

# Introduction to Institut d'Optique *Graduate School*

[www.institutoptique.fr](http://www.institutoptique.fr)

2021

Pierre BALADI  
Head of International Relations



Paris-Saclay



Saint-Étienne



Bordeaux

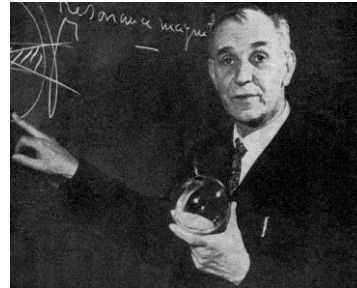
- **2017:** celebrated 100 years of research and education in optics and photonics
- **A century of expansion**
  - **1917:** creation of **Institut d'Optique**, in Paris
  - *1965: moving from downtown Paris to Orsay campus*
  - 2003: new campus in Rhône-Alpes
  - **2006:** *moving from Orsay to current location in Palaiseau*
  - 2012: new campus in Aquitaine
  - *2020: constituent of **Université Paris-Saclay***

■ **2021:**  
Saint Etienne  
Paris-Saclay  
Bordeaux

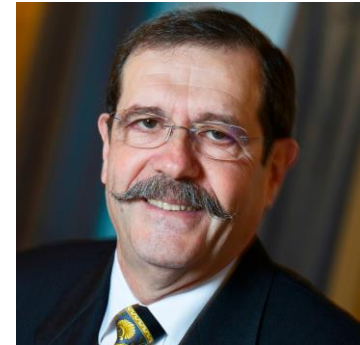
- **A rich history**



**Charles FABRY**  
*1st Director General*  
*(1917-1945)*



**Alfred KASTLER**  
*President of the Board*  
*(1960s)*



**Alain ASPECT**  
*Augustin Fresnel Chair*  
*Professor & Scientific Advisor*



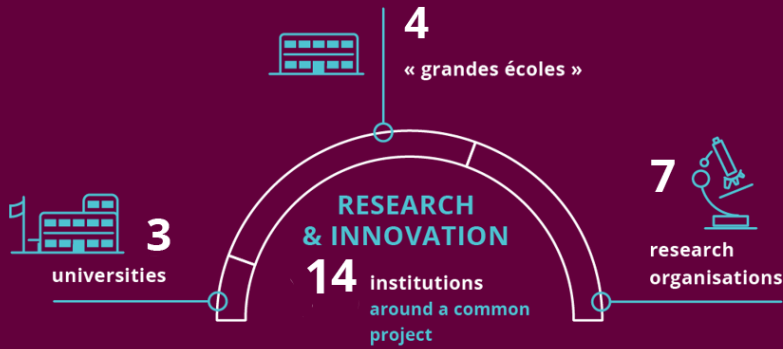
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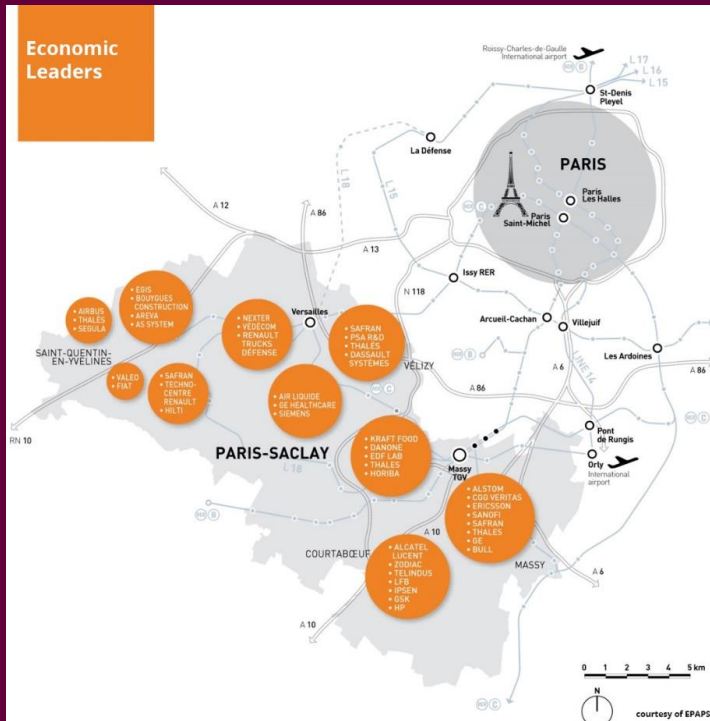


