WOMEN IN SCIENCE AND TECHNOLOGY

IMPACT OF STEREOTYPES.

Veronica BERMUDEZ

IMPORTANT CHALLENGE (EXEMPLE)

Impact and need in energy transition

THE PERFECT STORM

Supply

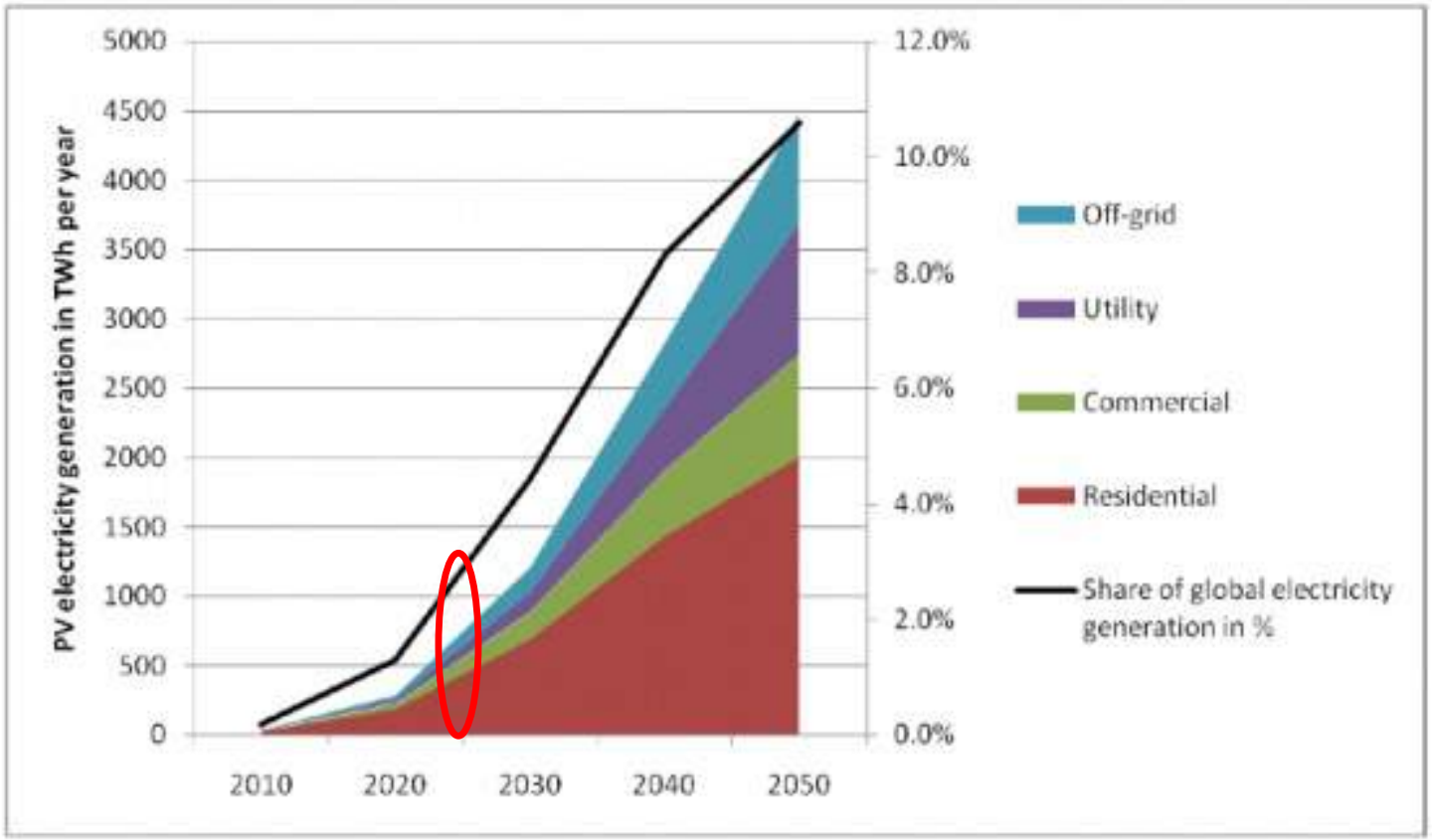
Security

Impacts

Energy supply and demand in general

- 500 EJ/year (15.8 TW)/18 T kWh-electric/year
- 86% fossil fuel/enough oil? enough air for coal?…
- Projected doubling of energy use and tripling of electricity use by 2050 in business as usual
- 1.4 Billion people without electricity in 2030
- 50 year time scale for major shifts in energy

LARGE NEED OF PROFESSIONALS TO TAKE THE CHALLENGE



Scientist:
- chemistry
- physics
- materials
- ....

Engineers:
- mechanisc
- informatics
- communications
- ....

Technicians
Managers
Leaders
.....

PV can provides 5% of global electricity generation in 2030, 11% in 2050

DID IT SURPRISE YOU THAT EVEN IF WE HAVE HUGE NEEDS FOR HUMAN CAPITAL, THERE ARE LESS THAN 10% OF WOMEN IN INDUSTRIAL PHOTOVOLTAIC RESEARCH AND DEVELOPMENT?

- This problem of under-representation is not only a gender issue but business-driven- **"why deprive the companies of access to half of the world's intellectual potential, if they are facing one of the most important challenging in industry in last decades?" which innovations, products and/or new business models are we loosing?**

- It is an absolute necessity. The quality of engineering is affected by diversity (or the lack of it). As a consequence of a lack of diversity, we pay an opportunity cost in designs not thought of, in solutions not produced.

- Cloned minds generate cloned ideas, and we do not invented electricity just by improving light bulb. Take the case of Apple, Google, ….

ASSOCIATED WORKFORCE

WHY SO FEW

Strategic position paper on strengthening the solar industry – impulses for the coalition negotiations 2025

