research in Southeast Asia?

Adele Esposito: I have conducted research in urban Southeast Asia for almost 20 years. My experiences have taught me two seemingly opposite lessons. On the one hand, it is very challenging to produce relevant knowledge on Southeast Asian countries. One must acquire a deep understanding of national and local history, politics, society, and languages, all while gaining familiarity -or even intimacy- with fieldworks that are sometimes difficult to access. On the other hand, Southeast Asia is a region shaped by high levels of diversity and intense transnational connections. Comparisons are particularly intriguing and stimulating. For this reason, collaborative projects that bring together specialists from different Southeast Asian countries offer fruitful perspectives to achieve 'thick descriptions' and grounded case studies, as well as regional comparisons.

What prompted the establishment of this International Research Network, and what were the motivations behind its creation?

The CREMA network was established in 2022. It brings together a group of researchers, professors, professionals, and activists who examine how the spaces of everyday life — the 'ordinary city' — can be valued as cultural heritage. More specifically, we are interested in the role of local activists, associations, and academics who act as 'brokers' in the processes of recognition, mediating between representatives of the State and local inhabitants. Additionally, we analyze how heritage recognition strengthens or even fosters the formation of local communities that empower inhabitants in local urban politics.

What applications can be derived from your research activities?

Our research is rooted in heritage studies, urban studies, and critical cartography. In terms of applications, CREMA is closely associated with the intensive doctoral training program, 'Urban Theories across Borders' (UTAB), a recurring event designed for master's and PhD students from Southeast Asia aspiring to pursue a career in urban research. UTAB is regularly organized in partnership with CREMA's collaborators and the IRASEC (Research Institute on Contemporary Southeast Asia) and aims to foster the creation of a community of young scholars focusing on contemporary urban Southeast Asia. Through its collaborative research seminars organized with local partners, CREMA also plays a role in deciphering heritage-making processes on the ground, guiding more inclusive heritage policies and practices.

What advantages and positive outcomes could arise from collaborating with colleagues from Southeast Asia on this particular subject?

I wouldn't say there are benefits; rather, the research work would not be possible without them. Our colleagues from Southeast Asia possess a profound understanding of the local contexts under study. They enjoy privileged access to the fieldwork and generously facilitate the research process for the entire network. Moreover, the majority of them are simultaneously researchers, professors, planners, and/or activists. The manner in which they generate knowledge, and the characteristics of the knowledge produced, challenge the boundaries between fundamental and applied research.

Whare are CREMA's future plans and objectives?

The network has two major objectives: to generate knowledge about participatory processes of heritage recognition in the ordinary city and their politics; and to experiment with innovative tools for documenting ordinary heritage in urban Southeast Asia, which is often informal, ephemeral, and mobile. In the long term, we aim to create a community of urban knowledge producers based in both Europe and Southeast Asia. Furthermore, leveraging our partnerships with associations, activists, and planners, we seek to promote reflective work on the categories of authoritative knowledge in the social sciences

Students on fieldwork with supervisors in Chiang Mai, Thailand. Credits: UTAB.

UTAB 2022's participants on fieldwork in Yogyakarta, Indonesia. Credits: UTAB.

Group photo of UTAB 2022's participants, Chiang Mai, Thailand. Credits: UTAB.

HEALTHDEEP

> This lab can coordinate large interdisciplinary projects.

The CNRS Laboratory HealthDEEP (Health, Disease Ecology, Environment, and Policy) is based in Bangkok. The research to be conducted at this Franco-Thai lab will focus on biodiversity and its links with human health. It will serve as a centre not only for collaborative research but also for training and dialogue with policymakers.

Could you tell us more about your research in the region?

Serge Morand: Southeast Asian countries, especially Thailand, have a rich history of implementing Global Health and One Health principles to combat neglected tropical diseases, global pandemics, and emerging infectious diseases. The new One Health approach, endorsed by international organizations and ASEAN members, emphasizes increased involvement of environmental disciplines and sectors. Our lab conducts its activities by integrating various disciplines, including biological, ecological, and social sciences, to better address the prevention of health risks at the interface between the environment, animals (both domestic and wild), and humans.

