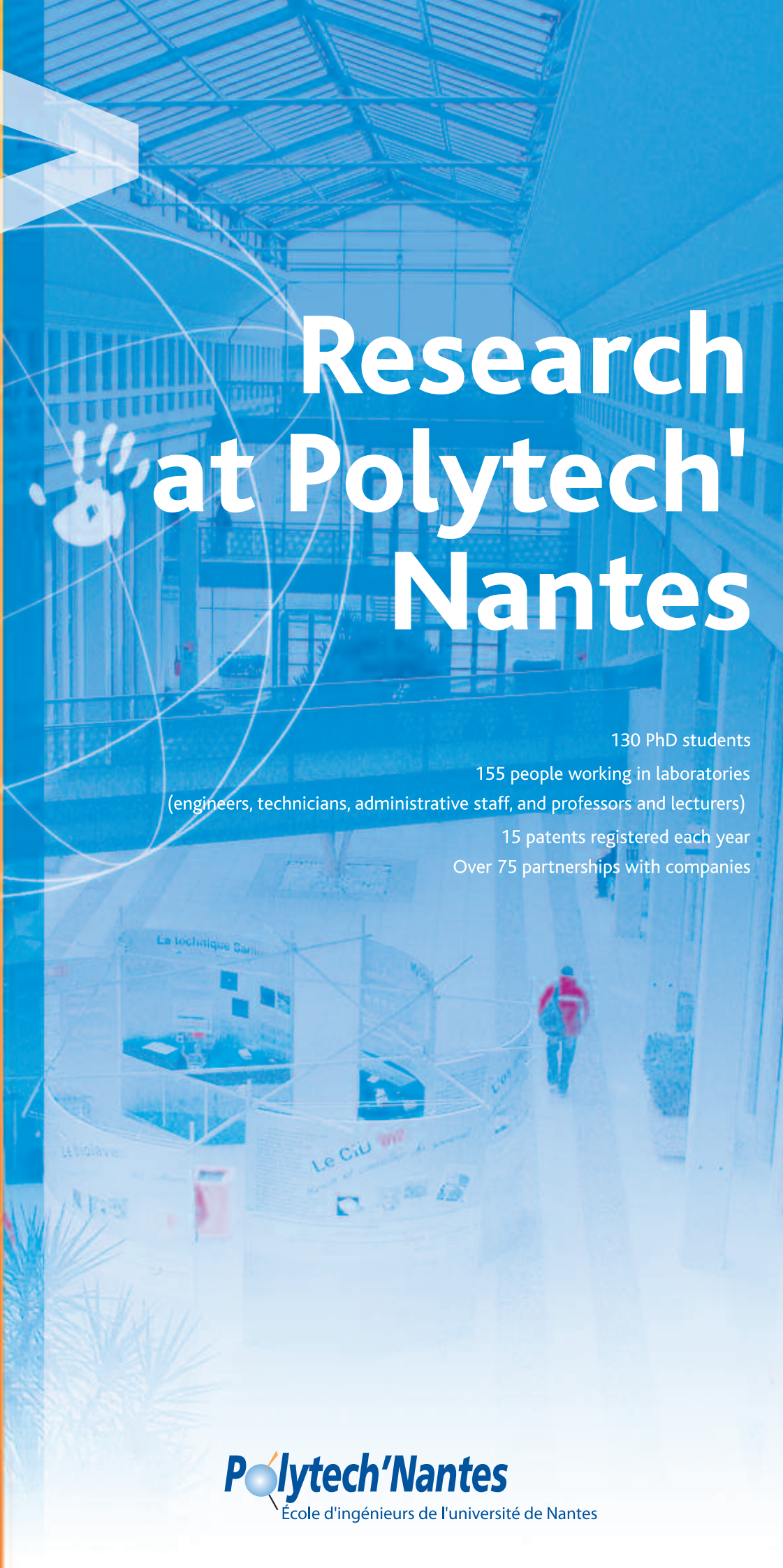
Research at Polytech' Nantes

130 PhD students

155 people working in laboratories
(engineers, technicians, administrative staff, and professors and lecturers)

15 patents registered each year

Over 75 partnerships with companies



UNIVERSITÉ DE NANTES

Polytech'Nantes
École d'ingénieurs de l'université de Nantes

Dynamism
Expertise
Reputation
Quality

The dynamism of Polytech'Nantes' laboratories involved in various spheres of excellence, in which they demonstrate their skills: the CNRS (AltanSTIC) center, competitiveness centers (EMC2, Images and networks, and the Leading automakers).