PRESENT GLOBAL SITUATION IN SCIENTIFIC AND TECHNOLOGICAL GRADES

Students in first years of academic grades

Career evolution

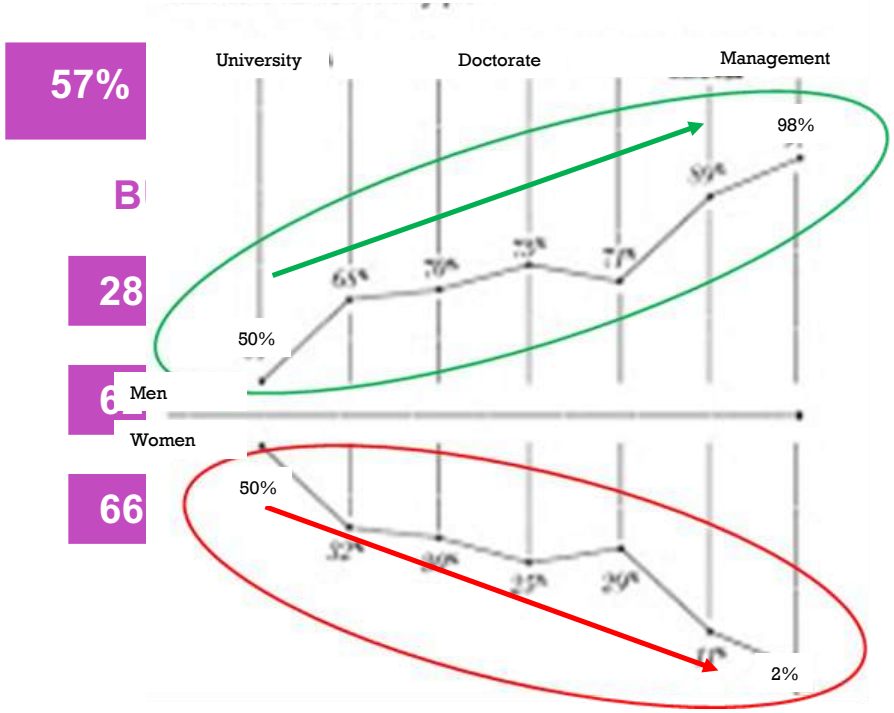
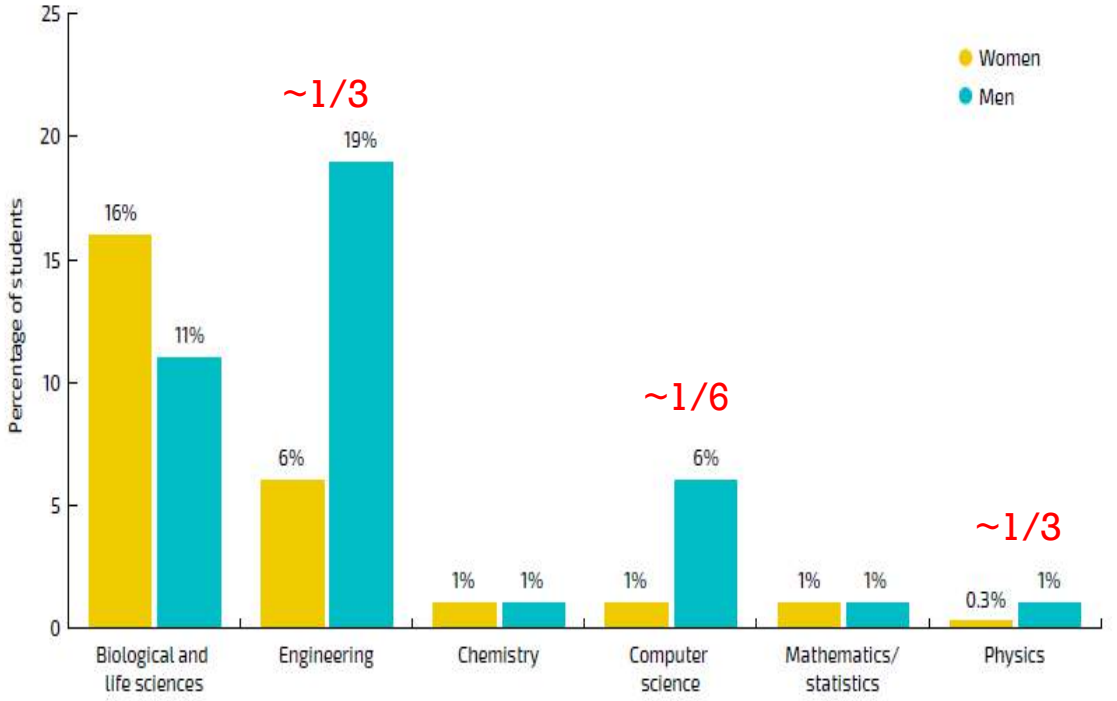


FIGURE 5. INTENT OF FIRST-YEAR COLLEGE STUDENTS TO MAJOR IN STEM FIELDS, BY GENDER, 2014



WHY SO FEW? LET'S START FROM THE BEGINNING….

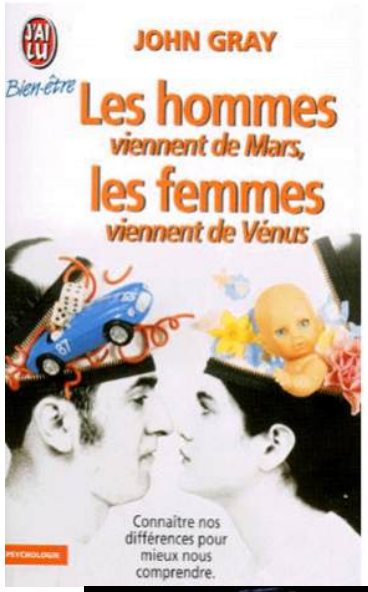
Are these differences related to our cognitive differences?

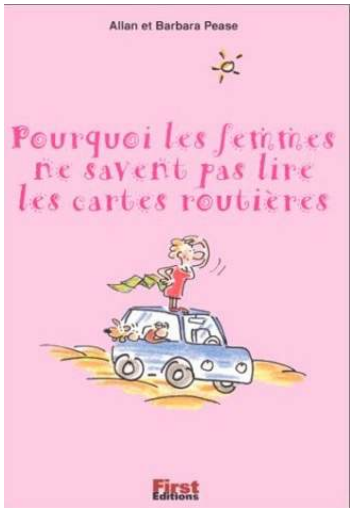
There are cognitive differences?

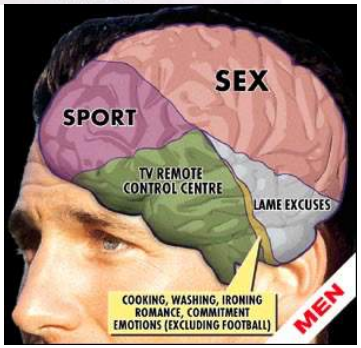
Are women really not fitted to?

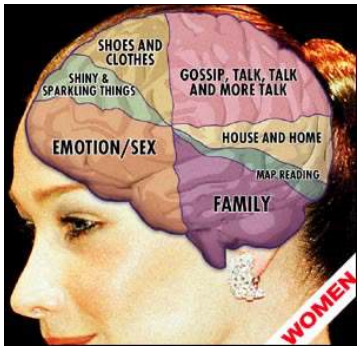
BRAIN, SEX AND PRECONCEIVED IDEAS

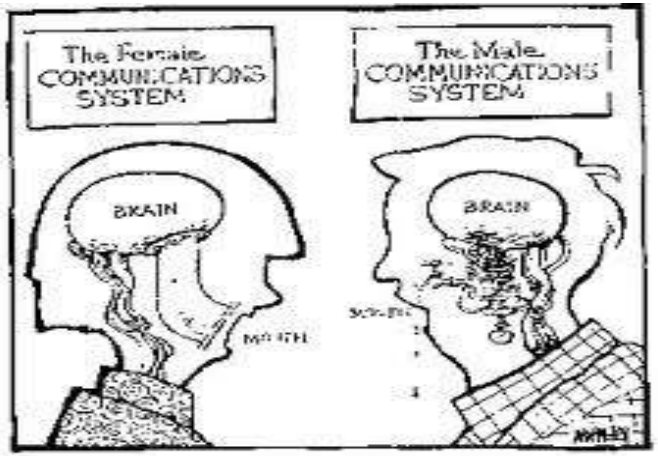
"Born talents"? Preconceived ideas? Other origin?











