

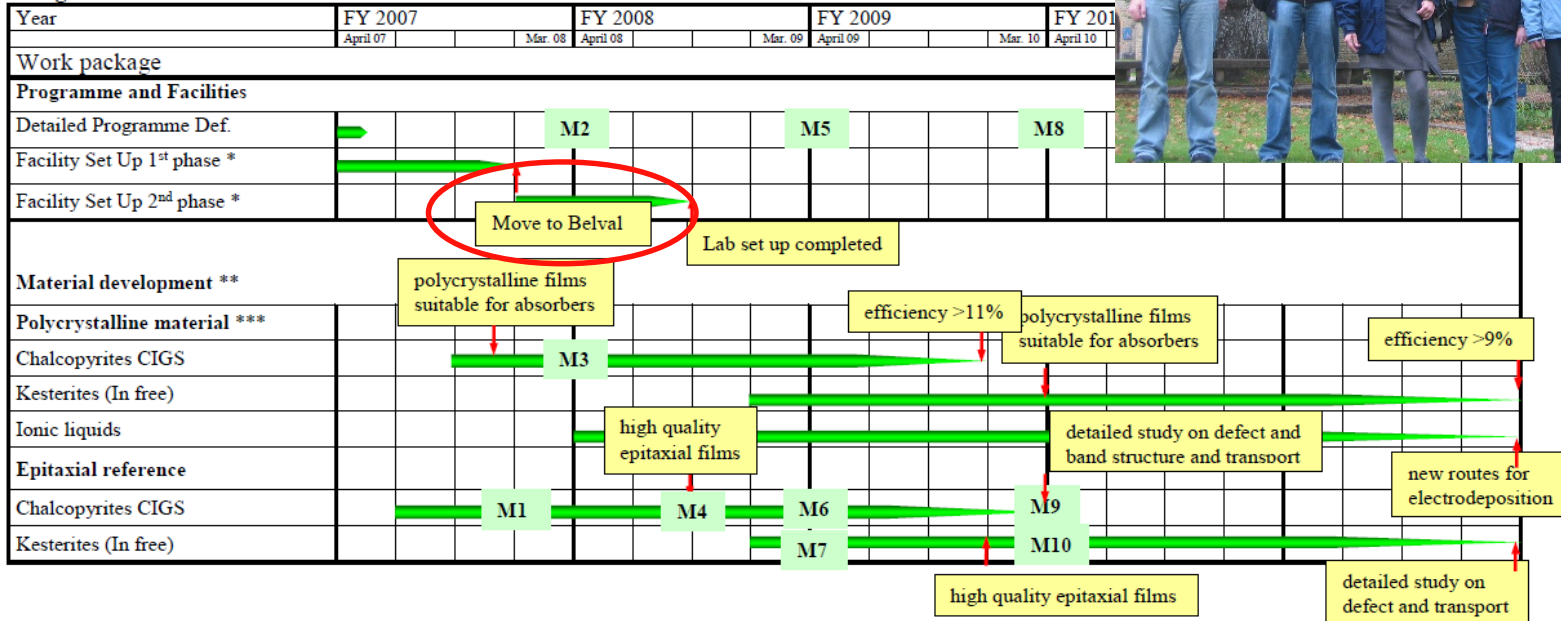
## 10 years Laboratory for Photovoltaics