The expertise of its research teams, which attracts more researchers each year.

The national and international reputation of its researchers.

The **top-quality** work carried out by its laboratories, recognised by means of the labels it is awarded: CNRS, INRIA, and the French Research Ministry.

An active approach: its laboratories' partnerships

Over 60 laboratories throughout the world work in partnership with research at Polytech'Nantes.

Polytech'Nantes' laboratories and teams work in partnership with other structures on many projects in leading fields. Such joint projects allow fundamental and applied research to be carried out by combining their skills.

For example, its partnership with the École Polytechnique de Montréal involves several laboratories at Polytech'Nantes:
it encourages exchange between professors and lecturers in France and Quebec.

Contents

Two major fields of research:

Computer science, electronics and electrical engineering

IRCCyN
Nantes Communication and Cybernetics Research Institute

IVC team (Image and Vidéo Communication)
irccyn@polytech.univ-nantes.fr

IREENA
Nantes Atlantique Electrical Engineering and Electronics Research Institute

ireena@polytech.univ-nantes.fr

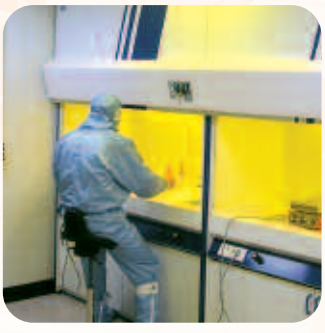
LINA
Nantes Atlantique Computing Laboratory

COD team (Knowledge and Decision), Atlas-Grim team (Management and summarization of multimedia data)

lina@polytech.univ-nantes.fr

Fields of activity

IRCCyN	IREENA	LINA
IVC team: Visual psychology, video, multimedia networks, Mojette transformation, medical imaging, written matter and documents.	Modelling, system architecture and design, signal processing applied to communication and control, electromagnetic modelling, energy conversion and management, optics and telecommunication materials, photonics.	**COD team:** Engineering and knowledge management, data mining, decision support. **Atlas-Grim team:** Summaries, classification, and management of large collections of multimedia data.



Main facilities

IRCCyN	IREENA	LINA
IVC team: Eye-tracker, smartbit, video/image quality testing room.	Anechoic chamber, clean room, electrical machine test bench, induction heating experiment platform.	**COD team:** Virtual reality room (financed through teaching). **Atlas-Grim team:** Calculation cluster.

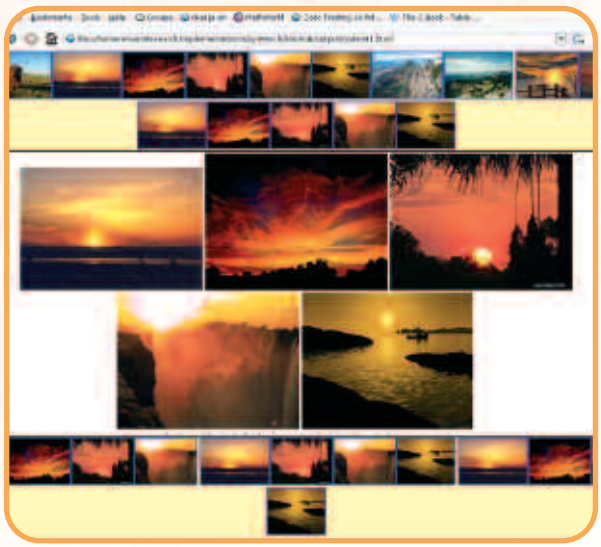
Computer science, electronics and electrical engineering

A few real-life applications

IRCCyN (IVC team): Working towards an improved visual quality of high-definition television...

