

2018 Japan-France Symposium in Higher Education (Dec. 7, 2018)

# Leading Synergy of Excellence and Innovation

Executive Vice President Tohoku University Toshiya Ueki



Tohoku University is located in Sendai, the largest city in the Tohoku region, well known as an *Academic City*.

[City of Sendai]Population<br/>As of September 20181,088,593By bullet train<br/>from Tokyo350 km<br/>1.31 h<br/>20 min





- 3rd National University in Japan, founded 1907
- Established through the support of a private conglomerate and regional government
- Advocates a "Research First" Principle





#### The first Japanese university to accept female students, in 1913



Chika Kuroda (Chemistry)



Raku Makita (Mathematics)

We continue to promote gender equality.



At the meeting with Sawayanagi Fellows (Female leaders)



#### International students since the early 1900s



Lu Xun (Medicine)



Chen Jiangong (Mathematics)



Su Buqing (Mathematics)

• We strive to welcome talented individuals from diverse backgrounds



At the ceremony for the Professor Fujino Incentive Awards







KS Steel, NKS Steel Foundation of metallurgy and modern Materials Science.



Hidetsugu

Yagi

Koichi

Tanaka

Yagi-Uda Antenna Global usage for home TV. IEEE Milestone.



Toshio Kurokawa

Mass Examination Propagation of mass examinations for Gastric Cancer.



Junichi Nishizawa

Laser Diodes "Father of Japanese Microelectronics". Results in optical communication, semiconductors, etc.



**Mass Spectrometry** Nobel Laureate in Chemistry 2002 for developing a method of biological macromolecule analyses.



Shunichi Iwasaki





Fujio Masuoka

**Flash Memory** 

Invention of Flash Memory.



Compactin Akira Endo Identification of the first statin drug used for treatment of cardiovascular diseases.



Fumihiko Imamura

**Tsunami Engineering** Unique approach for the science behind Tsunamis.









- A long history of collaboration initiated more than 30 years ago... in the field of Smart Materials and Tribology
  - Prof Georges, Prof Kato, Prof Gobin, Prof Tani
- Organization of various bilateral workshops
- Series of joint projects (IRCP JSPS&CNRS, etc.)
- Extension of collaboration fields...
- 2004: opening of Liaison Offices, at INSA and at TU
- 2005: double Master degrees between ECL and TU and between INSA and TU
  - 2007: 50th anniversary of INSA-Lyon100th anniversary of Tohoku University150th anniversary of EC-Lyon
- 2009: first double PhD degrees between ECL and TU and between INSA and TU started...



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#### Towards ELyTMaX





#### **ELyT: Engineering Science Lyon-Tohoku** Integrated cooperation



- Laboratoire International Associé (LIA):
  - Large researchers network, bridging Engineering Science between Lyon and Tohoku, with ~25 ongoing projects
  - Annual workshop (80~100 attendees)
  - 150+ joint peer-reviewed papers
  - 250+ joint conferences
- DD programs agreements at Master and PhD levels: 19 double degree PhD from 2009, 10 ongoing



- Summer school ELyT School
  - Since 2009, held alternatively between France and Japan institutions (INSA-Lyon, Ecole Centrale de Lyon, and Tohoku University).
  - Thematic: "Energy, Environment, Safety and Engineering"
  - ~50 graduate school students, including ~25 from abroad.













....for enhancing scientific collaboration



# The ELyTGlobal Concept

- **Our goal:** to become a center of excellence in Engineering of Materials and Systems, with the aim of answering currently challenging societal stakes
- In order to *gather existing knowledge* and *foster innovative research*:
  - Organization of **scientific workshops** for exchanging ideas
  - Support of travel expenses for researchers and student exchanges
  - Students training and opening to foreign cultures with the continuation of a annual summer school – named "ELyT School"
  - Invite partners from French and Japanese Industries and **promote industry-university research collaboration**.