# The first University chair: TDK Europe Professorship



## Programme



and the first ATTRACT fellow



Fonds National de la  
Recherche Luxembourg

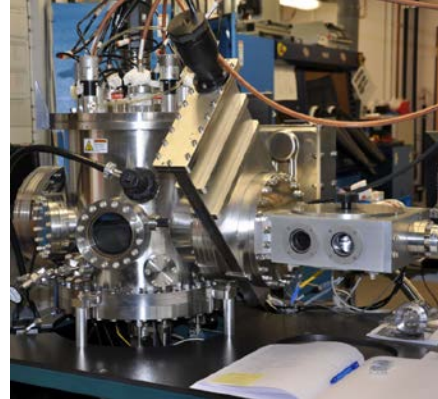
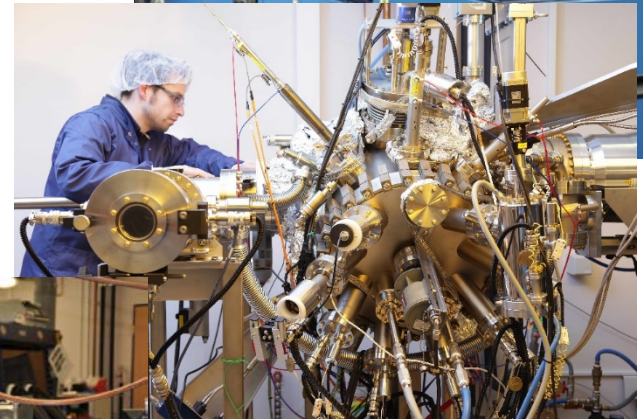
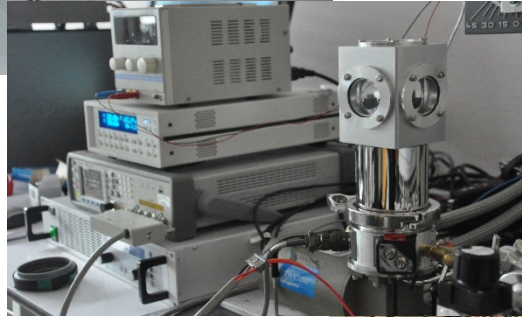
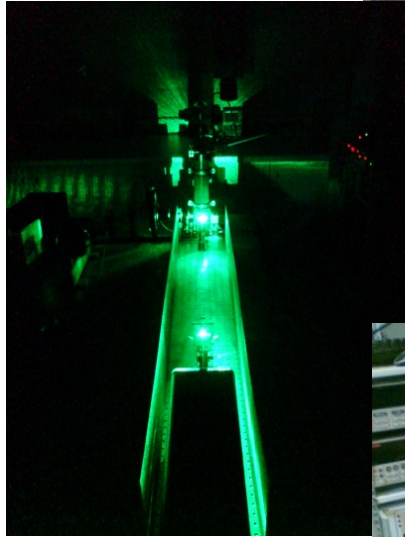
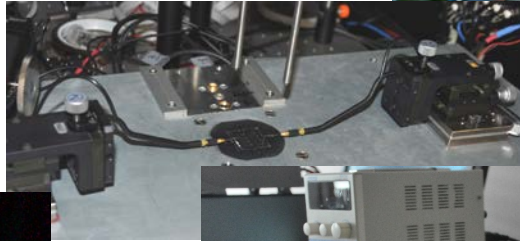
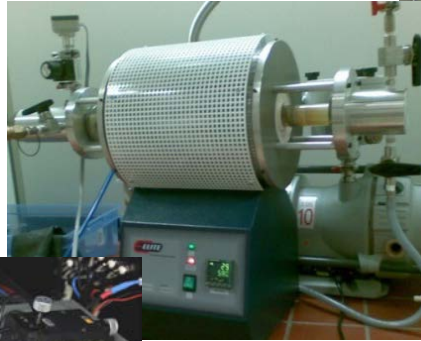




