Engineering science, computer science and imaging laboratory
CREATED IN 2013, THE LABORATORY BRINGS TOGETHER THE RESEARCH STRENGTHS OF THE UNIVERSITY OF STRASBOURG IN THE FIELDS OF ENGINEERING SCIENCE AND COMPUTER SCIENCE, WITH IMAGING AS THE UNIFYING THEME. THE MAIN AREAS OF APPLICATION ARE BIOMEDICAL ENGINEERING, ENVIRONMENT AND SUSTAINABLE DEVELOPMENT. WITH OVER 450 PEOPLE, ICUBE IS A MAJOR DRIVING FORCE FOR RESEARCH IN STRASBOURG.

Scientific excellence

The State-funded *Investissements d’Avenir*’s call for projects proved to be highly successful for the laboratory.  
ICube...  
... houses Robotex and FIT, 2 platforms of excellence (part of the *Equipex* research grant program), dedicated to medical robotics and the internet of things respectively. ICube is also a partner of Equip@Meso, an *Equipex* on scientific computing.  
... is member of 3 laboratories of excellence (*Labex*) - IRMIA, CAMI and G-Eau-Thermie – in theoretical computer science, medical robotics and geothermal energy respectively.  
... is the main scientific partner of the *Institut Hospitalo-Universitaire* (IHU) in minimally invasive image guided surgery and also belongs to 2 Institutes of Excellence for carbon-free energies (IEED) in the field of solar energy (PVF and INES2).

Transversal research programs

The laboratory’s scientific research program is centered around 5 transversal projects:  
• Medical and surgical imaging and robotics  
• The environment and sustainable development  
• Scientific computing  
• Imaging physics and systems  
• Material engineering for energy and environmental applications

A Laboratory at the interface between engineering and information science

ICube provides a unique environment, with 2 research communities working on cutting-edge projects interfacing the digital world and physics.
ICube is set to become a leading laboratory in biomedical engineering. The laboratory has a privileged connection with the medical world thanks to several research teams working within the Strasbourg University Hospital, the Institute of Research against Cancer of the Digestive System (IRCAD) and the Institute of Biophysics (IPB). The exceptional relationship ICube enjoys with the medical world is based on the more than 20 hospital practitioners belonging to the laboratory, working in biophysics, radiology and nuclear medicine, as well as cutting-edge medical imaging and robotics platforms, including 2 MRI machines, a high field small animal MRI scanner, several medical robot prototypes and a fast 3D prototyping system.

**Biomedical Engineering and applications**

ICube scientists are pursuing original research programs in remote sensing, water treatment, civil engineering, geothermal energy and solar energy, thanks to considerable experimental resources (a mobile laboratory for urban bioclimate monitoring, water treatment and flood simulation pilot units, a clean room for photovoltaic material engineering).

**Environment and Sustainable Development**
Computer science department

The Computer Science Research Department is made up of 5 teams covering a wide range of areas. It carries out fundamental and applied research in computer science, including next generation internet and networks, the internet of things, computer graphics and geometry, specifications and proofs in geometry, image processing, high-performance scientific computing, compilation, cloud computing, bioinformatics, data mining, knowledge engineering, stochastic optimization and complex systems.

Solid-state electronics, systems and photonics department

The research performed by the 3 research teams of the department covers a wide range of areas, including the physics and technology of elementary devices, the development of photonic and electronic instrumentation systems and innovative processes. The department contributes to the development of knowledge in fields with a high societal impact, such as information technologies (nano-electronic and photonic devices), renewable energies (photovoltaic cells) and medical instruments (integrated instrumentation systems).

Imaging, robotics, remote sensing and biomedical department

The research staff in this department carry out fundamental and applied research in the following areas of information technologies and science: signal and image acquisition and processing, computer vision, control theory, robotics, remote sensing, neurosciences and biophysics. Through its 4 research teams, the department is notably involved in developing new technologies for healthcare (clinical and preclinical medical imaging and robotics), as well as astronomy and observation of the Earth.