The European HD4U project carries out research into the development of high-definition television solutions for Europe.
The team's work aims at optimising video sequence coding. Its objectives: to improve the visual quality of video sequence display on new generation LCD and Plasma screens.

LINA: Organising your personal multimedia data...



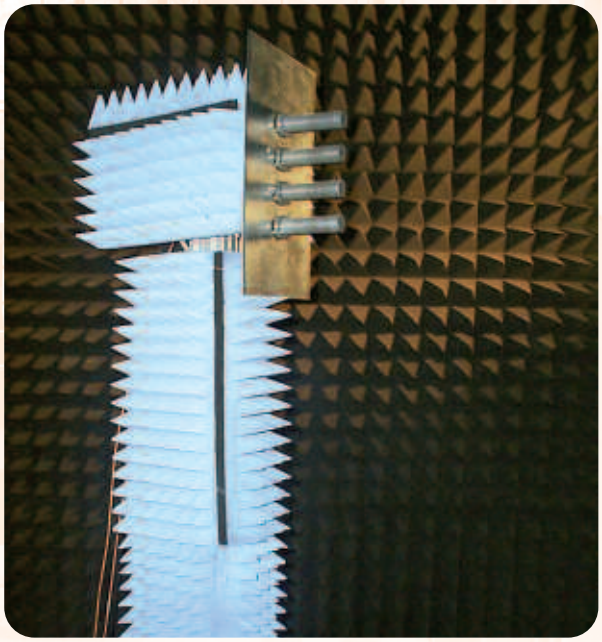
Different documents can be stored on a personal computer: photos, videos and music. When faced with a large volume of data, it can be difficult to find a specific document. LINA develops softwares that allow intuitive browsing in these files, finding images, matching a given image, pictures taken in the same place, or photos, videos or audio clips relating to a given person.
Finding 'all the pictures of sunsets from your holidays in Australia' will become child's play.

Computer science, electronics and electrical engineering

A few real-life applications

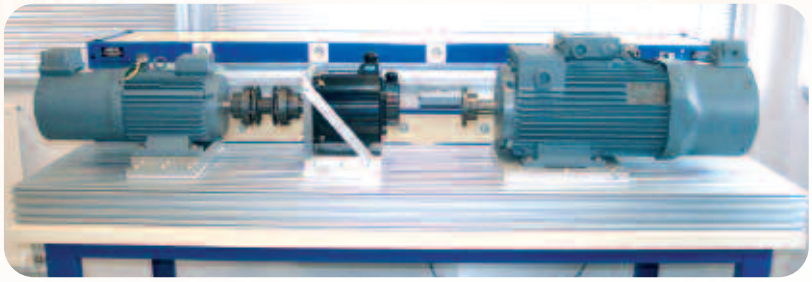
IREENA: From broadband Internet by satellite to Ambient Intelligence

Users already have multifunction workstations allowing them to access and process information and send it all over the world.
New advances in architecture, design methodology and systems technology will make it possible to develop remotely-controlled smart sensor networks that will interact, searching in real time for the resources required to transfer the data gathered. Various applications are possible: domestic ('intelligent' home), environmental monitoring (remote sensing of sea pollutants) or keeping an active watch on the possible decay of civil engineering structures (viaducts and motorway bridges).



IREENA: Energy management and power propulsion

The forecast shortage of fossil fuel sources has turned research towards optimal renewable energy management (wind power or swell energy for example) and the development of electric and hybrid motorisation techniques (combining electric and heat engines) for automobiles and boats.
In-depth analysis of energy conversion and storage techniques combined with the control of phenomena of embedded power networks will provide significant operating endurance to travelling bodies equipped with such systems.



Computer science, electronics and electrical engineering

Examples of partnerships

Industrial partnerships:

IRCCyN, IVC team:
Thomson R&D, Philips, TF1, VitecMultimedia, Envivio, Keosys, QualiForMed, Vision Object and PIBI.