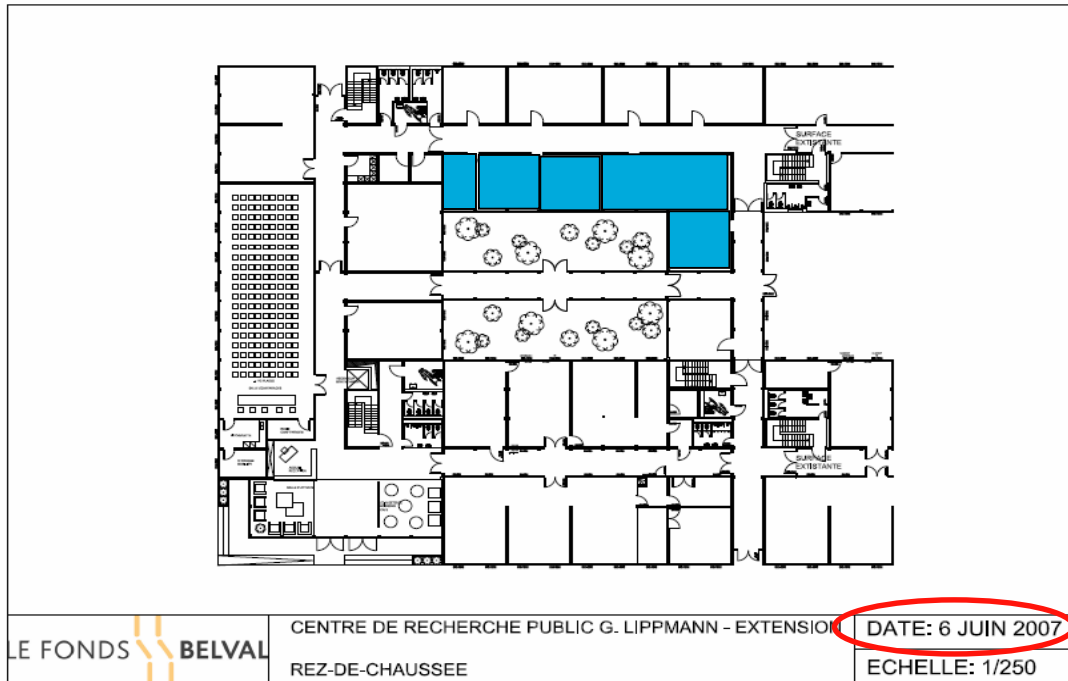
# Initial investment



TDK: 3.6 Mio €  
Uni: 2.1 Mio €  
FNR: 1.0 Mio €



# Belval





# The move

December 2008



Here we are...



the lab is crowded

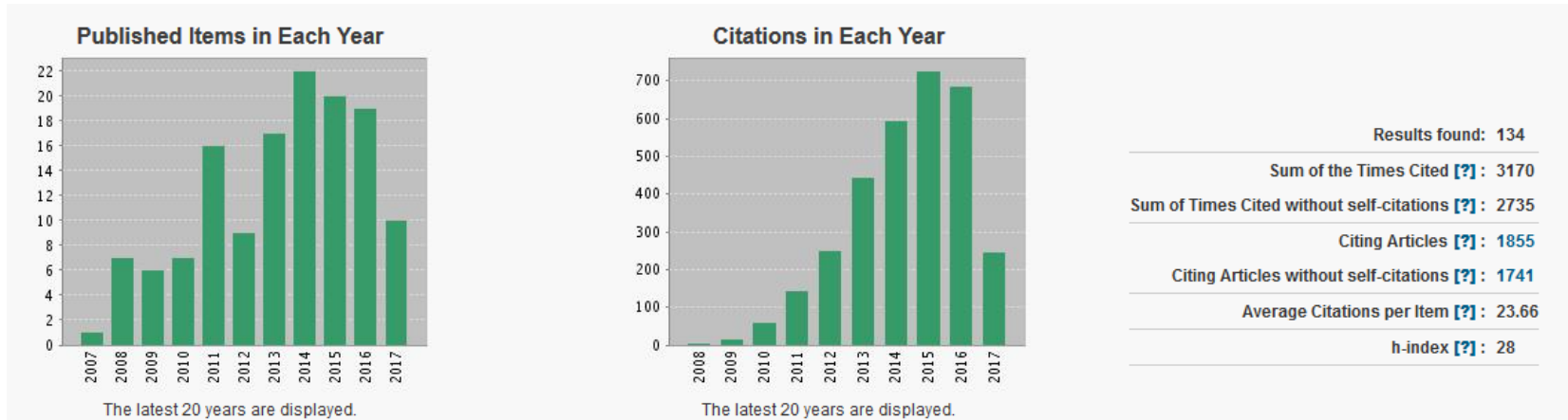
we hope for more space  
in Aile Nord/Aile Sud