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ARWU 'Shanghai' ranking 2020

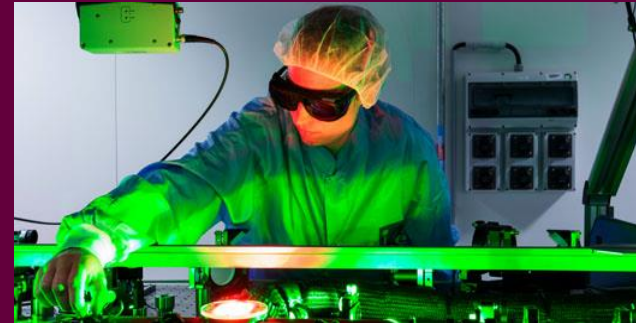
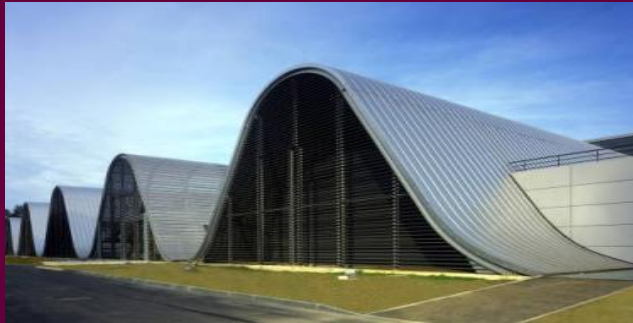
- 14<sup>th</sup> Worldwide
- 1<sup>st</sup> in continental Europe
- 1<sup>st</sup> in France
- Maths: 1<sup>st</sup> Worldwide, Physics: 9<sup>th</sup> Worldwide (1<sup>st</sup> in Europe), Telecom engineering: 23<sup>rd</sup>, Medicine: 24<sup>th</sup>



- 13% of French R&D
- 2 Nobel Prize
- 10 Fields Medallists
- 8 Schools
  - 45 Master's programmes
  - 300 Master's tracks (15% in English)
- 48,000 students
  - 9,000 Master's students, 38% international
  - 4,600 PhD students, 42% international
- 20 doctoral schools – 1,300 PhDs/year
- 9,000 faculty & academic staff
- 146 ERC grants for 161 ERC projects (1<sup>st</sup> in France, 3<sup>rd</sup> in Europe)
- 12,000 publications/year

# An International Research University

- **13 outstanding scientific facilities** - Equipex
- **11 Laboratories of excellence** - Labex
- **23 Strategic Research Initiatives**
- More than **400 active international partnerships**
- **45 CNRS International Associated Laboratories-LIA** – more than 25% of French LIAs



- **International Master's Scholarships** -160 Incoming full Master's scholarships / yr
- Over **350 full PhD grants / year** with additional **UPSaclay funding** for cotutelles with international universities
- **Jean d'Alembert fellowship programme** for junior and senior foreign scientists : 6-12 month stays - 10 laureates per call – Researchers working in any field & from any country
- Paris-Saclay **Chairs of excellence**: 5 laureates (450k€ / 3years)

Graduate education



Research Innovation

## Paris Saclay

*Physics &  
Engineering of light*



## Bordeaux

*Nanophotonics &  
digital optics*

## St Etienne

*The imaging chain,  
lighting & energy*



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## Graduate education

- Master of Science in Engineering degree (500)
- Master degrees (50)
- PhD (150)
- Co-operative education programme ('co-op') with companies: CFA SupOptique
- Continuing Education

## Research

3 research centers with international reputation

- LCF: Laboratoire Charles Fabry (150)
- LP2N : Photonics, Digital Data and Nanosciences (50)
- *LHC : Laboratoire Hubert Curien (170) – common with UJM St Etienne*

## Innovation

- 210 people (headcount)
- 37 startup companies in integrated partnership
- 2 innovation centres at the '503 Centre', Institut d'Optique's own innovation centre: 10000m<sup>2</sup> + 1500m<sup>2</sup>



