

ENIGME

Ab initio study of
silver chloride



the photochromatic image of Edmond Becquerel

IPANEMA, 20 September 2018

Arnaud Lorin, Matteo Gatti, Lucia Reining, Francesco Sottile



LSI, Ecole Polytechnique
CNRS/CEA - Université Paris-Saclay





Matteo Gatti



Victor de Seauve



Marie-Angélique
Languille



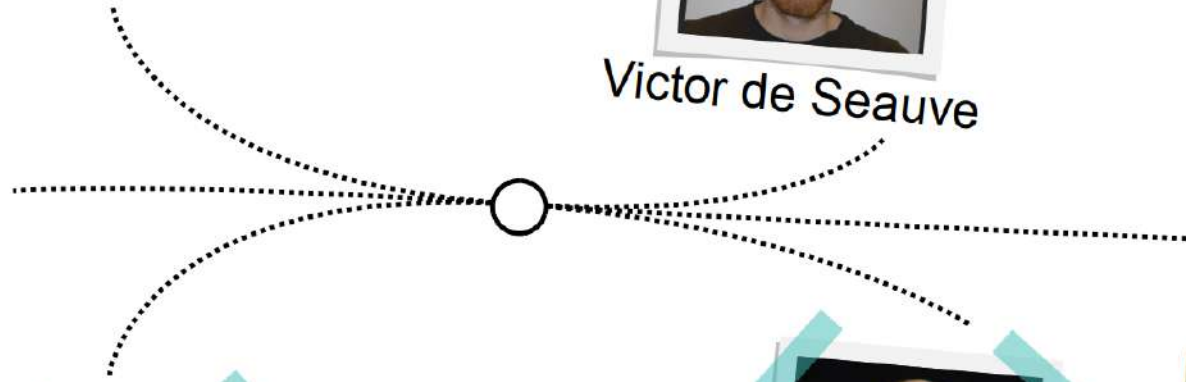
Bertrand Lavédrine



Arnaud Lorin



Lucia Reining



1st color photography



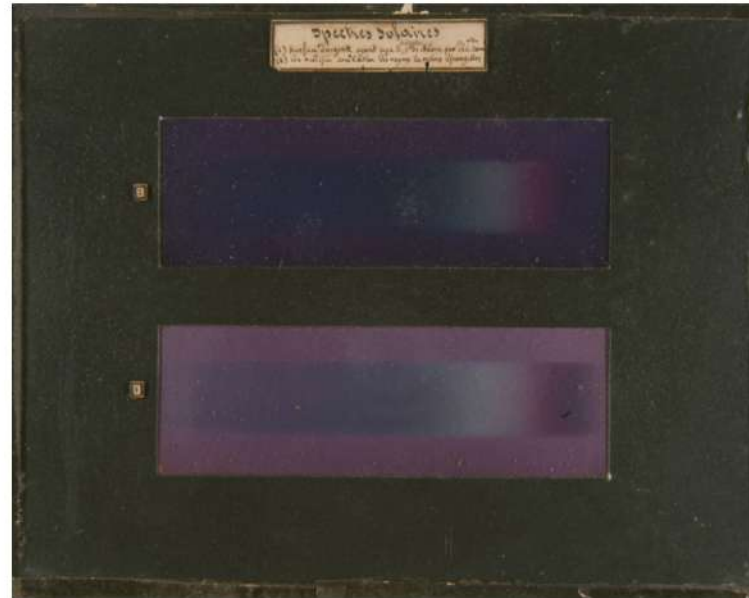
Victor de Seauve



Marie-Angélique
Languille

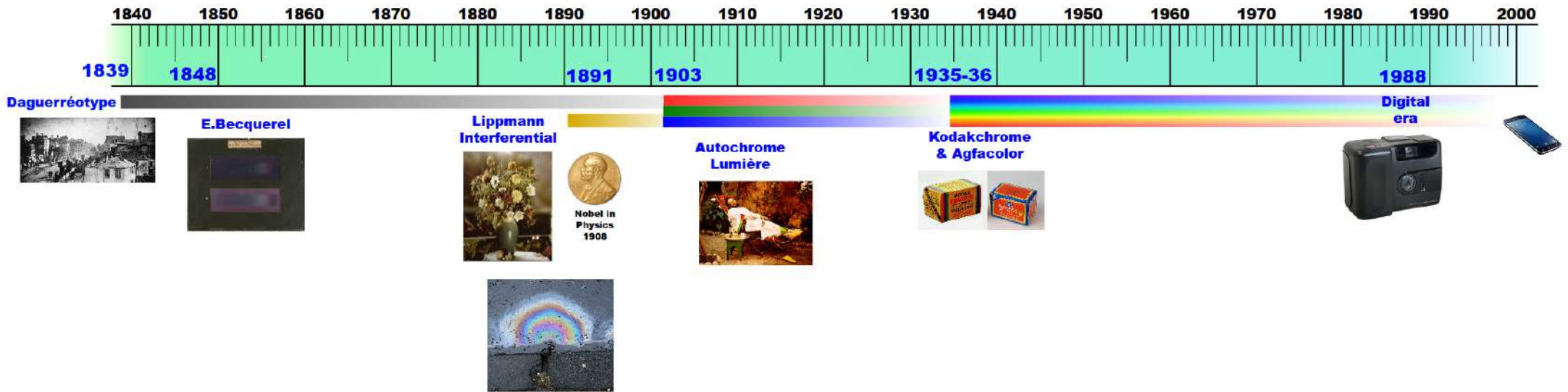


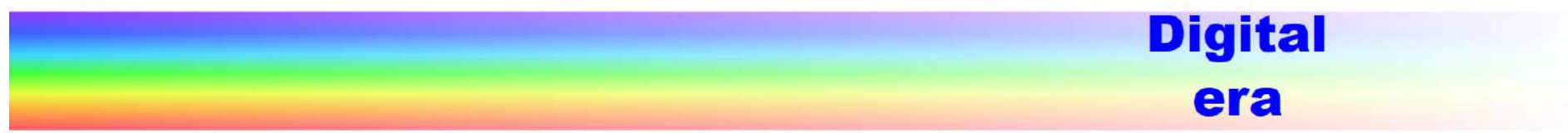
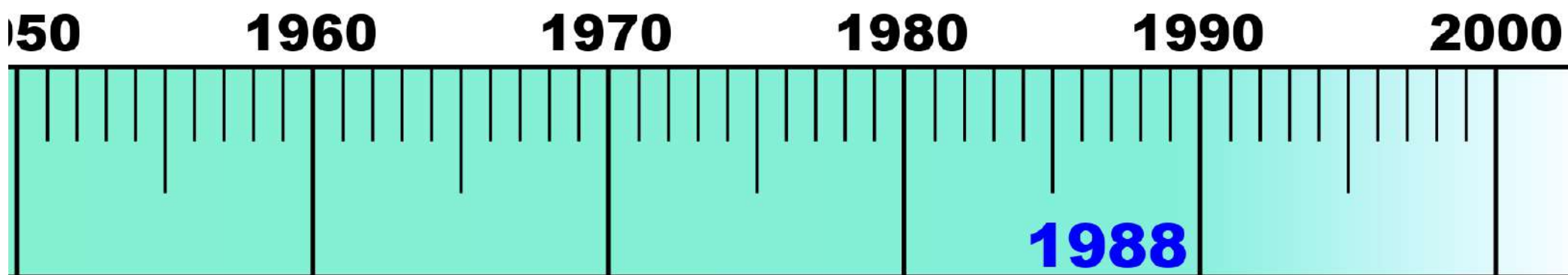
Bertrand Lavédrine