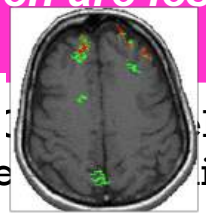
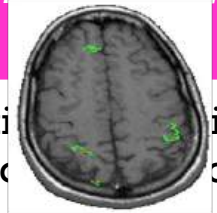
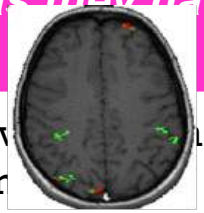
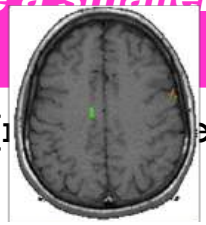
Publicity, books, journals,… seem say that

BRAIN, SEX AND PRECONCEIVED IDEAS

Have the brain a sex? Do we men and women have a different brain?

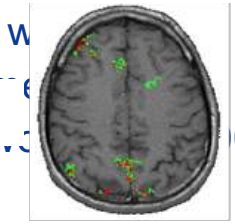
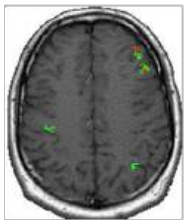
- YES!!! controls reproduction functions

19th century: ***« women are less intelligent as they have a smaller brain »***

Women    

During a determined test each individual activates the brain in a different way

- Average brain w

Men    

IRM during a mathematical test.

but….

difference : 150 g

This difference vanish when brain weight is normalized to total weight and size.

BRAIN, SEX AND PRECONCEIVED IDEAS

Mathematical aptitude and preconceptions

« Women's brains are less suited to mathematical reasoning than men's».

FALSE !

- Based on a 1990 statistical study in the United States of 10 million students:

  Boys perform better than girls on math tests.

"Disproved" in 2008 by J.S. Hyde et al. (Science) "Gender Similarities Characterize Math Performance"

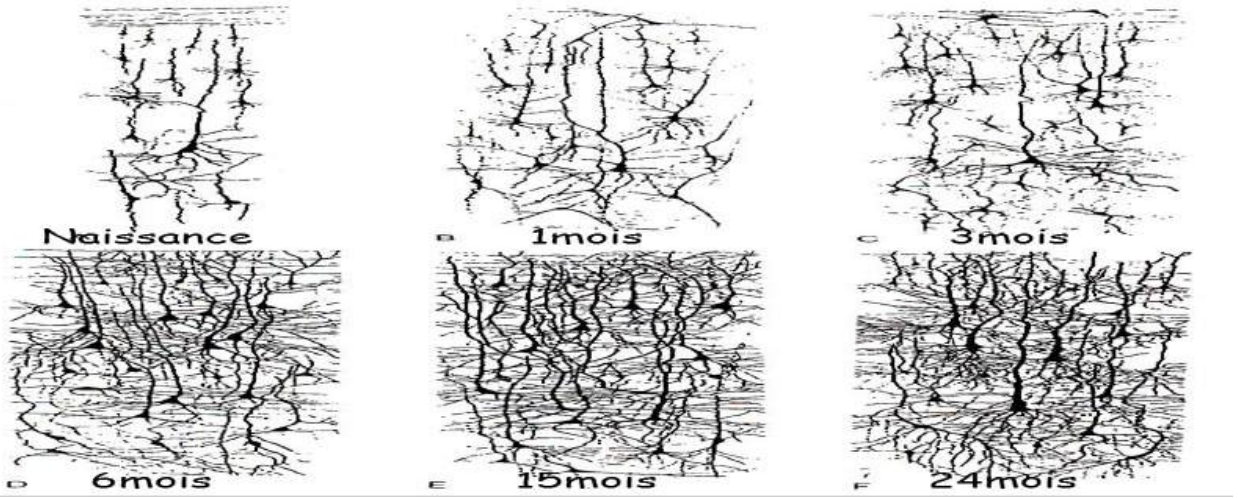
➡ **Female brain inability to do math?????**

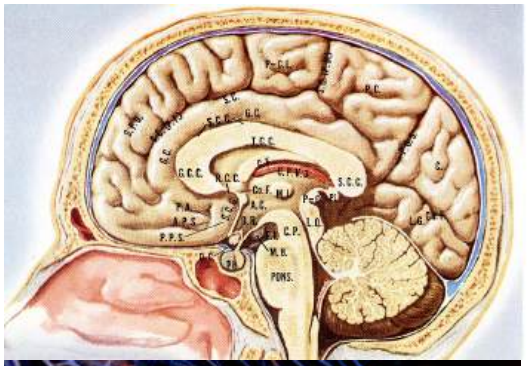
BRAIN, SEX AND PRECONCEIVED IDEAS

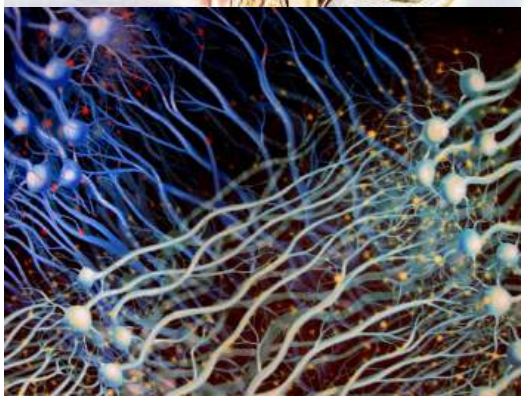
Less capacities for sciences? Less ability to lead? To manage?

Neurobiology demonstrate the BRAIN

=> brain is modelled with experiences and learning







-100 billion neurons

-1 million of billion of connexions between neurons

-10% of neu

- 90% are fo

Physiological argument on a supposed inferiority of women and less ability for STEM is NOT VALID!!!

WHY SO FEW?

SOCIAL, EDUCATIONAL AND ENVIRONMENTAL ENVIRONMENT

The stereotypes

If when you think of a scientist, you picture a man…
…. Then you're part of the problem.

This claim was part of the American For Women in Science campaign several years ago. Some of you may wonder:

- What's the point after all?
- That "**Science" could be a "male" discipline.**
- Could this still be considered valid today?
- Do you also picture a man?

You can't blame it on Albert Einstein…

… but his crazy look and funny hair shaped our vision of scientists. And if you're not an "Albert" fan, then you easily picture tall, strict and silent figures with perfectly greased hair with big eyes behind thick glasses – and they are all male. You can't really rely on Marie Curie and her sad face to come to the rescue. **Unfortunately, women are not linked to modern technology in the popular** imagination and even less to a happy and balanced life as scientists/engineer.

STEREOTYPES

Clémence, CM1 (4 year elementary school)

BUT REAL LIFE GOES MUCH FURTHER OF PRECONCEIVED IDEAS

IEEE Women in Engineering We

STEREOTYPES

Definition:

Simplified or deformed representations (judgments, feelings, opinions, images) of a reality by one or more characteristics of a person or group.

«All the irish are redheads »

«Women are charlatans »

Stereotypes have a reducing character, and this reduction has the effect of eliminating the differences, attributing a general image to all the people of the same group.

Consequence :

"A scientist is a lonely man, of indeterminate, bearded age, who performs experiments in his laboratory ... "

STEREOTYPES

Sex social relations

Concept forged in the 1970s to account for:

- the social organization of relations between men and women
- the way in which social roles are defined
- the cultural constructions associated with femininity and masculinity.

60's in Spain

Educated for family and house care

« A woman with young children should not work, and even less in a men environment »

STEREOTYPES

Gender

Challenging concept

- the idea of "natural" differences between men and women related to biological sex,
- the use made to justify inequality

'Gender' is 'used to designate the social dimension of the roles associated with the male and female individual'.