# Results - Metrics

134 papers with affiliation  with 3170 citations



7 patents



27 invited talks at international conferences

2 international workshops hosted

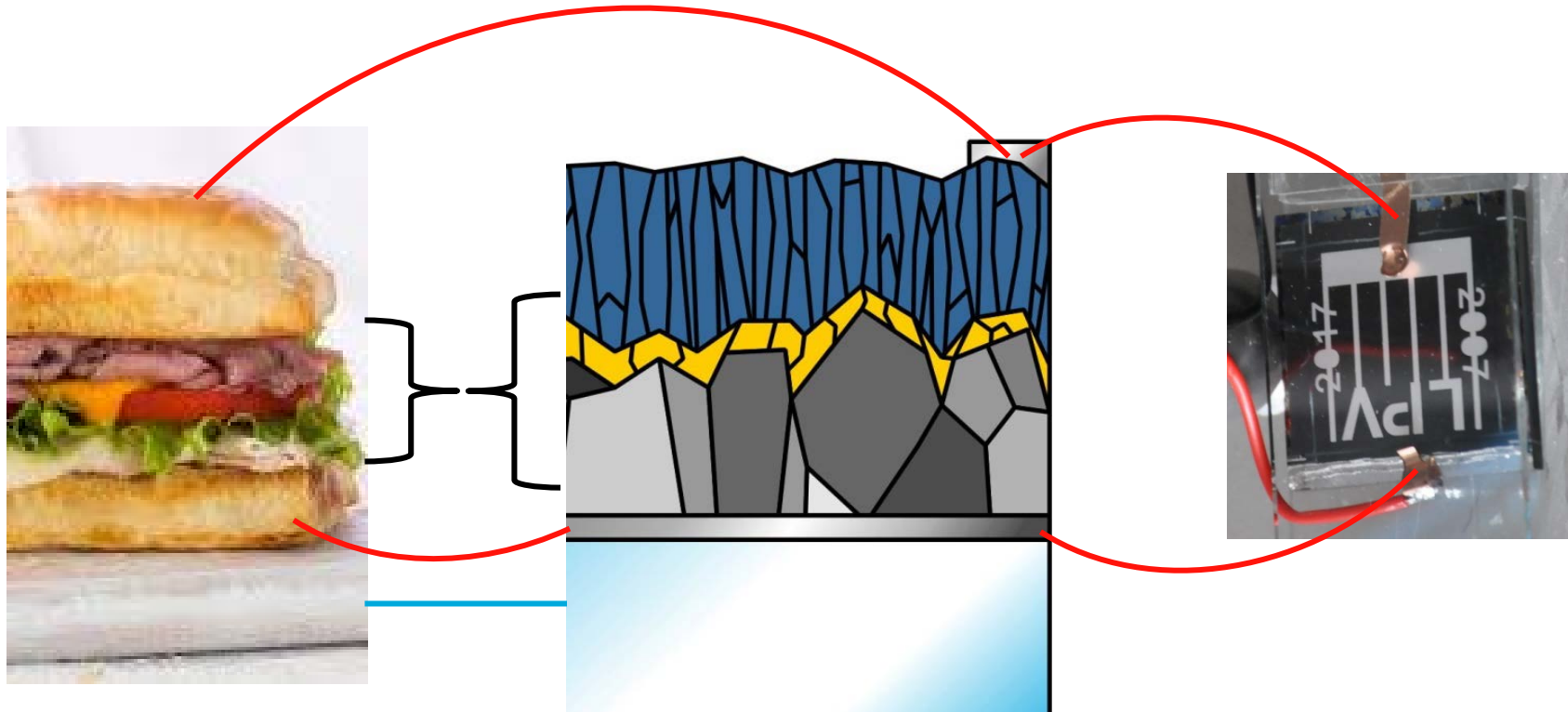


about 1.1 Mio € per year from

 Fonds National de la Recherche Luxembourg



# Sandwiches and Thin film Solar Cells

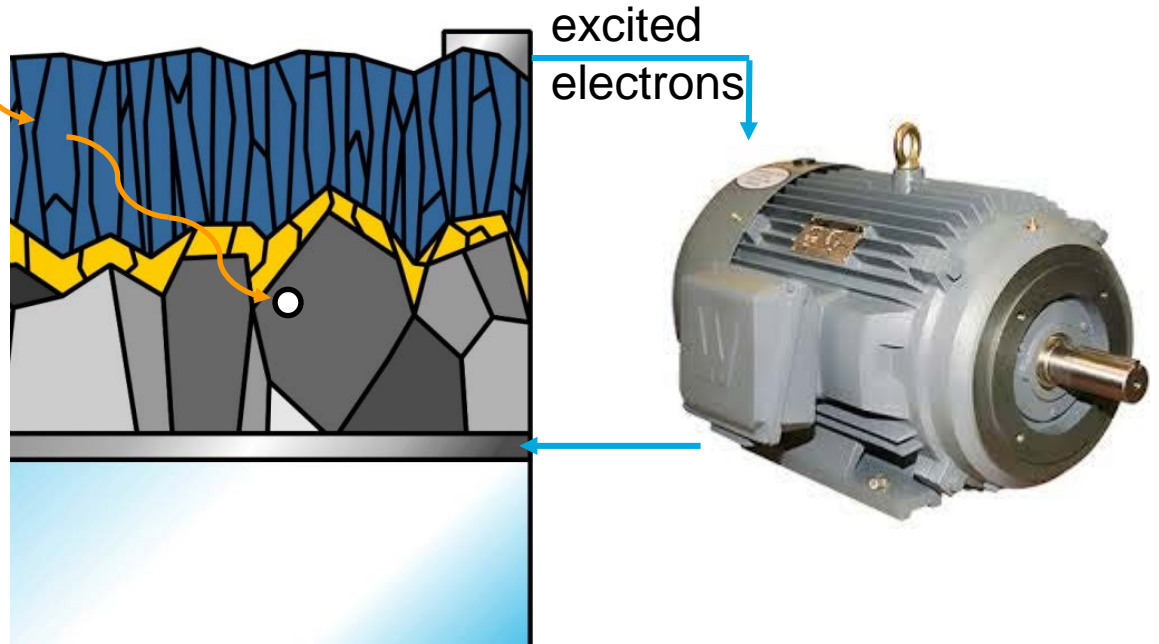
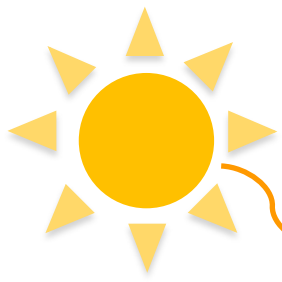