Edmond
Becquerel

Photography :: a historical timeline





1880

1890

1900

1910

1920

1930

1891

1903

1

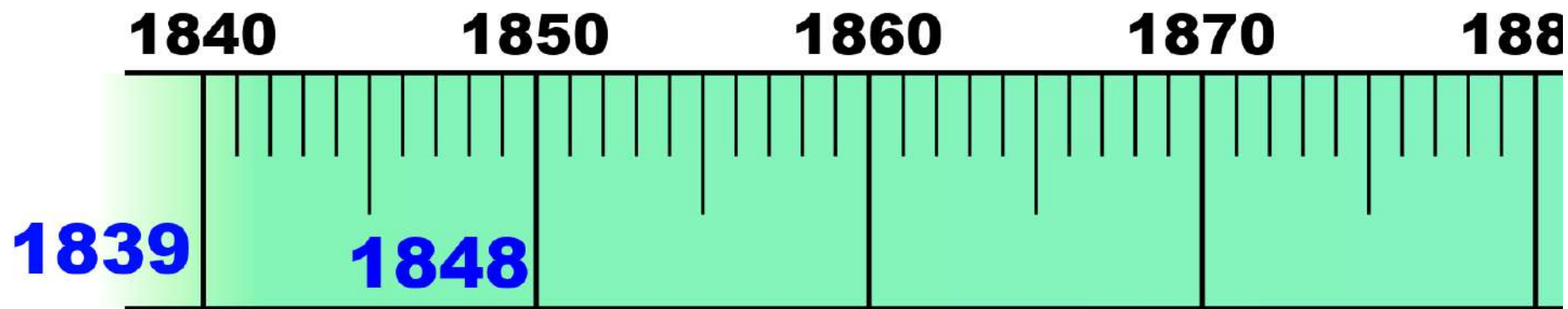
Lippmann Interferential



**Nobel in
Physics
1908**

Autochrome Lumière

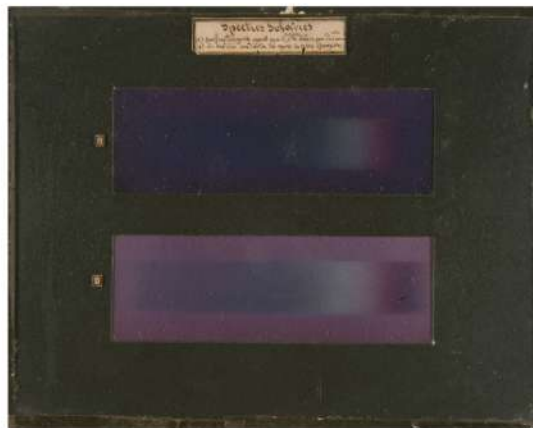




Daguerrréotype



E. Becquerel



**Li
Inte**



1st color photography



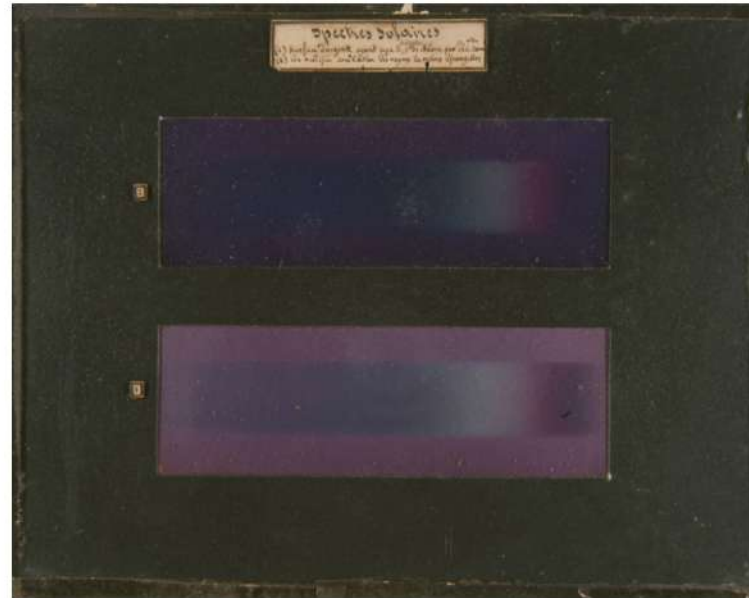
Victor de Seauve



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Edmond
Becquerel

1st color photography



Victor de Seauve



Edmond
Saeuvel



Bertrand Lavédan



- **Image is not fixed !**
- **Direct analysis is impossible !**

ur-Saône

1st color photography



Victor de Seauve



Edmond
Sèze



Bertrand Lavédol

- **Image is not fixed !**
- **Direct analysis is impossible !**



How to preserve it ??