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## A graduate school of international level

### Graduate education

- One of the widest ranges of courses in photonic and optical engineering
- Strong links between Master-Engineering degree-PhD : 35% of graduates undertake a PhD worldwide (*4th /168 engineering schools in France*)

### Research

- 1 scientific paper and 2 communications per day
- 37 Highly Cited Papers (web of science)
- Numerous international prizes

### Knowledge dissemination

- Today: home of *Société Française d'Optique* (National Optical Society)
- European Optical Society was created at Institut d'Optique (1993 merger)



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## A graduate school of international level

### Innovation

- 3 MIT Technology Review Best World Innovators Under 35
- 2 start-up companies created per year, since 2008



*French Research & Higher Education Assessment Agency,  
Evaluation report, Aug. 2014*

*« Its strategic position as a leading engineering school  
specializing in optics and photonics, makes it **unique in  
France and among the very best in the world.** »*



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**Components & Systems  
for Photonics**

**BORDEAUX**  
**Laboratoire Photonique  
Numérique et  
Nanosciences  
LP2N  
(50 people)**



**Lasers  
Nonlinear Materials  
X & UV Optics**

**Cold Atoms  
Quantum Optics  
Biophotonics  
Nanophotonics**

**Virtual &  
Augmented Reality**

**Digital  
Images**



**Instrumentation**

**Image Processing**



**PARIS-SACLAY**  
**Laboratoire Charles Fabry LCF  
(150 people)**

**Visual Rendering  
Safety**



**SAINT ETIENNE**  
**Laboratoire Hubert Curien –  
with UJM (170 people)**



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**4 x more patent holders than the average French school of engineering**

**Pierre ANGÉNIEUX (1929)**

*Inventor of the automatic zoom lens*

*French optics accompanied the first men on the moon*

**Bernard MAITENAZ (1947)**

*Inventor of the progressive lens (Varilux)*

*Chairman of the Board & CEO Essilor*

**Sébastien BIGO (1992)**

*Record transmission on a single optical fiber*

*(70 Tbit/s over 10 000 km)*

## MIT Technology Review Best World Innovators Under 35

**Gabriel CHARLET (1999)**

*Optical communication platforms at 40 & 100 Gigabit/s,*

**Thibaut MERCEY (2000)**

*Fast optical detection of molecules*

**Anaïs BARUT (2014)**

*Non invasive detection of skin carcinoma*



**Cecile SCHMOLLGRUBER (2008)**

*3D technology Awards: Software of the year*

*Hollywood, Sep. 2014*



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# Some companies created by Innovation and entrepreneur track students