- Some projects aims at **achieving better fundamental understanding**, necessary to improve current technologies
- Some projects aims to develop new technologies, requiring the combination of several scientific fields
- We thus propose **3 application themes** and **3 scientific topics**:





## Already 27 collaborative research projects!

Acronym	Name	Acronym	Name
BeNTo	Nonlinear and dynamic micromagnetic Behavior modeling and characterization for Non Destructive Testing techniques optimization	MicroCell	Microsystems for Cell Engineering
BoneDrill	Development and Friction Characterization of Biomodels of Bones	MICRONS	MultIscale Characterisation of BacteRiO-active Nanoglass Surfaces
CarboEDiffSim	Simulation of Carbon eletcro-diffusion in Iron with phase change	MISTRAL	Miniature-Scale Energy Generation by Magnetic Shape Memory Alloys
CODOMOs	COrrosion Degradation of cOld spray coating by electrocheMical analysis at the lOcal Scale	MuORode	Robust Multi Objective optimization design approaches
COSMIC	COmpression-Shearing Method – understanding Interfaces in metal Composites	OPSCC	Optimizing surface finish to Prevent SCC initiation in energy industries
DECCOBABA	DEvelopment and Characterization of New CO BAsed alloys for Biomedical Applications	PolymCold SprayCoat	Resilient Polymeric cold spray coating
DeProMiNa	De alloying to produce micro and nano porous metals	POMADE	POlymer-Metal-fiber Adhesions DElamination control
ELiceTrib	Tribology of elastomer/ice contact from nm to mm scale	SilicaGelSim	Prediction of thermal and mechanical properties of Silica Aerogel using atomic scale simulations
FMMD	Friction and sensory models for development of medical devices	SPICE	Sintering and Phase transformation In CEramic materials
IPAMA	Improvement of Plasticity in Amorphous Metallic Alloys	SuperLub	Superlubricity: Experimental and Computer Simulations
LASMAT	Nd3+/Yb3+ rare earth ions-doped transparent laser ceramics by Spark Plasma Sintering method. Comparison with single crystals	TEmPuRA	Theory for Electrostriction of PolymeRic Actuator
lofDIAMS	Low and ultralow friction of microcrystalline diamonds films	TriArtiJoints	Tribology of artificial joints
MARECO	MAgneto-Rheological elastomers for Energy Conversion	PYRAMID	Piping sYstem, Risk management based on wAll thinning MonItoring and preDiction
DESIRE	DESign of Interface structure of fiber-Reinforced polymer blEnd		



## Key points on ELyTMaX

### ELyTMaX is an operational research unit

- **Specific staff** (as for Oct. 2018):
  - 13 permanent staff (3 from France & 10 from Japan) ~6 eq. full time researchers
  - 3 postdocs, 5 DD PhD students, 1 master student
  - 3 part-time administrative staff
  - >20 people,
- Specific research premises (170m<sup>2</sup> at MaSC, Tohoku Univ. + 100m<sup>2</sup> lab. space, Lyon)

## • Funded projects:

- France: ANR ECPOR
- Japan: 1 JSPS Kiban A, 1 JSPS Kiban B
- Bilateral: ANR-MEXT PYRAMID
- 2 industrial contracts

## • Publications from 2016:

- 12 peer reviewed journal papers,
- 6 invited conferences,
- 50+ international conferences

# • ELyTMaX is also a professor exchange platform





French site inauguration, Lyon, March 5<sup>th</sup>, 2018



## Extending lifetime of materials and structures

Sebald, Sci. Tech. Adv. Mater, 2017, doi: 10.1080/14686996.2017.1377590

Abe & Watanabe, J. Nuclear Mater., 2012, doi: 10.5772/23623

Cold Spray technique



Japanese and French sides

Quantification of residual stresses in ferromagnetic steels



- Both faculty members and graduate students promote joint research with UdL and CNRS within the frame of ELyTMaX
- Lyon Center establishes solid research network with UdL and CNRS through substantial research activities.



# **Issues that IFS Lyon Center Tackles**

Lyon center explores interdisciplinary science based on fluid science and materials science to answer current societal stakes in the fields of transportation, energy and engineering for health.





#### Joint Usage / Research Center

Fluid Science Global Research and Education Hub

- IFS has been certified as "Fluid Science Global Research and Education Hub", where our members work together with researchers from other organizations through collaborative research projects.
- IFS Lyon Center will attract researchers from the European and Japanese fluid science communities.



We have developed an *integrated system* 



....for enhancing scientific collaboration

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#### Inbound

**B1** 

**B2** 

**B3** 

**B4** 



2 years study abroad

M2



## Inauguration of IFS Lyon Center (Nov. 21<sup>st</sup>, 2018)



# Thank you for your attention