Traditional sterotypes

Femenino	Masculino
No agresiva	Agresivo
Dependiente	Independiente
Influenciable	No fácilmente influenciable
Sumisa	Dominante
Pasiva	Activo
Orientada a la casa	Orientado al trabajo
Emocionalmente débil	Emocionalmente fuerte
Indecisa	Decidido
Habladora	No muy hablador
Debil	Fuerte
Sensible a los demás	Menos sensible a los demás
Deseosa de protección	Protector
Llora mucho	Raramente llora
Emocional	Logico
Verbal	Analitico
Amable	Cruel

« A man is hard, strong; A woman is sensitive, fragile »

STEREOTYPES

Sex roles

Traits, behaviors, tasks, activities in a given environment, define what should be and do when you are a girl / woman or a boy / man.

« It is the woman who must deal with a child who is ill. »

« Boys do not cry. That's girls»

« Integrating a woman into a service is going to hurt the job. »

STEREOTYPES

Stereotypes and their effects on educators and students

« Girls are more careful, calmer and more hard-working than boys.»

➡ **This reinforces the gender division of powers.:**

- Boys produce/generate ideas and solutions; girls perform tasks that require care and attention well.

- A boy who has not obtained good results has not worked hard enough. For a girl, a bad result is proof that she is not made/capable for such studies..

➡ **In science class boys are questioned more often than girls:**

- Girls internalize that their success is less important than that of boys.

STEREOTYPES

Stereotypes and their effects on educators and students

« In mathematics, boys perform better than girls, are more creative and sometimes show brilliant traits…»

- **Girls are showing less and less confidence in themselves and, in general, they consider themselves less capable of pursuing scientific studies.**
  They perceive that it is not a girl's thing.
  They give up the pleasure of science.

STEREOTYPES

Have the different disciplines a sex?

- **Language** ➡ **communication**
- **Life science** ➡ **life, care**

So, they are fitted for girls…

- **Mathematics, physics, informatics, engineering, are « hard » studies** ➡ **Then they are for men**

Conclusion ... "girls do not like mathematics, they are endowed with languages, literature, life sciences and care for the person! »

STEREOTYPES

Confidence.

At the same level, boys are judged more gifted and skilled than girls. Have (or are they induced?) A greater ego

- When they judge themselves very good at math, 8/10 boys choose a scientific high school

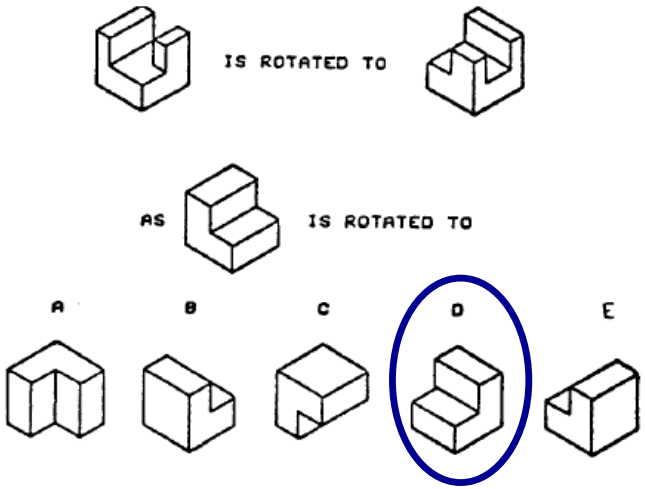
- When they judge themselves very good at mathematics, 6/10 girls choose a scientific high school

We must not forget that advertising messages can be very dissuasive.

STEREOTYPES

Women do not know how to read a map, and they are difficult to orient

One of the best known and persistent stereotypes in the cognitive gender difference found in the area of mental rotation, where boys consistently perform better than girls.



Playing with construction toys helps develop special vision.

THE SPATIAL VISION IS NOT INNATE, IT IS ACQUIRED WITH PRACTICE. PLAYING!!!

STEREOTYPES

Sexual orientation differentiates boys from girls

The process of orientation

- Sexed identity plays a key role.
- To line up

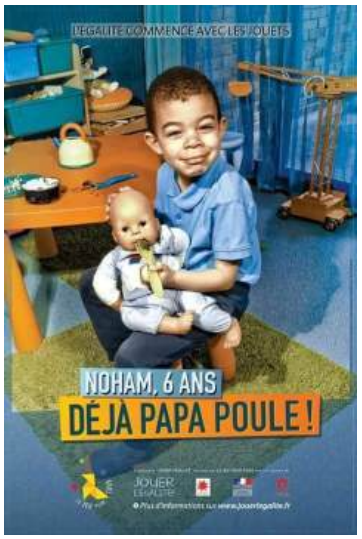
Self-image

The one we want to show to others

WITH

Image of the studies to follow

The one of the profession to exercise.



WHAT ABOUT THOSE IN THE WORKFORCE

Hard times

STEREOTYPES

Cars: a mens world?

Photos :Volvo

Are they stand hostesses for Volvo?

STEREOTYPES

Cars: a mix-world!!!!

They are responsible for the design, design, implementation of this model

2004 Concept Volvo car
« Your Concept Car YCC »

Technical Director of the YCC project, "she is proud of her role in the project

Photos :Volvo

JOB STEREOTYPES

Career stereotypes. Importance of role models

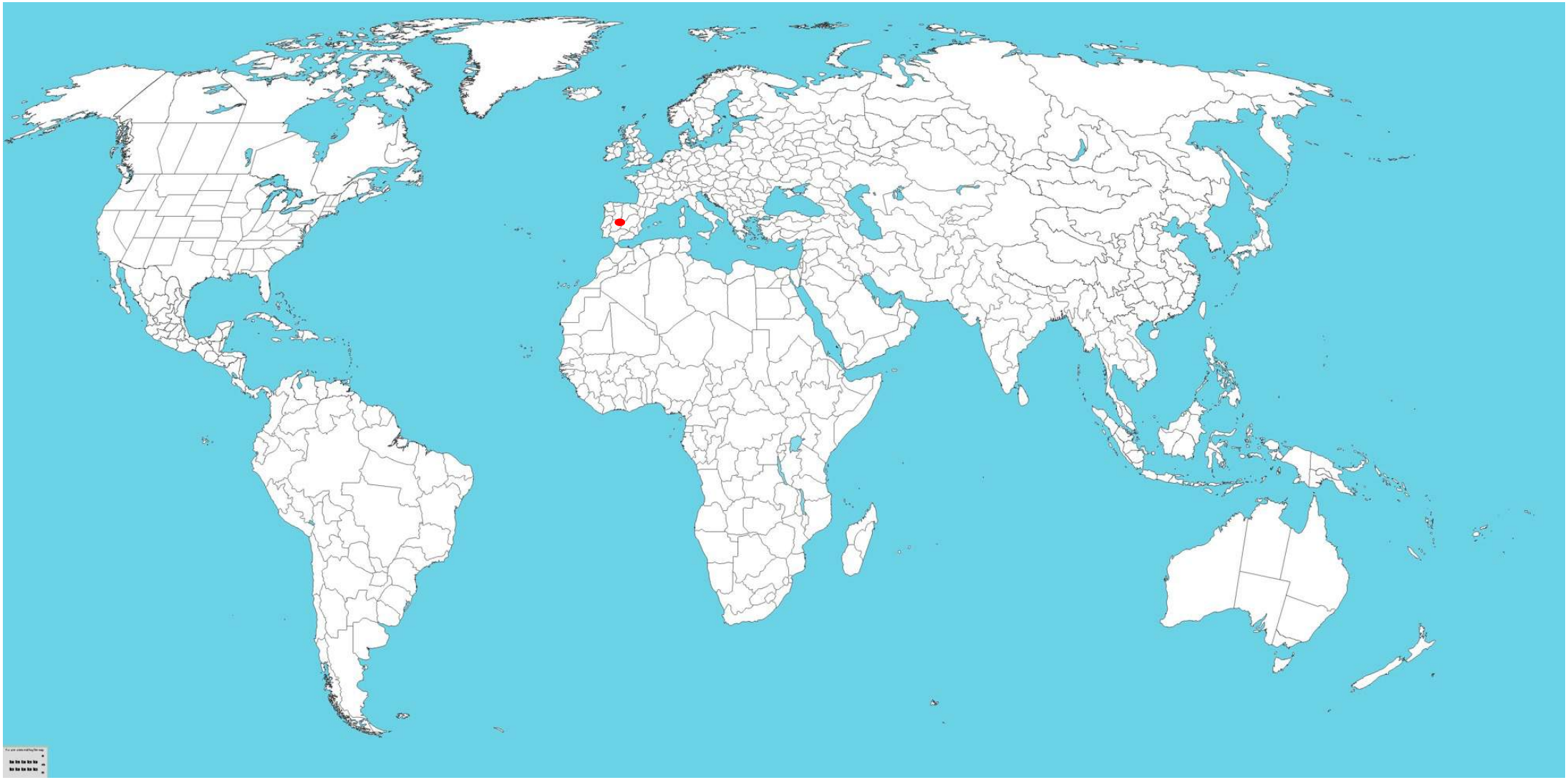
Stereotypes convey a reduced and deformed representation of our professions far from reality.