LED Lighting for the industry



LiDAR for wind plant optimisation



ARCHIMEJ TECHNOLOGY

Spectrometers For medicine



Wind speed measurement



nodea medical  
Engineering for patients  
Breast cancer diagnosis tool



Thickness control of industrial coatings



Air quality analysis



High quality 3D information



Logistic solutions for industry



LED Lighting for the Arts & Decoration



3D laser animations



Non invasive skin diagnostic



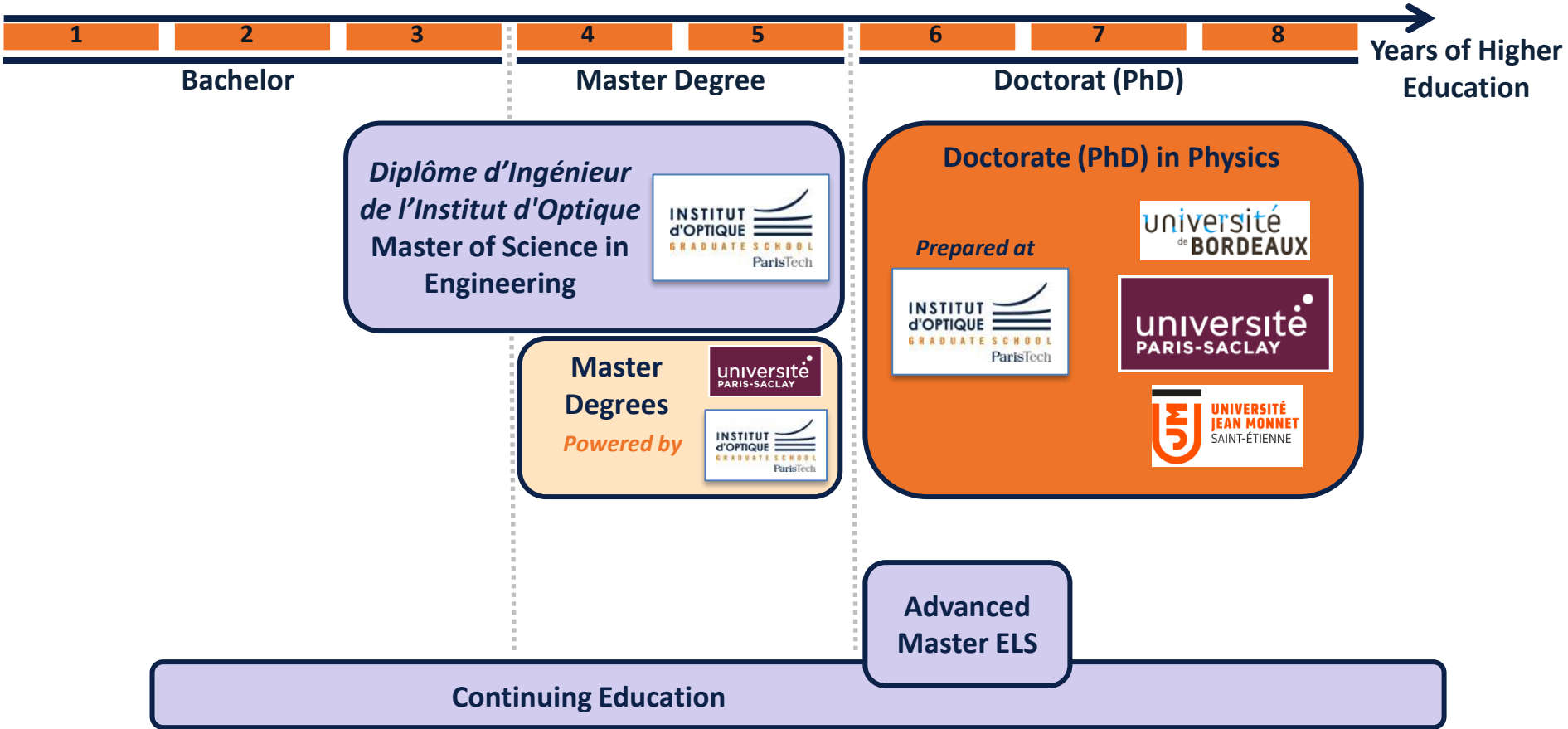
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## MScEng – Diplôme d'Ingénieur

1 <sup>st</sup> year = Bachelor final	2 <sup>nd</sup> year = Master 1st	3 <sup>rd</sup> year = Master 2nd
General inter-disciplinary education	General inter-disciplinary education	General inter-disciplinary education
General scientific education	General scientific education	Wide range of openings and specialisations
Photonics	<i>Paris Saclay</i> : Light-Matter Interactions, Signal and Image Sciences, Nanosciences, Extreme (X and UV) Optics	
	<i>Bordeaux</i> : Photonics and Digital Sciences, Virtual Reality, Cognitive Sciences, Physics and Modelling	
	<i>St Etienne</i> : Photonics for Imaging, Lighting, Energy	
(1 month internship)	3 month internship	4-6 month internship



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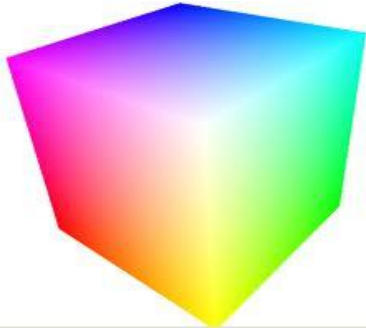


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Very wide spectrum from embedded electronics to quantum optics