T. Bertram  
thesis



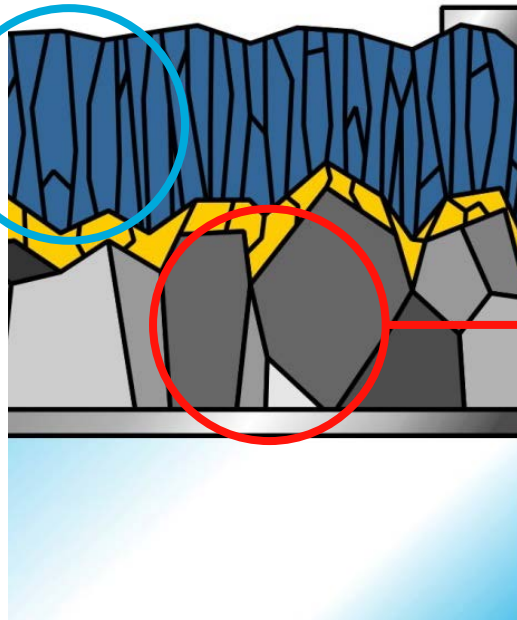


# Basic principles



## Two success stories

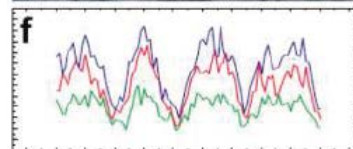
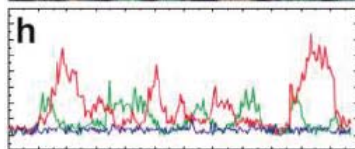
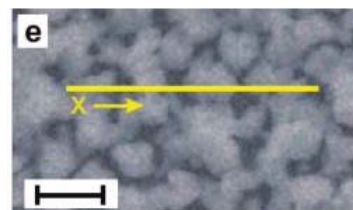