Department of mechanics

This department comprises 3 research teams. Its research and transfer activities include fluid mechanics (hydraulics, rheology and turbulence), reactive transfers with applications in waste water treatment, biomechanics and the relationship between medical imaging and mechanical properties, the mechanics of multiscale materials and the evolution of their microstructure, civil engineering and its applications in geothermal energy and eco-design.
GEOMETRY AND COMPUTER GRAPHICS / NETWORKS / SCIENTIFIC AND PARALLEL COMPUTING / THEORETICAL BIO-INFORMATICS, DATA MINING AND STOCHASTIC OPTIMIZATION / MODELS, IMAGES AND VISION / CONTROL, VISION AND ROBOTICS / REMOTE SENSING, RADIOMETRY AND OPTICAL IMAGING / INTEGRATIVE MULTIMODAL IMAGING IN HEALTHCARE / MATERIALS FOR PHOTOVOLTAIC AND ELECTRONIC DEVICES/ HETEROGENEOUS SYSTEMS AND MICROSYSTEMS / PHOTONICS INSTRUMENTATION AND PROCESSES / FLUID MECHANICS / MULTISCALE MATERIALS AND BIOMECHANICS / CIVIL ENGINEERING

Experimental platforms

The experimental and software platforms are managed by the research teams and the departments. They are used for research purposes as well as for industrial transfer activities. They are also available for contractual work in the following areas: networks, data mining, massively parallel artificial evolution, digitization, geometric modeling, virtual reality, in-vivo imaging, medical image processing, medical robotics, interventional radiology, polarimetric imaging, urban bio-climatology, 3D urban models, optical instrumentation and microscopy, holography, technologies for organic and inorganic devices, characterization of materials and devices, microelectronic testing and design, biomechanical modeling, hydraulics, civil engineering, etc.
Partnerships

Working closely with industry

Over the past 5 years, the laboratory researchers have developed partnerships (through research contracts and consulting activities) with over 100 SMEs, mid-cap companies and major national and international groups.

The laboratory is a member of the Carnot Télécom & Société numérique institute, thanks to its close relationship with Télécom Physique Strasbourg.

ICube is involved in a number of collaborative industrial projects in the Alsace Biovalley, Energivie, Hydros and Véhicule du futur competitive clusters.

The laboratory also works closely with SERTIT, the Strasbourg regional image processing and remote sensing service and the IREPA LASER laser-processing centre.

Scientific partnerships

In the field of information science, ICube enjoys a close relationship with INRIA, whose CAMUS project team works within the laboratory, and with the Institut Mines-Télécom, mainly through the Futur & Ruptures program.

In the biomedical field, ICube works in close partnership with:
• the Strasbourg University hospital through a shared MRI platform in the interventional radiology department of the city’s new hospital.
• IRCAD, the Institute of Research against Cancer of the Digestive System, which houses the laboratory’s medical robotics research team and its experimental platforms.
• the Faculty of Medicine, by being an active member of Strasbourg translational research federation.

The laboratory is partner of PMNA, the regional pole of excellence about material sciences.

Researchers open to the world…

The researchers in the laboratory have developed collaborative work with close to 200 laboratories worldwide during the past 5 years.
ICube is the main research laboratory for Strasbourg’s 4 engineering schools: Télécom Physique Strasbourg, INSA of Strasbourg, ENGEES, and ECAM Strasbourg-Europe.

ICube is the main laboratory for the teaching staff in computer science, engineering science and biophysics affiliated to the Mathematics and Computer Science Faculty (UFR), the Physics and Engineering Faculty (UFR), the Faculty of Medicine, as well as the Haguenau, the Robert Schumann and the Louis Pasteur University Institutes of Technology (IUT).

ICube is the supporting laboratory for the Computer Science Masters at the Mathematics and Computer Science Faculty, the Imaging, Robotics and Biomedical Engineering (IRIV) Masters at Télécom Physique Strasbourg and the Engineering Science (SPI) Masters at the Physics and Engineering Faculty. It provides training through research projects for more than 100 trainees and PhD students each year.
ICube laboratory key figures

Staff

The members of ICube numbered 454 on January 1st 2013, with:
274 permanent members including 55 Full Professors, 143 Assistant or Associate Professors, 8 Research Directors, 12 Researchers, 45 Engineers and 11 Technicians, with 20 Hospital Practitioners among the researchers and faculty staff.