- They prevent young people from orienting themselves professionally according to their centers of interest, their passions
  «I would love to participate in the construction of the Airbus 380»
- They brake the choice of professions or companies that need specialists to develop their projects,
  «She dreamed of a team of production of innovative materials»
- They hide little-known career careers,
  "They do not propose that career change because she is a mother"

And worst of all we are not even aware, in most cases, of how we limit ourselves

WHAT ABOUT ME?

WHO I AM:



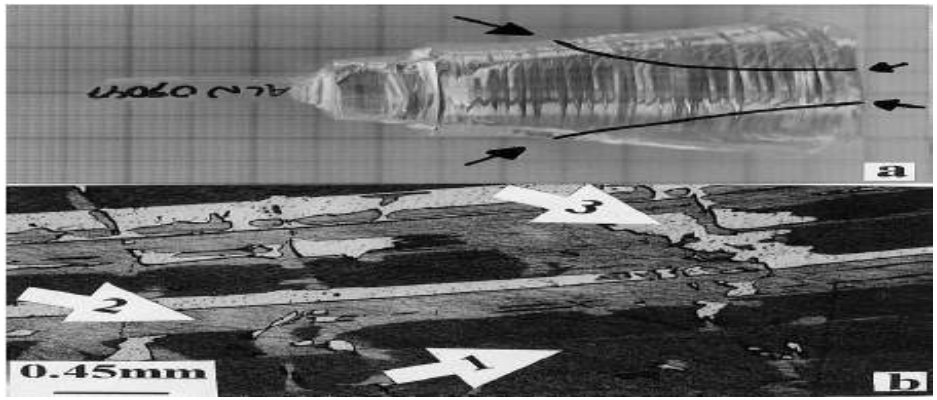
A Spanish Physicist

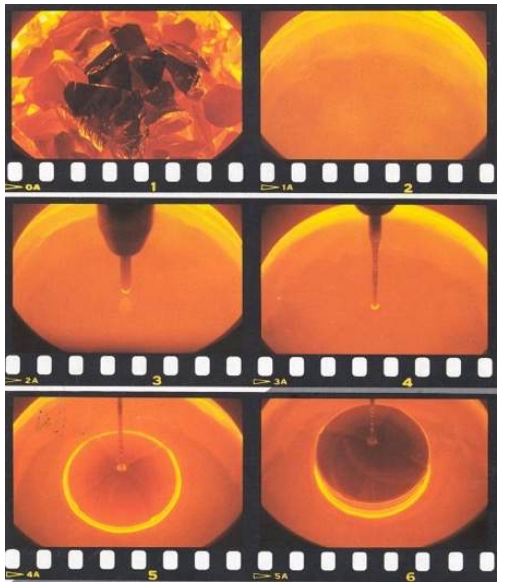
Universidad Autónoma de Madrid

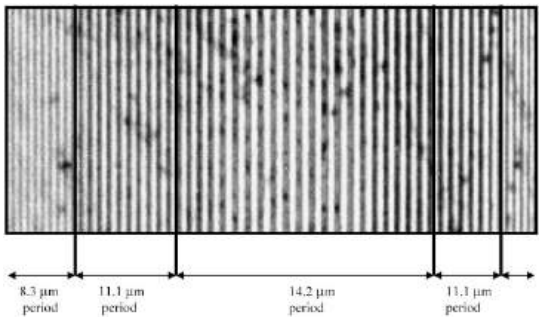
Universidad Autónoma de Madrid
Research Master Physics(1995-1996)
"Study and characterization of domain structures in $LiNbO_3$"

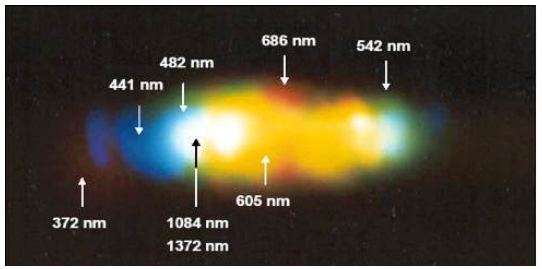
PhD in Physics (1995-1998)
"Obtention and Characterization of Periodically Poled Structures in $LiNbO_3$ doped with Er and Yb"

Sobresaliente Cum Laude
1998 Extraordinary Prize of the University "PhD in Science"



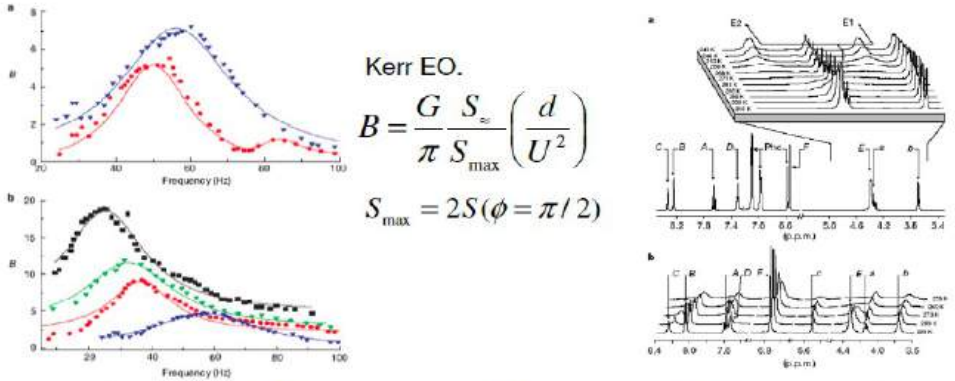


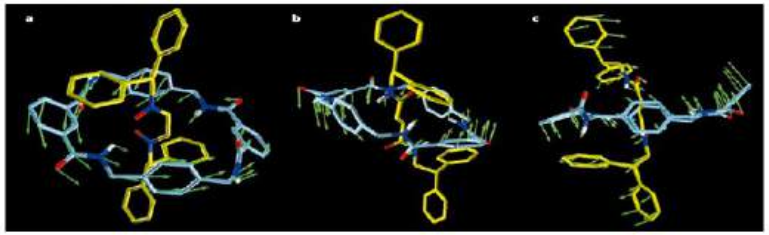




First professional experience. Marie Curie “Post-doc” (1999-2000)