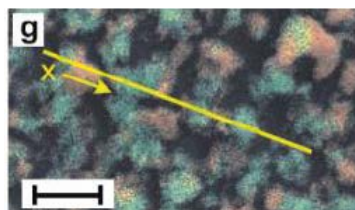
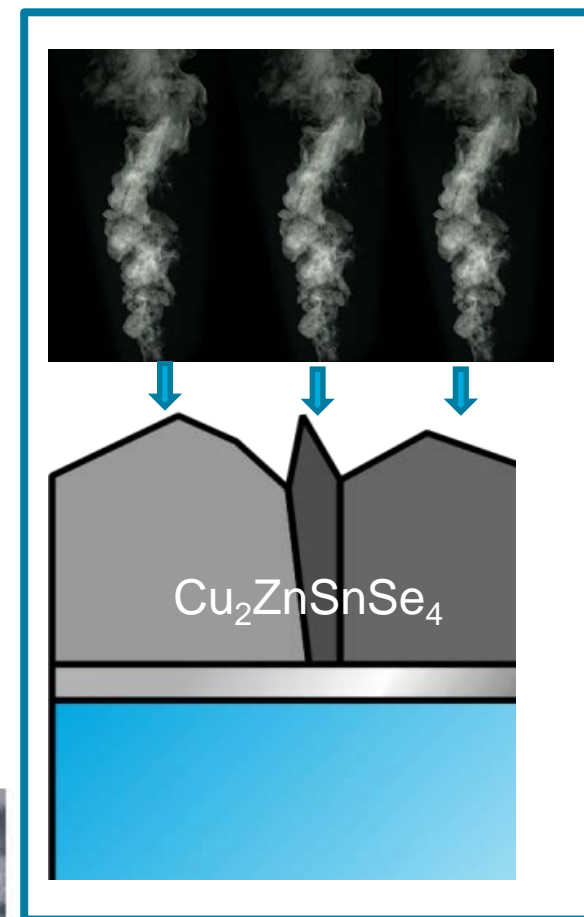
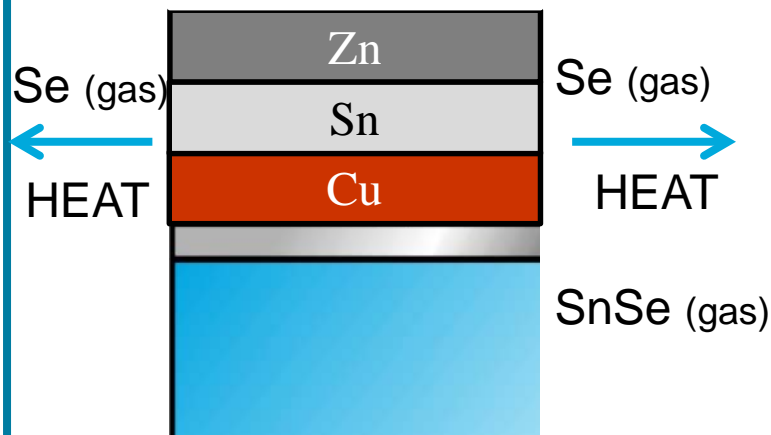
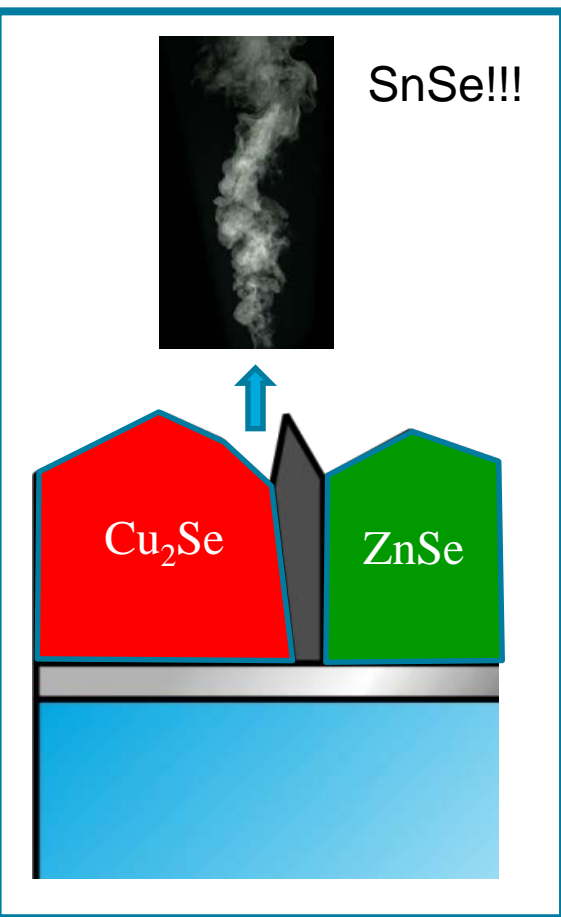
Transparent  
Conducting  
Oxide  
ZnO