IREENA:
Alcatel, ATMEL, CEA, CELAR, Chantiers de l'Atlantique, CNES, EADS, EDF, France Telecom, Philips, Photonetics, PSA Renault, THALES, and Thomson R&D.

LINA, COD team:
PeformanSe and KnoweSia.

LINA, Atlas-Grim team:
France Telecom, Nokia, and Thomson multimedia.

Academic partnerships:

IRCCyN, Équipe IVC:
TSAR project with the Louvre Museum, IETR, LIRMM, LIS and IRSTV.

IREENA:
GREAH, GREEN, ENSAAT, ICMB, IEMN, IETR, LCPC, LEAT, LEG, LEST, LESTER, LIP6, LPUB, LSO, L2EP, L2ES, SATIE, TAMCIC,TIMA and XLIM.

LINA, Équipe COD:
ENSIETA, ERIC and GRIMM.

LINA, Équipe Atlas-Grim:
CLIPS-IMAG, CNAM and IRISA.

International cooperation

IRCCyN, IVC team:
Rome III University, University of Chicago, Monash University in Melbourne, University of Southern California (USC), and FDA/CDRH in Washington.

IREENA:
Lodz University, University of San Diego, École Polytechnique de Montreal, École Supérieure Polytechnique of Dakar, Fez University, Marrakech University, Louvain La Neuve University, University of Bath, Higher Technical Institute in Lisbon, Concordia University, Mohammadia School of Engineering, Constantine University, Sfax National School of Engineering, University of Cape Town and Technikon Gauteng in Pretoria, EPFL, Mainz University, Rostock University, National Physical Laboratory London, and Fraunhofer Institute Wurzburg.

LINA, COD team:
University of Turin, Bucharest Polytechnic Institute, South East European University, Galatasaray University, University of Palermo, Can Tho University, Yokohama and Kiushu Universities, Laval University, and University of Regina.

LINA, Atlas-Grim team:
University of New South Wales, and Rabat Faculty of Science.

Materials, thermal and energy science

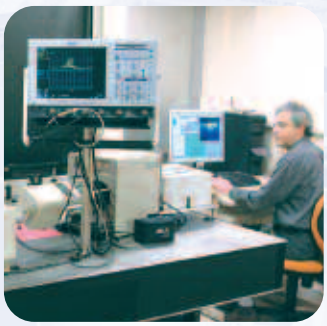
IMN
Jean Rouxel Materials Institute
imn@polytech.univ-nantes.fr

LGMPA
Materials Sciences and Engineering Laboratory
lgmpa@polytech.univ-nantes.fr

LTN
Nantes Thermokinetic Laboratory
ltn@polytech.univ-nantes.fr

Fields of activity

IMN	LGMPA	LTN
New materials synthesis for energy conversion and storage, development of new optics materials, plasma processes for microelectronic material deposition and etching, characterisation for microtechnology and nanotechnology, and synthesis, characterisation and measurement of nanomaterials' physical properties.	**Materials and processes:** Damage and embrittlement of materials,engineering of microstructure,welding processes and metallurgy. **Energy and components:** Energy storage and conversion system, heat transfer and energetics materials and components: design and analysis.	Interface and microsystem thermophysics, heat transfer in polymer material forming processes, thermofluids, complex flows and energy.



