

Advanced Technological Facilities



LAAS

has always been concerned by the development of advanced equipments and technological platforms. In 1976, it was the first academic laboratory to invest in a clean room for the manufacturing of microsystems. In 2012, it inaugurated a new experimental instrumented and energy autonomous building. This platform is dedicated to several of the research topics within the Adream axis, including cyber-physical systems and energy.

LAAS research platforms

- Design and simulation platform for micro and nanosystems
- Technological platform: 1500 m² clean room, part of the Renatech national network for micro and nano technologies
- Alive platform: 400 m² for biological and chemical analyses
- Characterization platform: more than 600m² for electrical, microwave thermal and EMC analyses
- Robot fleet: a dozen of walking, rolling, flying robots
- Adream axis instrumented building:
 - cyberphysical systems
 - photovoltaic energy

The Adream building,

by the scale and sophistication of its instrumentation, anticipates what our living environment could be in a near future. It provides an experimentation platform - featuring close to real conditions - for the research projects within the Adream Axis. Indeed, most correspond rapidly changing areas such as embedded systems, sensor networks, Internet of things, machine to machine communication, interconnected services, companion robots, privacy protection and optimized energy. The platform will grow progressively with new robots, sensors and networks and new energy related equipments.



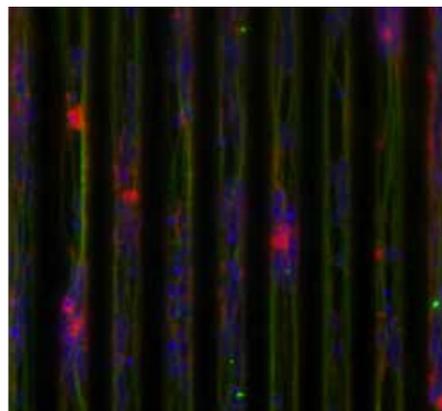
LAAS Clean Room

is central to the micro and nanotechnologies platform that belongs to the national Renatech network. The 25 million euros worth design, layout, materials processing equipments support the prototyping of microelectronic components and micro and nanosystems. These facilities are open to the academic community and to industrial applications. This platform is continuously evolving for nearly 40 years.



The Alive platform

gathers 400 m² of experimental facilities for studying and characterizing micro and nanosystems dedicated to biology, health and environment. These resources are vital to the research work of the Alive axis on biosensors, nanobiosystems, labs on a chip, bio-inspired nanotechnologies.



LAAS

LABORATORY FOR ANALYSIS
AND ARCHITECTURE OF SYSTEMS

The intelligence of systems



Laboratoire
conventionné avec
l'Université de Toulouse

LABORATOIRE D'ANALYSE
ET D'ARCHITECTURE
DES SYSTEMES DU CNRS

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2 Strategic Axes

Adream

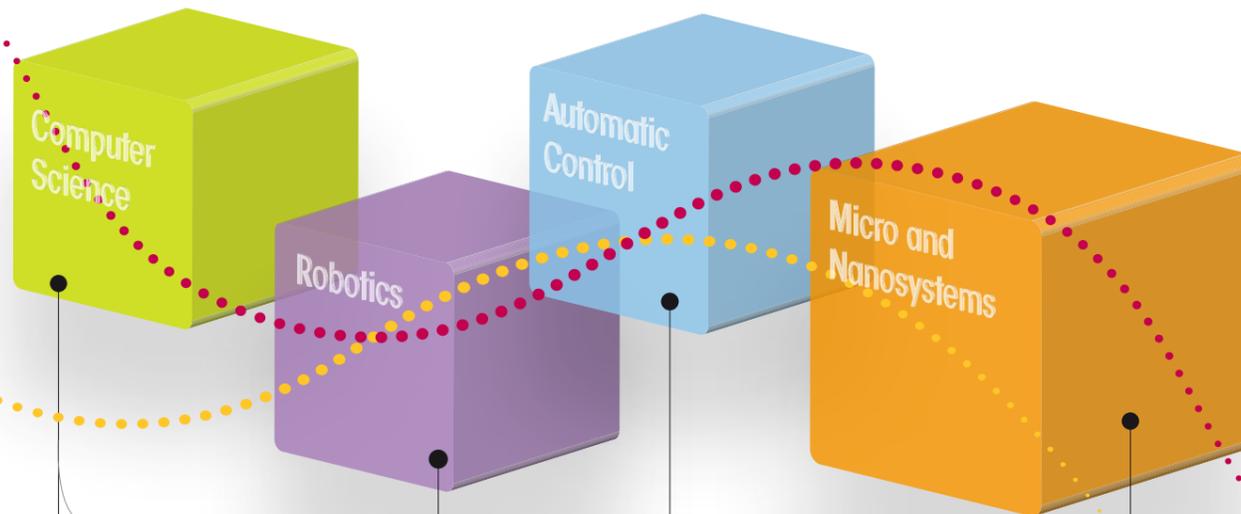
Architectures for dynamic, reconfigurable, embedded, autonomous, mobile systems