180 non-permanent members including 144 PhD students, 16 Postdocs and 20 staff members with limited-term appointments

Employers of the permanent staff

International collaborations

193 active scientific collaborations with foreign researchers in the past 5 years with 129 collaborations having produced joint publications

Industrial partnerships during the past 5 years

83 national industrial partners:
Renault, AREVA, ARKEMA, SNCF, Suez Environnement, EDF, 6Wind, Telmat, Orange, Alenia Space, Framatone, Blédina, Veolia Environnement, Alcatel-Lucent, Photowatt, Total, EADS, CSG, STMicroelectronics, Hutchinson, SOCOMEC, Schiller Medical, Schlumberger… to cite but a few.

30 international industrial partners:
Novartis, Daimler, Volkswagen, General Electric, Dynamore, Holcim, Merck-Millipore, Roche, Karl Storz Medical, Cisco, Siemens, Merck-Serono, TransMedics, Montena, Novelis, Suntech, Corning, ON-Semiconductor, Lilly, KETEK, Infineon/Intel, Ela Medical, Hydac, General Motors… to cite but a few.

Startups:
Axilum Robotics, Bluejimp.

Research grants

95 active contracts in 2012 totaling 25.5 M€:
• 14 European projects for 3 M€
• 34 grants from Agence Nationale de la Recherche for 12.3 M€
• 31 industrial contracts for 1.7 M€
• 16 other contracts for 8.5 M€

32 contracts started in 2012 totaling 9.5 M€:
• 6 European projects for 0.75 M€
• 9 grants from Agence Nationale de la Recherche for 7.8 M€
• 9 industrial contracts for 0.3 M€
• 8 other contracts for 0.6 M€

2013 operating budget: 0.9 M€

2013 overall budget with research grants, permanent staff salaries and non-permanent staff scholarships: 28 M€

Doctoral theses

100 researchers and faculty staff have the Habilitation à diriger des recherches diploma
36 PhD Diplomas were awarded in 2012

Scientific publications

19 book chapters
164 peer reviewed international journal publications
15 peer reviewed national journal publications
183 publications in the proceedings of international conferences

Patents

4 patent applications in 2012
12 active patents
Addresses of the different sites

1. ICube laboratory - UMR 7357
   Télécom Physique Strasbourg
   300 bd Sébastien Brant
   BP 10413
   67412 Illkirch Cedex
   France

2. ICube laboratory - UMR 7357
   IRCAD
   Hôpitaux Universitaires
   1 place de l'Hôpital
   67091 Strasbourg Cedex
   France

3. ICube laboratory - UMR 7357
   Institute of Biophysics (IPB)
   Faculté de Médecine
   4 rue Kirschleger
   67085 Strasbourg cedex
   France

4. ICube laboratory - UMR 7357
   23 rue du Loess
   BP 20 CR
   67037 Strasbourg Cedex 2
   France

5. ICube laboratory - UMR 7357
   2 rue Boussingault
   67000 Strasbourg
   France

6. ICube laboratory - UMR 7357
   INSA of Strasbourg
   24 bd de la Victoire
   67084 Strasbourg Cedex
   France
ICube is a joint research laboratory, administrated by the University of Strasbourg, the CNRS, ENGEES and INSA of Strasbourg.

Getting to Télécom Physique Strasbourg (main office)

Take the A35 highway and come off at exit 5, marked Illkirch Nord, Baggersee. Go straight over the Baggersee crossroads (traffic lights) and down Alfred Kastler road. When reaching the roundabout, take the 4th exit, marked Parc d’Innovation (bd Sébastien Brant). The Télécom Physique Strasbourg car park is on the left.

Take tram A towards Illkirch, from the main railway station and get off at the Campus d’Illkirch stop.

There is a train every 15 minutes from Entzheim airport to Strasbourg railway station. From there, take the tram, as indicated above.