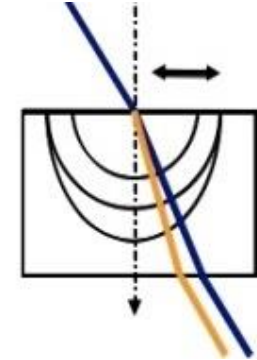
Photometry



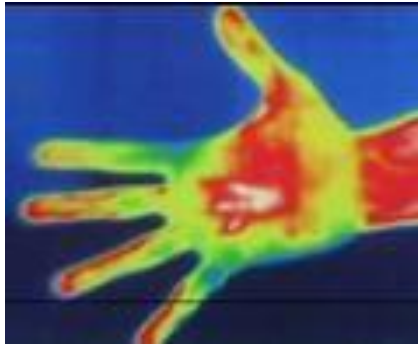
Lasers



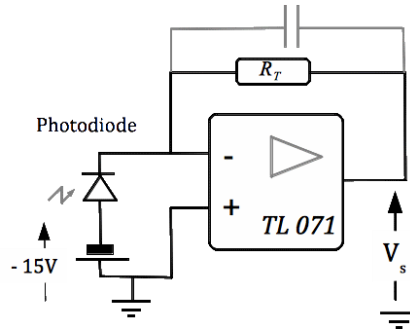
Fibers



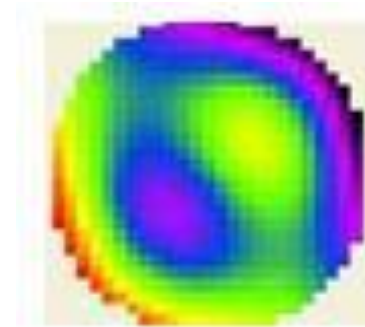
Polarization



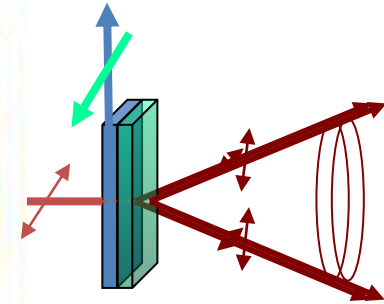
Infrared



Electronics



Optical systems



Quantum optics



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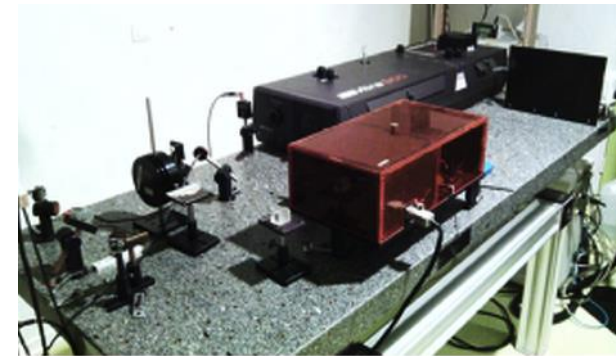
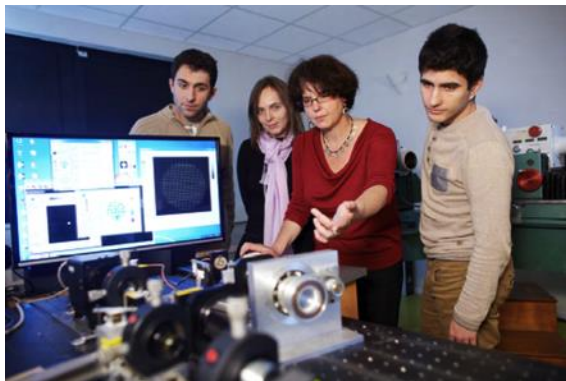
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# Education Lab in photonics