Alive

Analysis and interaction with life sciences and environment

To anticipate

the interdisciplinary challenges of emerging and future systems, LAAS identified two strategic axes. They are based on the four major disciplines that have been the hallmark of the laboratory since its inception. Within these disciplines, eight scientific themes define scientific orientations for the coming years and coordinate the activities of 22 research teams.



- CRUCIAL COMPUTING**
- Dependable Computing and Fault Tolerance
 - Verification of Time Critical Systems
 - System Engineering and Integration
- NETWORKS AND COMMUNICATIONS**
- Services and Architectures for Advanced Networks
 - Distributed Computing and Asynchronism

- ROBOTICS**
- GEPETTO: Movement of Anthropomorphic Systems
 - Robotics, Action and Perception
 - Robotics and Interactions

- DECISION AND OPTIMIZATION**
- Diagnosis and Supervisory Control
 - Methods and Algorithms in Control
 - Operations Research, Combinatorial Optimization and Constraints

- MICRO NANO BIO TECHNOLOGIES**
- Nano Bio Systems
 - Microsystems for Analysis
 - Materials and Processes for Nanoelectronics
 - Fluidic High Frequency Micro and Nano Systems
- ENERGY MANAGEMENT**
- Power Management System Integration
 - Energy and Embedded Systems
- MICROWAVES AND OPTICS: from Electromagnetism to Systems**
- Micro and Nano Systems for Wireless Communications
 - Microwaves and Opto-microwaves for Telecommunication Systems
 - Optoelectronics for Embedded Systems
 - Photonics
- NANO ENGINEERING AND INTEGRATION**
- Nano Engineering and System Integration

Research in information and systems sciences

RESEARCH

at LAAS aims at a fundamental understanding of complex systems while considering the use that may arise. Conversely, many industrial and societal issues, for example in the field of aeronautics, space, health, energy or communication networks, raise fundamental questions which feed researchers inspiration.

LAAS is a laboratory of CNRS, the French organization for scientific research, and is also a member of the Network of Carnot institutes — that gathers selected labs involved in scientific research and innovation for enterprises.

SCIENTIFIC COMMUNITY

LAAS is active in the main governing bodies of its community: consultation and decision bodies (National Committee for Scientific Research, scientific board of CNRS Institutes to which it belongs), leadership bodies (European networks, learned societies such as IARP, IFAC, IEEE, IFIP, SEE, etc.), expertise bodies (journals editorial boards, international conferences program committees, French agencies for research funding, ANR, FRAE, ...). Among its most tangible contributions, the visibility of LAAS publications stands within the research community. Moreover, half of the publications are co-authored with researchers from other organizations.

Among the 1000 publications in 2011

- 22 Books
- 187 International journals
- 393 International conferences
- 29 Invited talks
- 62 PhD theses



A culture of openness

EXCHANGE OF KNOWLEDGE

LAAS has been involved in European programs since they were first set up. During the 6th Framework Program, LAAS participated in 36 projects and coordinated an integrated project, Cogniron, and two networks of excellence, ResIST and AMICOM. In the FP7 phase, 16 projects are still running.

The laboratory is also very much involved in the national scientific life, especially in the *Investissements d'avenir* (Investments for the future) Program, national research projects, or in the governance of scientific foundations. LAAS is on the steering committee of the French Research Thematic Network *Sciences and Technologies for Aeronautics and Space*.