Main facilities

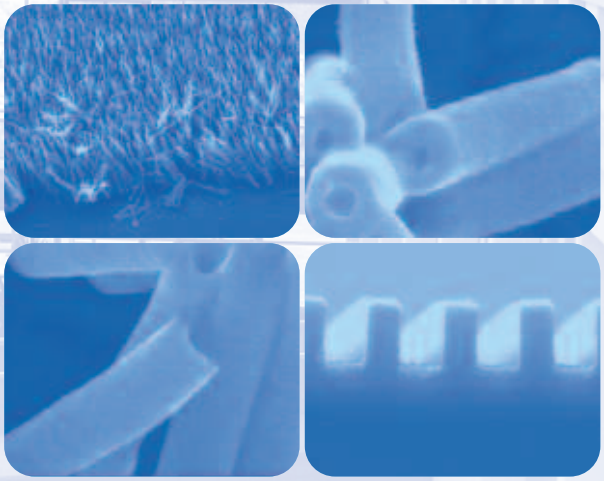
IMN	LGMPA	LTN
High-resolution NMR of solids, microESCA, femtosecond luminescence, X-ray diffraction, and high-resolution transmission electron microscopy.	Electron Probe Micro Analysis (EPMA), Auger electron Spectrometer (AES) with in situ low and high temperature fracture stage, scanning electron microscope equipped with X microanalysis (EDX), an EBSD detector and a high temperature stage.	Engine exhaust pipe thermal test bench, on-line conductivity meter for injected polymers, multifunctional exchanger platform, thermal metrology and anemometry (LDA and PIV).

Materials, thermal and energy science

A few real-life applications

IMN: Nanomaterials, nanosciences and nanotechnologies... useful in every field!

In this world of very small objects, so-called nanometric objects (one nanometre is one millionth of a millimetre), carbon nanotubes, conducting polymer nanowires and processes that create all types of objects in this nanoworld through micromachining are being developed. Their applications vary from microelectronics to biotechnologies to energy storage and analysis of the material's various properties at a scale that is new to the majority of industrial companies.



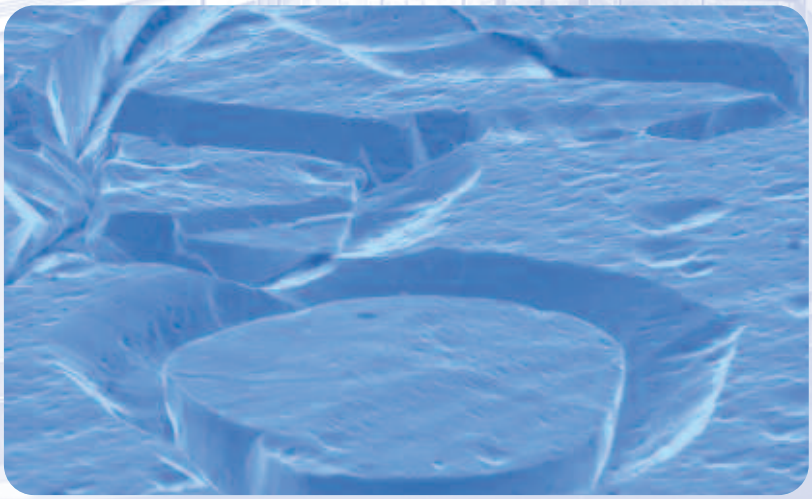
LTN: Exchangers/reactors, new technology for the chemicals industry

Exchangers/reactors and multifunctional exchangers combine three functions: heat transfer, mixing and reaction. They have several advantages: improved reaction control thanks to heat transfer, better selectivity due to the intensification of the mixture (increased isothermicity and a reduction in residence time), reduction in secondary reaction products, etc. for improved reactor safety.

Materials, thermal and energy science

A few real-life applications

LGMPA: Higher performance welding processes for the car and aeronautics industries...



These processes are used for assembly (auto bodies and structural aircraft parts) and repairing worn out and cracked parts following intensive use (turbine blades in aircraft engines).

LGMPA aims at developing new processes, especially 'activating fluxes' welding: assembly methods have higher performances (welding thick parts), are quicker (increased productivity) and welded joints are stronger (increased performance and safety).

Thanks to the laboratory, the risks of faults and cracks appearing in welded joints can be lowered (improved quality) by using simulating and modelling computer tools to study metallurgy and thermomechanical aspects.

Materials, thermal and energy science

Examples of partnerships

Industrial partnerships:

IMN:
Alcatel, Batscap (Bolloré Technologies), EDF, Firadec, Inanov, Lapeyre, Lemer Pax, Rhodia, STMicroelectronics, Thales and MHS.