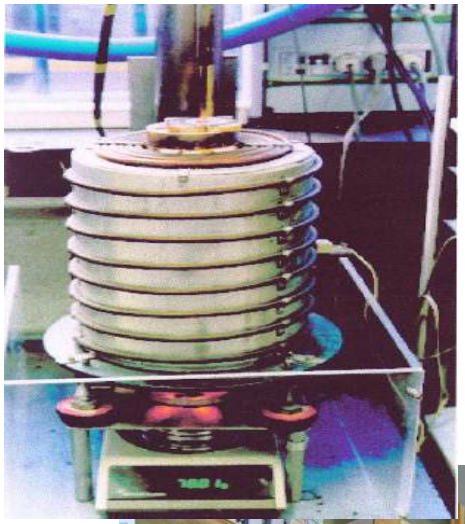
Post Doctoral Fellow - Marie Curie (5 Framework European Union)
Advanced Technologies Laboratory (DEIN/SPE/GCO) at CEA - Saclay, Ile de France, France





Tenure Track Excellence Program "Ramon y Cajal" 2001-2005

UAM Universidad Autónoma de Madrid



Research: Materials and processes for PV

Teaching: - Physics
- Materials Science

Spanish National Prize for Young Scientists (2004)

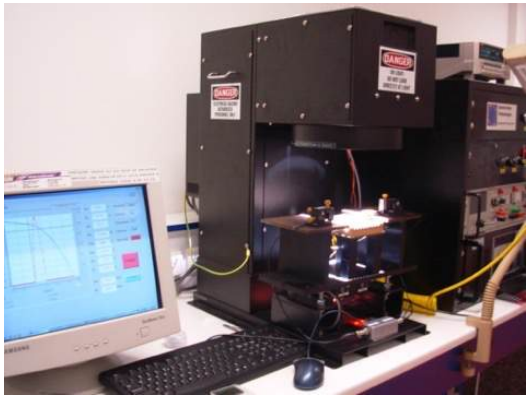
Moving to France EDF (2005-2009)

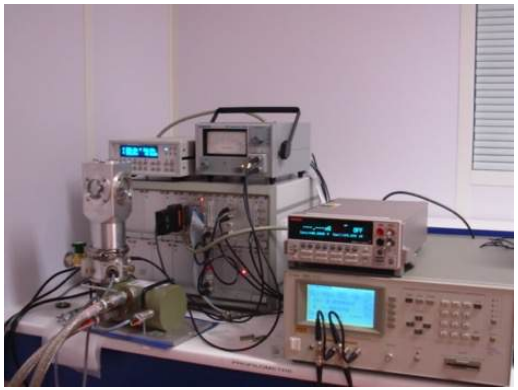
Institute for the Research and Development of Photovoltaic Energy (IRDEP) EDF R&D, CNRS, ENSCP Mix Institute, Chatou (France)

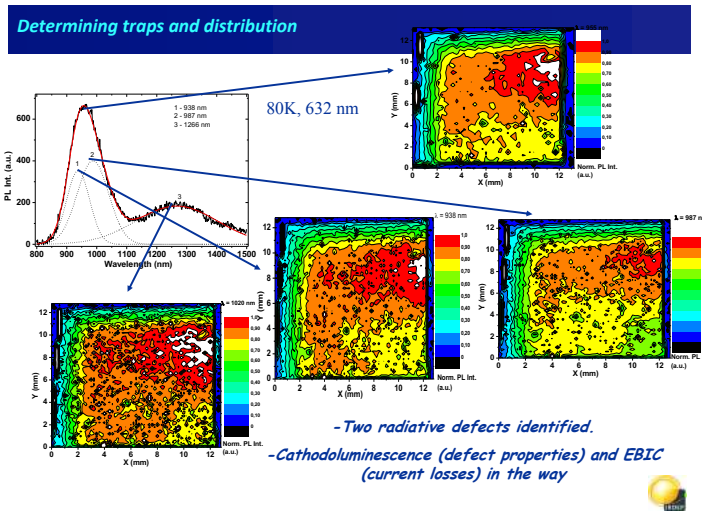
Head of the Optoelectronic Characterization Lab.

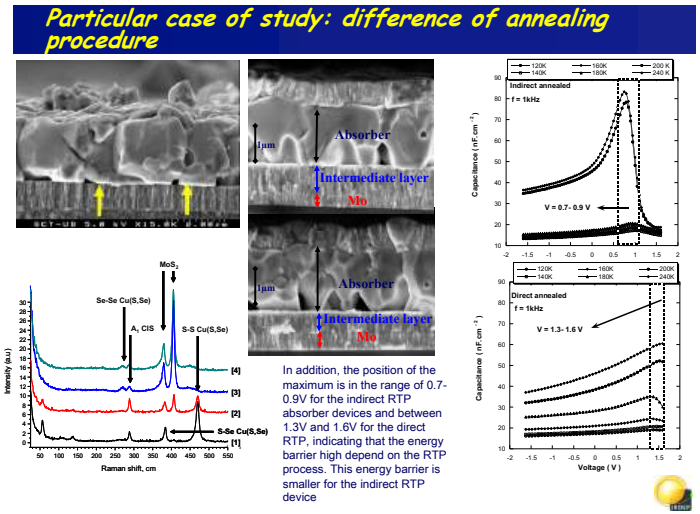
2005-2007 as "Poste Rouge" in CNRS

2007-2009 as Engineer-Researcher in EDF R&D









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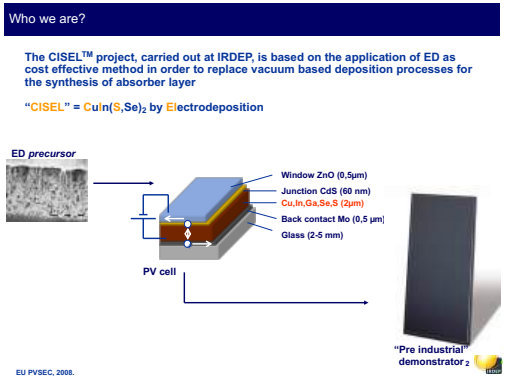
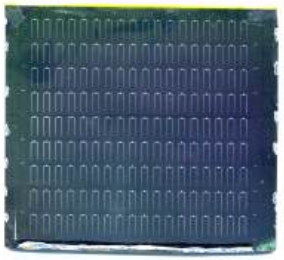




Highlights CISEL™ PV performances*

With $CuIn(Se_{0.05}S_{0.95})_2$ absorber :

- ☑ 11,4 ±0.5% % on 0.1 cm^2 : record cell
- ☑ <8.5±0.5%> on 26 cm^2 : reproducible (<10%> can be achieved)
- ☑ <8%> on 30x30 cm^2 : record, **lack of homogeneity/reproducibility**

↓

Material and optoelectronic diagnosis of process related losses

EU PVSEC, 2008.