Earth abundant  
semiconductor  
 $\text{Cu}_2\text{ZnSnSe}_4$



# $\text{Cu}_2\text{ZnSnSe}_4$ a Smoking Semiconductor

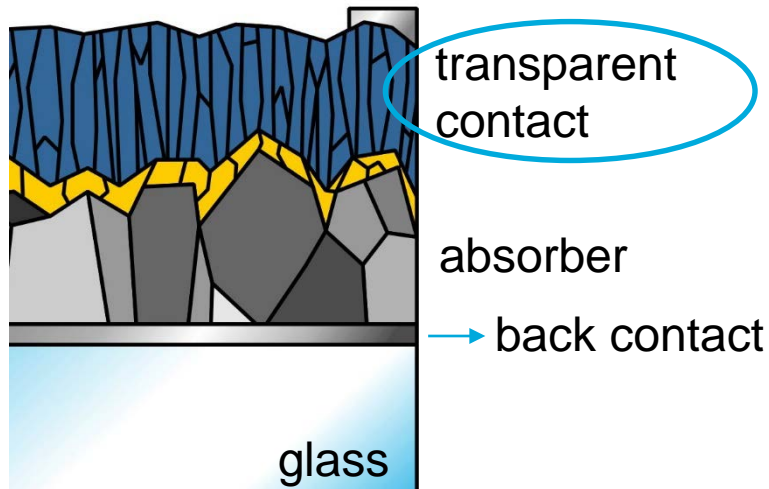


"The consequences of kesterite equilibria for efficient solar cells",  
Redinger, Berg, Dale, Siebentritt, Journal of the American Chemical Society 133, 3320 (2011)

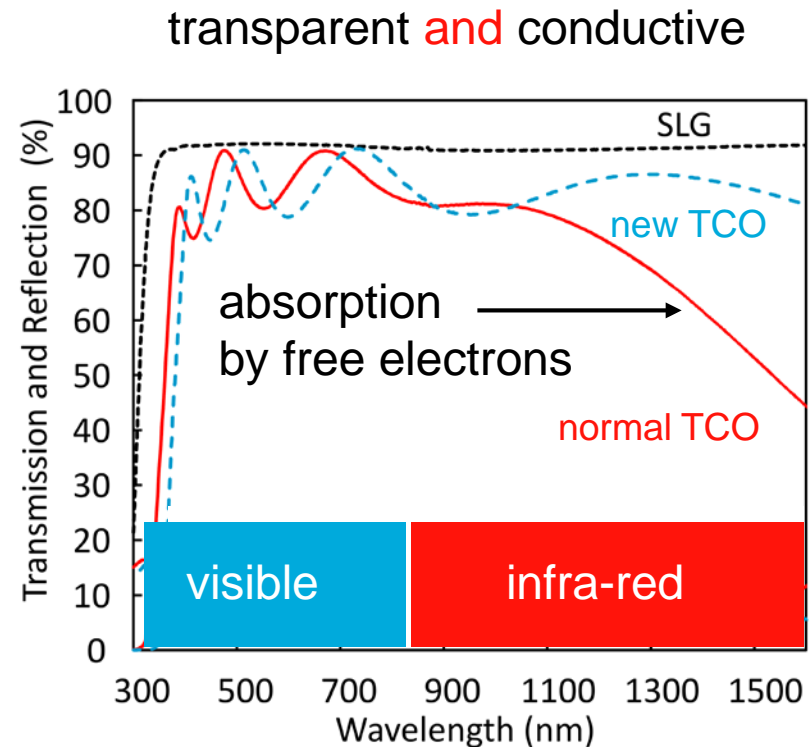




# Transparent conductive oxide



T. Bertram  
thesis



**new TCO:** less free electrons  $\Rightarrow$  less absorption  
better mobility of electrons  $\Rightarrow$  same conductivity  
 $\Rightarrow$  more current from the solar cell



Hala, Fujii, Redinger, Inoue, Rey, Thevenin, Depredurand, Weiss, Bertram, Siebentritt,  
"Highly conductive ZnO films with low NIR absorption",  
Prog. Photovolt. Res. Appl. 23, 1630 (2015)