Investissements d'avenir (investments for the future)

LAAS is involved in:

- Equipments of Excellence:
- ROBOTEX - National network of experimental robotics platforms
- LEAF - Laser processing platform for multifunctional electronics on Flexible substrates
- Laboratory of Excellence: GanEx - National network for GaN
- Institute for Technological Research AESE - Aeronautics, Space and Embedded Systems
- Toulouse Midi-Pyrénées Society for Accelerating Technology Transfer: Toulouse Tech Transfer
- Initiative of Excellence: University of Toulouse and of Midi-Pyrénées

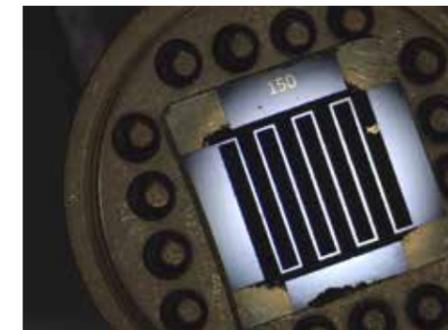
MORE THAN 1500 PhD THESES

were defended at LAAS since its foundation. The laboratory is engaged in scientific education for research and through research. It is in charge of two doctoral programs: "Electrical engineering, electronics and communications" and "Systems". It also offers graduate training in two others: "Mathematics, IT, telecommunications" and "Materials science". LAAS is associated with three universities and three engineering schools within the "PRES-Université de Toulouse". At LAAS, international exchange is a culture that is acquired since the thesis period. Among the PhD students, 38 nationalities coexist. About 20 PhDs are being co-advised with foreign organizations.

INTERNATIONAL COOPERATION

LAAS international visibility is the result of a proactive behavior. Relationship is ongoing with countries of the European Union, as part of the Framework Programs. It also exists outside Europe, in particular with Latin America, the United States and Asia. LAAS is a partner in CNRS international units such as *Biomaterialization and Nanostructures* in China, *Integrated Micro Mechatronic Systems* in Japan, *Indo-French Center for Applied Mathematics*, and with the European associated laboratory *SmartMEMS* with Greece and Romania. LAAS regularly hosts foreign researchers through bi-lateral collaborations, Excellence Research Chairs or sabbatical stays. In addition to foreign PhD students and post-doctoral fellows, the laboratory annually hosts a dozen of visiting researchers from abroad for several month periods.

4 Disciplines
8 Scientific Themes
22 Research Teams



APPLICATION AREAS

LAAS researches impact many areas: aeronautics, space, embedded systems, communications, transport, networks, chemistry, health, environment, defence, services. The laboratory has strong links with industry and is involved in many collaborative projects with local, national and international companies of all sizes. Partnership research often took the form of joint research-industry laboratories, for example with Actia, Airbus, Astrium, Essilor, Freescale. This concept was first set up at LAAS in 1991.

Start-ups from LAAS

- offer an industrial take-off to some of its research results. Among them:
- Kineo Cam: Motion planning
 - QoS Design: Network traffic optimization
 - Tag Technologies: Microsystems for motion detection in home automation
 - Noomeo: 3D sensors
 - Epsilone: Laser-based anemometry technology

LAAS AFFILIATE PARTNERS CLUB

is also a breeding ground for relationship with the industry. Founded in 1990, the Club has currently more than 70 members, encompassing large enterprises and SMEs. Its aim is to create a discussion forum about issues that matter for the industrial partners. Also, it offers them a special access to LAAS scientific and technical publications. Finally, the relationship with industry is also developed via industry-research training agreements (the CIFRE conventions). Currently, 29 CIFRE-funded theses are underway at LAAS.

Competitiveness Clusters

- (French clusters gathering companies, research centers and education institutions in cooperative efforts)
- LAAS is very active within Midi-Pyrénées clusters:
- Aerospace Valley (Aeronautics, space and embedded systems)
 - Cancer-bio-health
 - Agrimp Sud-Ouest Innovation (agriculture and food industries)
 - Water (Valorisation of water resources)
- LAAS is also involved in clusters of other regions:
- Systematic (ICT) — Ile de France
 - Cap Digital (Digital content) — Ile de France
 - DERBI (Development of renewable energy) — Languedoc-Russillon

A long tradition of partnership and innovation

LAAS CARNOT INSTITUTE

LAAS is one of the 34 French Carnot Institutes. This label, awarded in 2006 and renewed in 2011, recognizes LAAS partnership practices. Carnot institutes develop both upstream research, in order to enrich their scientific and technological skills, and also a proactive research partnership policy with enterprises.