How does it work ??

ur-Saône



Matteo Gatti



Victor de Seauve



Lucia Reining



Bertrand Lavédrine



Arnaud Lorin



Marie-Angélique
Languille



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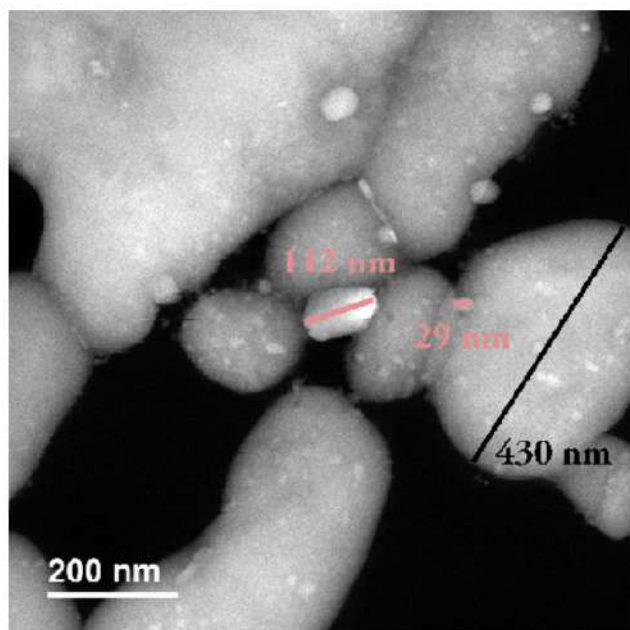
Reproduction
of the original
procedure of
E. Becquerel



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Theoretical analysis
Prediction and references

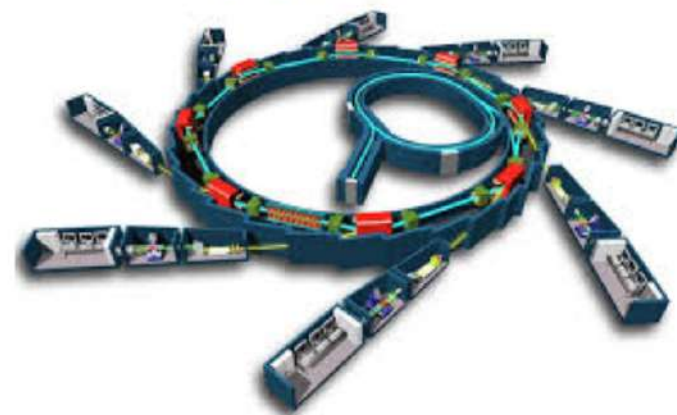
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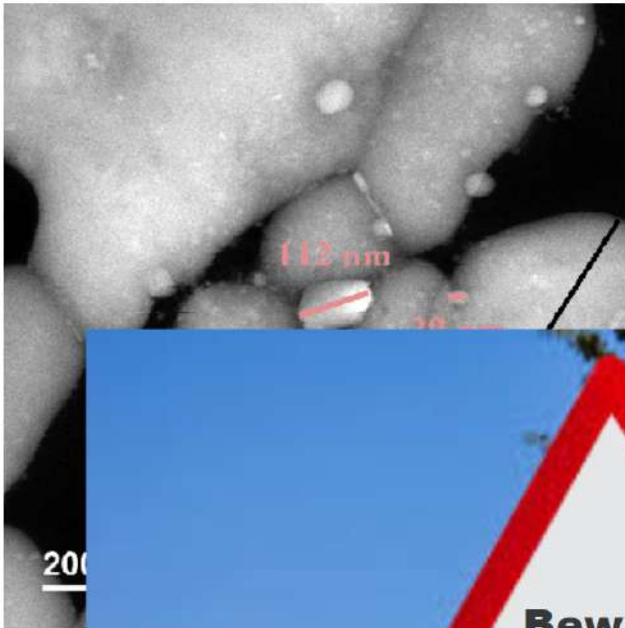
LPS
ORSAY