** measured by means of cartography of 0.1 cm^2 area cells without grid and without AR-coating*

In the founding team of an start up (2009-2014)

Senior Scientist (2009-2014)
HDR AIX Marseille University (2011)

NEXCIS key figures

- 2009 spin off from IRDEP
- Investors: EDF, SIIF (investment company), IBM (founder)
- Highly experienced staffing from microelectronics, PV and other industries (90 people)
- Large partnership Network with17 joint ownership and exploitation agreements

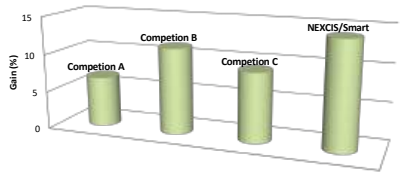
Confidentiel

Optimizing module performances
Ex: **smart module** induced gain under shadowing conditions

Tests configuration description:

Source Photon international

Average efficiency gain using Smart Module



Confidentiel

Responsable de Programa de Investigación EDF (2014-

EFESE EDF R&D

Responsable Programa de Investigación "Solar y almacena

Les éléments d'une centrale photovoltaïque

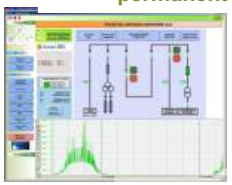
energies EDF nouvelles

Modules CdTe

L'exemple de Narbonne

Base Vie

Monitoring permanent



Sur des structures fixes inclinées (h=3.5m)

Poste de livraison : la jonction avec le réseau

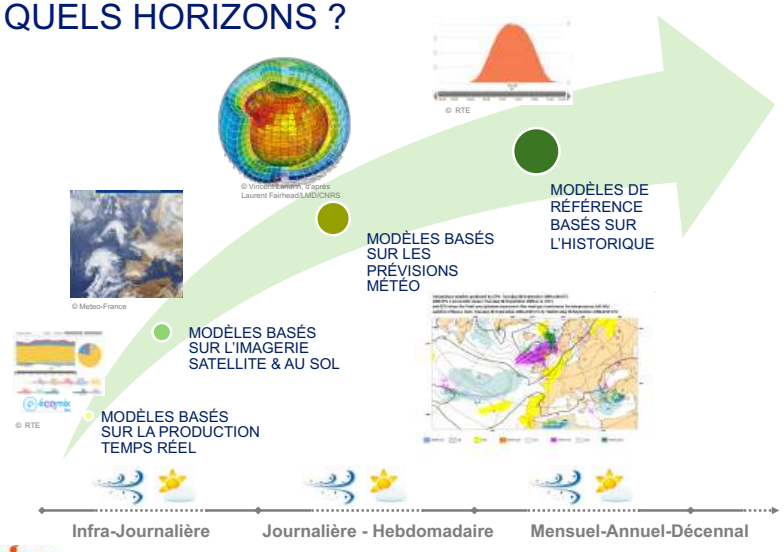
Onduleurs

Contrôle des accès

Pistes d'exploitation internes

6

LA PRÉVISION PHOTOVOLTAÏQUE QUELS HORIZONS ?



Traslado a Japon (2016-2018)

General Manager, División Tecnológica del Centro Solar Frontier, Atsugi (cerca de Tokio), Japón

A Global Solar Energy Solutions Company

- **Solar Frontier is:**
  - The world's largest CIS thin-film solar energy company
  - Active across the PV value chain: R&D and module manufacturing to system solutions
  - Based in Japan, serving the world
  - A company of 1,500 employees

SOLAR FRONTIER

Experimental Reports

Restricted		
社外秘	ISO#	RCB17-0
	Admin.	白間 英樹
	Date	2017/06/22

新ひかりプロセスによる光吸収層高性能化量産試作まとめ3

技術開発部
杉本、平井、長橋、鎌田

目的
硫化温度及び追硫化温度の最適化（最終）。冷却速度の影響調査。炉別サイクル別における新ひかり効果の確認。

結果
1st硫化580℃、2nd硫化570℃、追硫化410℃、冷却ファンRef戻しが最適。
メンテサイクル別では初期～中期は1W程度、中期～末期は2W程度の向上。
新しい最適条件によりさらに上乗せできるかが今後のネック。

ソーラーフロンティア株式会社

SOLAR FRONTIER

R&D to Achieve Our Strategic Goals

R&D is core to driving forward our leadership in technology, scale and solutions

Atsugi Research Center

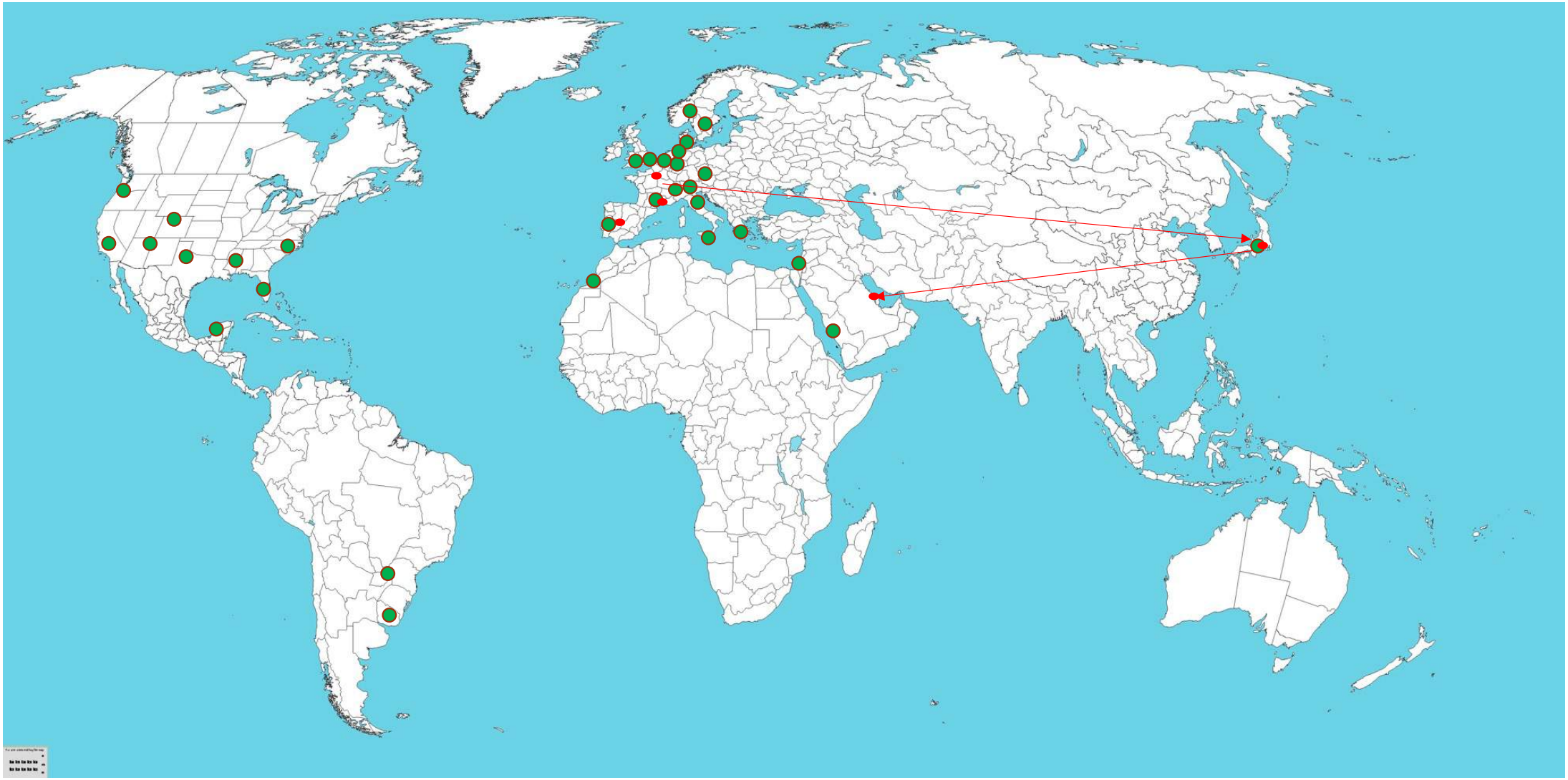
Location: Kanagawa, Japan

Established: 2009

Mission:

1. Advance CIS module efficiency
2. Drive down total system cost
3. Create new products to open new markets
4. Develop proprietary mass production lines

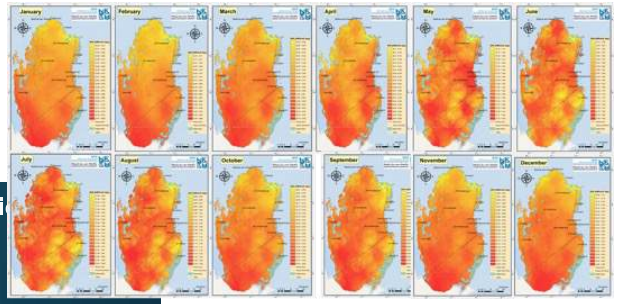
LAR FRONTIER

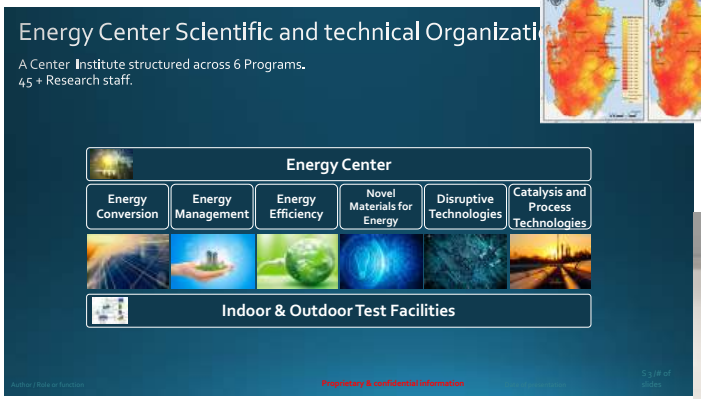


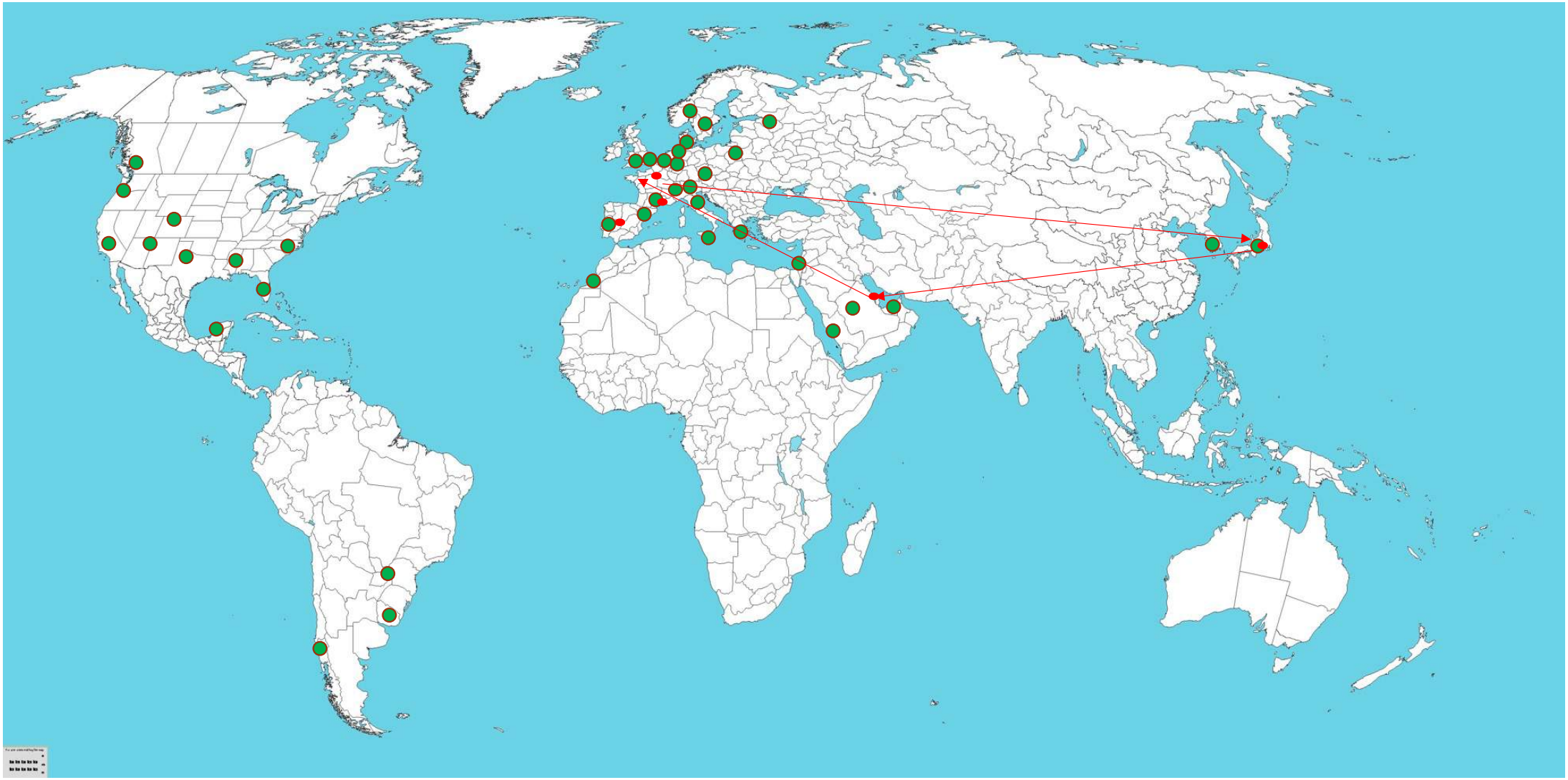
Traslado a Qatar (2018- 2025)

Senior Research Director, Energy Center
QEERI , Doha, Qatar

QEERI
معهد قطر لبحوث البيئة والطاقة
Qatar Environment & Energy Research Institute
جامعة حمد بن خليفة
HAMAD BIN KHALIFA UNIVERSITY







Back to France (2025- .....)

Family project -

BERBETIN

Trinasolar

WA4STEAM
Women Angels for STEAM

الوجبة
Al Wajba

A chapter closes a new life emerges, new opportunities, new adventures and a way to eliminate some more stereotypes

THANK YOU!

- Questions
- Comments

- What do you take with you?
- Have any of this resonated to you?