150 experiments including 80 different subjects



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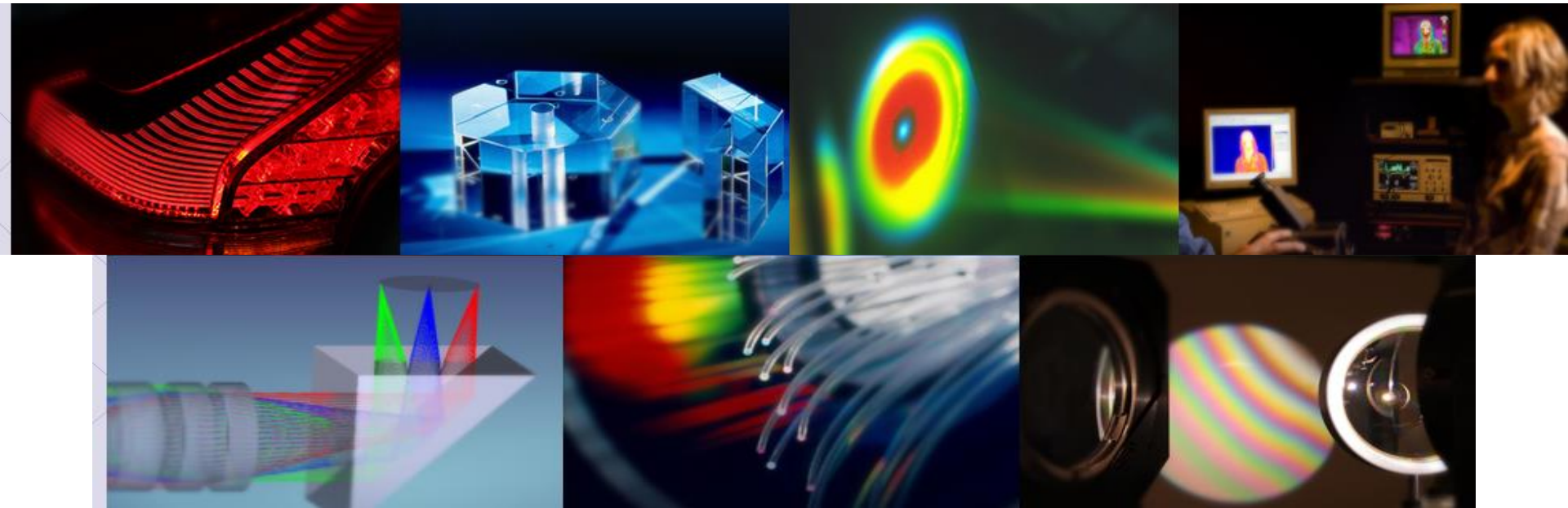
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Every subjects related to photonics and innovation:

- Instrumentation, components
- Sources, Lighting
- Optical design
- Image processing
- Telecommunication
- Electro-optical systems
- Measurements

## Training

- On catalogue
- On demand, in French or in English
- Short or long programs



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## Looking back on a century of History...

Foreign students since the first intake (1919 for the MScEng programme)

Etat adressé le  
29/1/19 avec plusieurs articles  
de journaux sur l'I. d'O.  
à M. Belugou, 45 Rue Blanche