SOLEIL
SYNCHROTRON



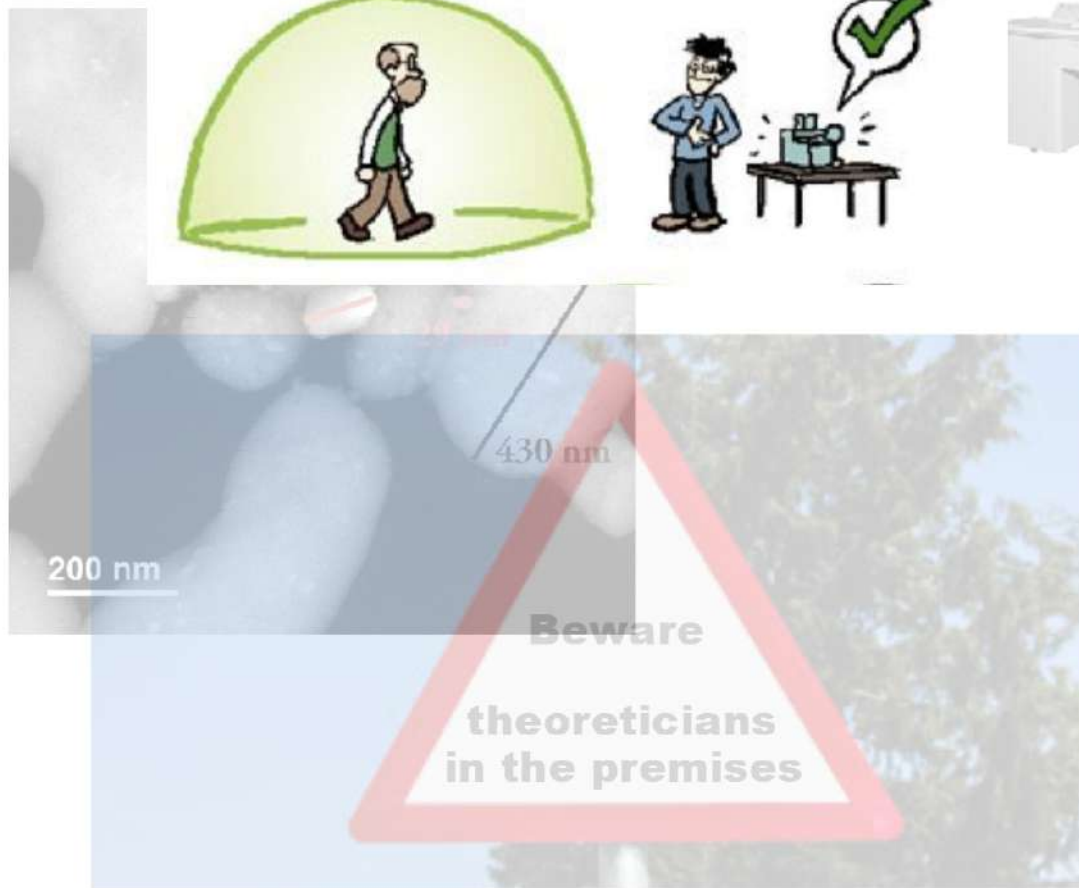
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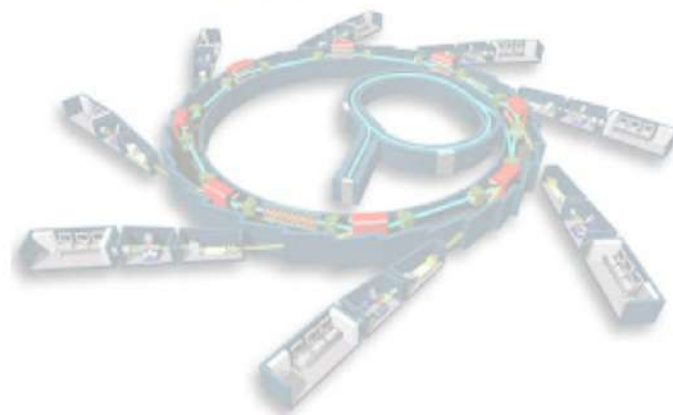
SOLEIL
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LPS
ORSAY