LGMPA:
Air Liquide, Batscap, CEA, EDF, PSA, Renault, Snecma, Imphy, Microcar and Technisoud.

LTN:
Airbus, Alcatel, CEA, CETIM, DCN propulsion, EADS, Impress, Renault, Simulforge, Synervia and Usinor.

Academic partnerships:

IMN:
Paris 6 University, IPCMS (Strasbourg University), ICMCB (Bordeaux I University), IRC (Claude Bernard University Lyon), Paris-Sud Orsay University, Versailles Saint Quentin University, Fourier University Grenoble, and Montpellier II University.

LGMPA:
CIRIMAT, LAMMI, LIOAD, and CRISMAT.

LTN:
GMCM, LTVP (ENSAM Paris), LMMH (ESPCI Paris), and GEM (ECN Nantes).

International cooperation

IMN:
University of Sao Paulo, Lodz University, University of Sofia, Raleigh University North Carolina, North Western University, Tokyo Institute of Technology, Kiel University and Brno University.

LGMPA:
Significant cooperation programme with the Universities of Quebec (UQÁM, INRS, ETS and McGill University), University of Cambridge, University of Mexico, University of Cordoba, Constantine University, and Laghouat University.

LTN:
Tsinghua University, Brown University, École Polytechnique de Montreal, Donghua University, Fudan University, Michigan State University, Caltech, and the New Jersey Institute of Technology.

IHT, a link between Man and technology

The Institut de l'Homme et de la Technologie, which is part of Polytech'Nantes, plays a pioneering role in training engineers by encouraging multidisciplinary research between engineering, and human and social sciences.

The IHT comprises two research centers:

- **'Risks and vulnerability'** deals with safety issues in industrial activities, forms of thinking and social life organisational models.
- **'Objects, Society, Information and Communication Technology'** (OSTIC) center is interested in the contribution of engineering history to develop students' knowledge and methodological approaches.

The IHT's research activities are carried out in partnership with university laboratories, as well as public and private sector economic partners.

Picture taken from a 3D animation produced by the IHT with a Computer-Aided Design softwares.

Polytech'Nantes, Nantes University's Graduate School

➤ 5 graduate engineering education specialities:

- Electrical engineering
- Computer science *(option: software and network, option: decision support systems)*
- Materials science
- Electronic systems and computer engineering
- Heat transfer and energetics

➤ 300 qualified engineers each year

➤ Over 4,000 working graduate engineers

• In-depth training through specialisation

Students choose their speciality from one of the fields offered. Specialisation is Polytech'Nantes' identity: it allows to train graduate engineers who meet the market's needs.

• A vocational training department

• Introduction to research

Tutor-supervised projects allow engineering students to make contact with laboratories and the industrial world as they carry out studies for companies.

• Research masters: optional additional training

Taken along with their final year, research masters provide students interested in research with the expertise required to do a PhD.

• Two research schools: STIM and MTGC

These allow students doing PhDs to continue training and prepare for their careers while carrying out their research work.

STIM (Information and Materials Science and Technology)

MTGC (Mechanical, Heat Transfer and Civil Engineering)

The Polytech network:

a national network of university écoles polytechniques.
2,200 qualified engineers a year for the entire network.

Polytech'Nantes - Ecole polytechnique de l'université de Nantes

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Polytech network
www.polytech-reseau.org

Polytech'Nantes
École d'ingénieurs de l'université de Nantes

Laboratory supervisors

IMN: Nantes University and CNRS
www.polytech.univ-nantes.fr/imn

IREENA: Nantes University
www.polytech.univ-nantes.fr/ireena

IRCCyN: Nantes University, Ecole Centrale de Nantes, Nantes School of Mining Engineering and CNRS
www.polytech.univ-nantes.fr/irccyn

LGMPA: Nantes University
www.polytech.univ-nantes.fr/lgmpa

LINA: Nantes University, Nantes School of Mining Engineering and CNRS
www.polytech.univ-nantes.fr/lina

LTN: Nantes University and CNRS
www.polytech.univ-nantes.fr/ltn

June 2006
Alphacom junior