28 Janvier 7

ECOLE SUPERIEURE d'OPTIQUE

Année scolaire 1919-20 - 16 élèves

dont 13 français  
1 polonais  
1 japonais  
1 américain

Année scolaire 1920-21 - 17 élèves

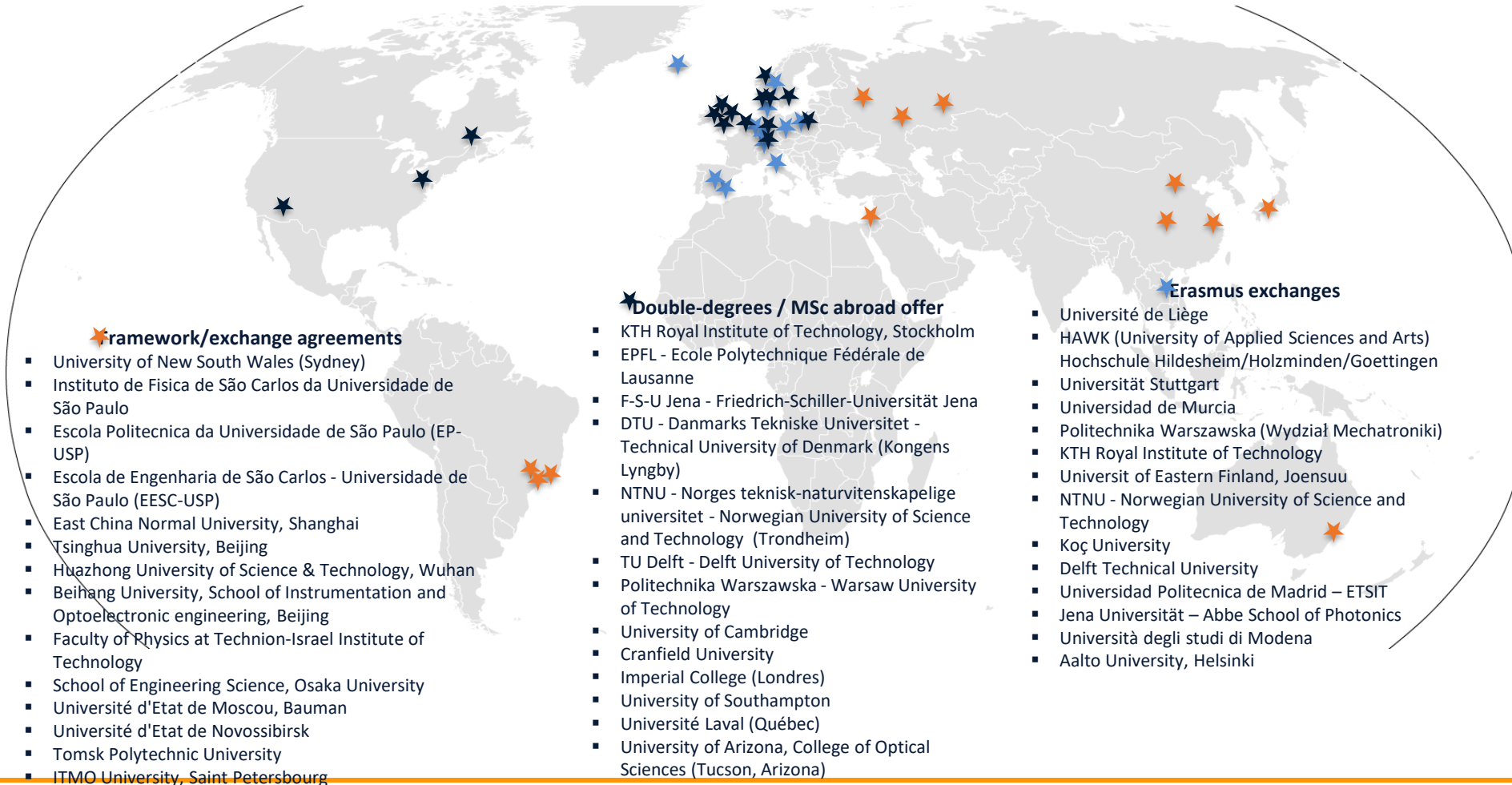
dont 16 français  
1 bulgare

1st cohort from 1919:  
among 16 students,  
1 from Poland  
1 from Japan  
1 from the USA



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## Worldwide partnerships in the 21st century



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## Outgoing international mobilities for MScEng

### Bachelor final year

- **ATHENS Programme week:** 1-week course in March in European partner universities within ATHENS network
- **Internship (>4 weeks):** can be carried out abroad, especially in summer schools (ITMO, Beihang...)

### Master 1st year

- **Internship (>3 months):** can be carried out abroad, in university lab or company

### Master 2nd year

- First **semester** can be done as **exchange student** in a partner university
- **Final internship (>4 months):** can be carried out abroad, in university lab or company
- Whole year can be replaced by **MSc in a foreign university (DD)**



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## Incoming international students in MScEng

### Semester or year as exchange student (non-degree)

- M1 (and some M2) level courses available in English

### Degree-seeking student (2 or 3 years)

- Either admitted for M1-M2 years: possibility of international admission thanks to a wide course offer in English
  - → Many courses taught in English for the M1 & M2 years, with language courses of French for foreigners (=adaptation semester)
- Or admission in Bachelor final year for 3 years (B3-M1-M2), but B3 year is taught in French (and then part of the courses in English in M1 & M2)



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## Incoming international students / other mobilities

### Research internships

- In Institut d'Optique's labs
- Usually several months, typically for thesis (BSc or MSc thesis)

### Advanced master in Embedded Lighting Systems

- Admission after a Master degree or Bachelor and several years of professional experience
- Specific field: embedded lighting systems in the automobile industry
- Can be part of continuing education

### PhD programme

- After a Master degree, for 3+ years, in one of our labs



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# Thanks for your attention!



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