# Connections...



## Visits - VIPs

2008 TDK Chairman Sawabe-san



2013 Mr. Science from RTL



2014 MEP Claude Turmes

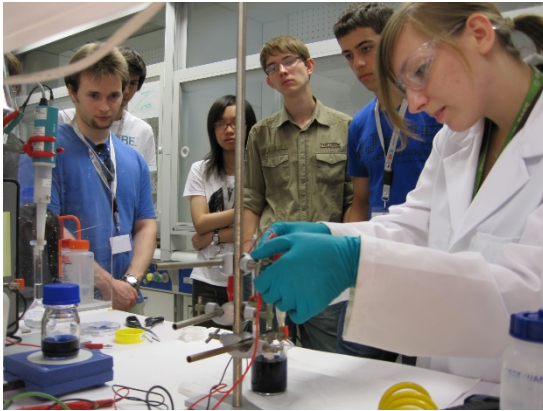


2015 Energy Committee of the Parliament





## Visits - coming VIPs



## Prizes

2014 FNR Award  
Outstanding publication



2015 Grand Prix des Sciences physiques  
Prix Paul Wurth  
of the Institut Grand Ducal



2015 Klimahelden am Alltag





# The teams of LPV and LEM

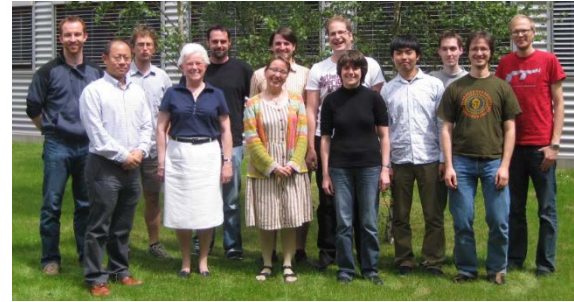
2007



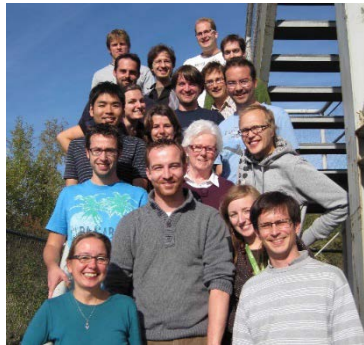
2008



2009



2010



2012



2014



2016



2015





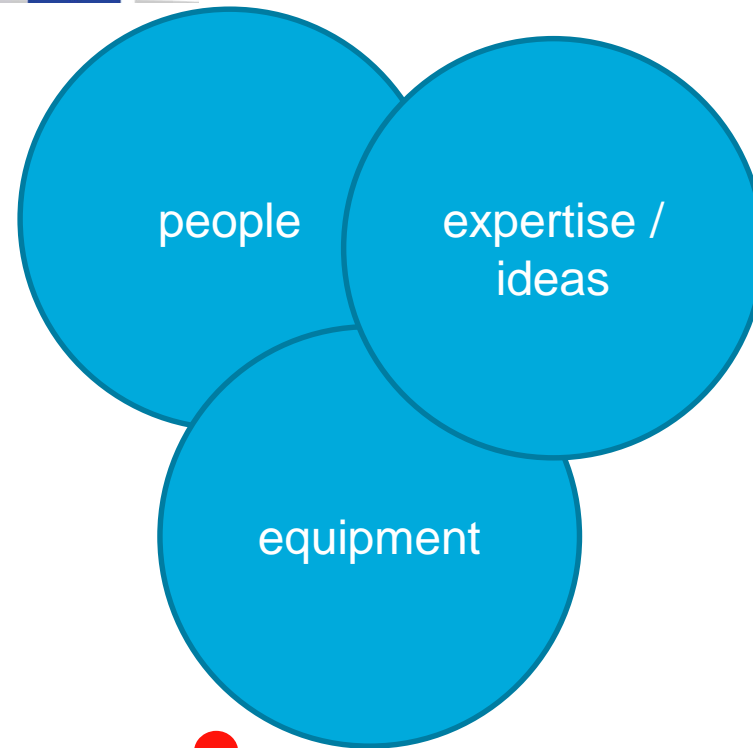
# The Future



Fonds National de la  
Recherche Luxembourg



## A PV hub in Europe?



equipment fund?



10 successful years

*Thank you!*