Whar about HealthDEEP storyline?

HealthDEEP is the culmination of fifteen years of collaborative work supported by several projects, including the French National Research Agency (ANR). However, it originated from the observation that Southeast Asia is a hotspot for the emergence of infectious diseases as well as endangered biodiversity. The initial objective was to investigate the link between the loss of biodiversity and the emergence of infectious diseases or the spread of zoonotic and vector-borne diseases. The first project immediately focused on the effect of land-use change (deforestation, commercial plantations, agricultural expansion, urbanization) on the risks of zoonotic diseases associated with wildlife (rodents). Subsequent projects broadened interests to the effects of climate change, antibiotic resistance, pesticides, including other animals (domestic or wild) and humans, but always starting from the socio-ecological context.

What types of applications do your research activities lead to?

HealthDEEP benefits from numerous field research activities conducted by its members, supplemented by laboratory investigations on parasitic or microbial agents through collaborations with various partners from universities in Thailand, Laos, Malaysia, Cambodia, and Singapore, as well as the Pasteur Institute network, Fondation Mérieux, and the Oxford University-Wellcome Trust network. HealthDEEP has two observatories: one located at Mahidol University Kanchanaburi Campus (MUKA), dedicated to the study of reservoir, vector, and pathogen ecology; and another one, the Social-Ecological Observatory of Health and Biodiversity of Saen Thong, situated in Nan province, where collaborative research continues between scientists, communities, and local administrations. Our new projects now focus on prevention at the ecosystem level and wildlife interface within the ASAMCO (PREACTS Afd-funded project and coordinated by IRD) and PREZODE. In particular, we aim to assess the role of ecological restoration, such as community reforestation, as a nature-based solution to prevent the emergence and spread of zoonotic or vector-borne diseases.

What types of applications do your research activities lead to?

Thailand and France have a long history of collaborative research. We can highlight the significance of the Thailand International Cooperation Agency (TICA), which provides support for projects involving foreign experts. The lab and its French researchers benefit from this recognition through the «Innovative Animal Health project» granted by TICA. On the French side, HealthDEEP could benefit from programs run by the French Embassy in Thailand, such as «Programme Hubert Curien» or «Fonds Equipe France.» Finally, the collaborative research calls of the French ANR and PEPR PREZODE make it possible to establish consortia bringing together French researchers from different research institutions. HealthDEEP, under the supervision of the CNRS together with Kasetsart University and Mahidol University, is well-positioned to coordinate large interdisciplinary projects involving various French institutions and other research networks and universities in Asia.

What are your ambitions for this new laboratory?

Our primary ambition is to be a recognized scientific partner in social-ecological health and biodiversity by strengthening our scientific capacities for collaborative projects, fostering significant advances in preventing health risks at the human-animal-plant-ecosystem interface essential for nature-based innovations, and contributing to global and regional science/policy dialogue; the final ambition is to mentor the next generation of Thai and French researchers for the challenges of HealthDEEP

Signing ceremony of the laboratory HealthDEEP at the French Embassy in Thailand, in presence of Serge Morand (Director of the laboratory) and Antoine Petit (CNRS CEO). 12 July 2023, Bangkok. Credits: CNRS.

Serge Morand leading a CNRS delegation in Mahidol University, Kanchanaburi Campus. Credits: Kanchanaburi Campus.

Rice planting season in Nan Province, Thailand, amidst infectious disease risks heightened by rainy weather and climate variability. Credits: Chuanphot Thinphovong.

Notes

CNRS in ASEAN 2023

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Front cover photo
Fieldwork in ASEAN, with Serge Morand and his team.
Credits: Serge Morand.

Back cover photo
CREATE Tower, hosting both CNRS@CREATE and the CNRS Representative Office for ASEAN.
Credits: CNRS@CREATE.