SOLEIL
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LPS
ORSAY

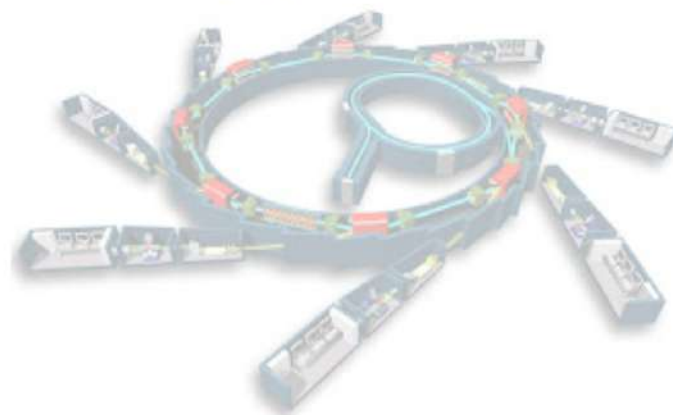


AM © 2007



Beware
theoreticians
in the premises

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SYNCHROTRON



LPS
ORSAY



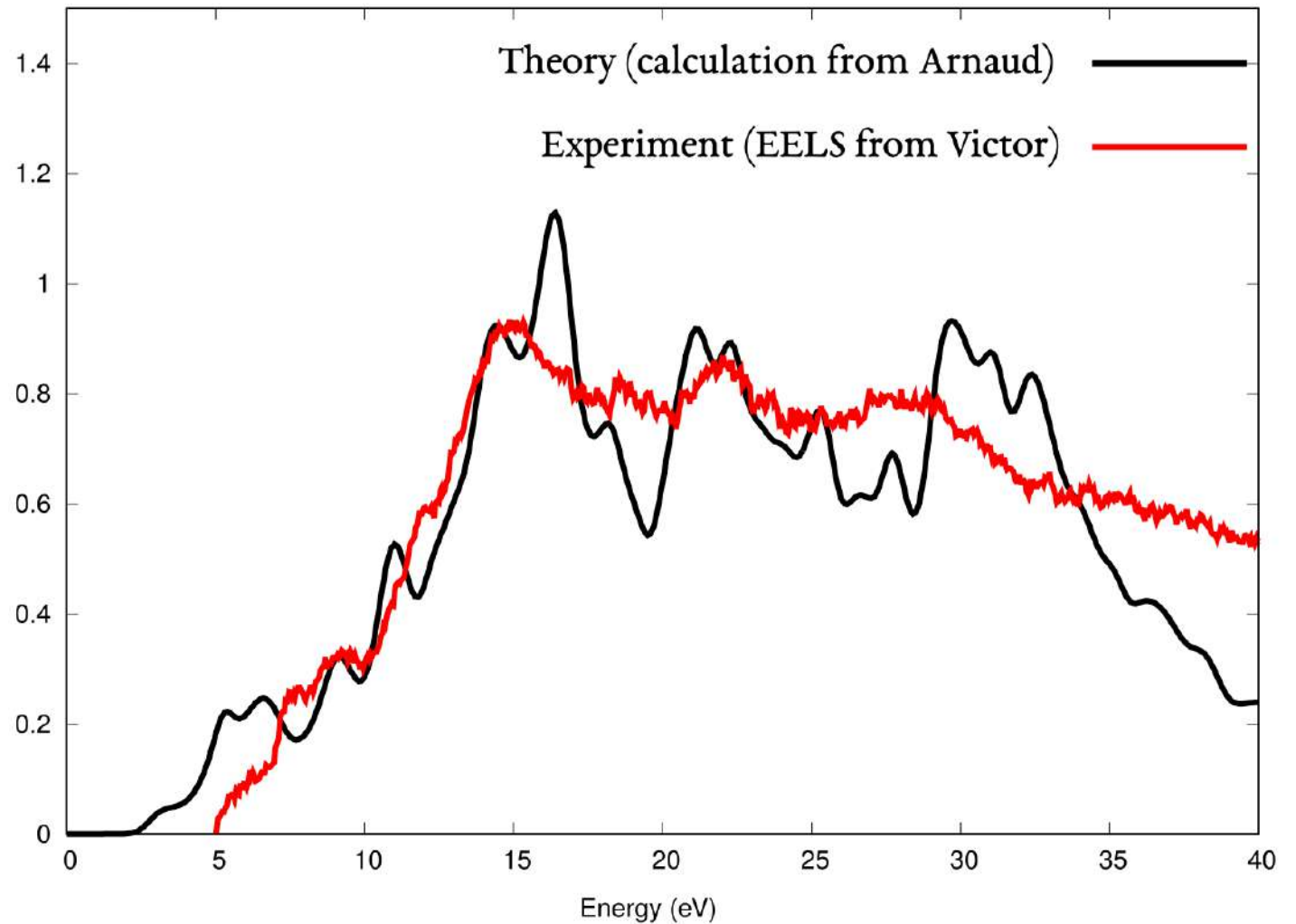
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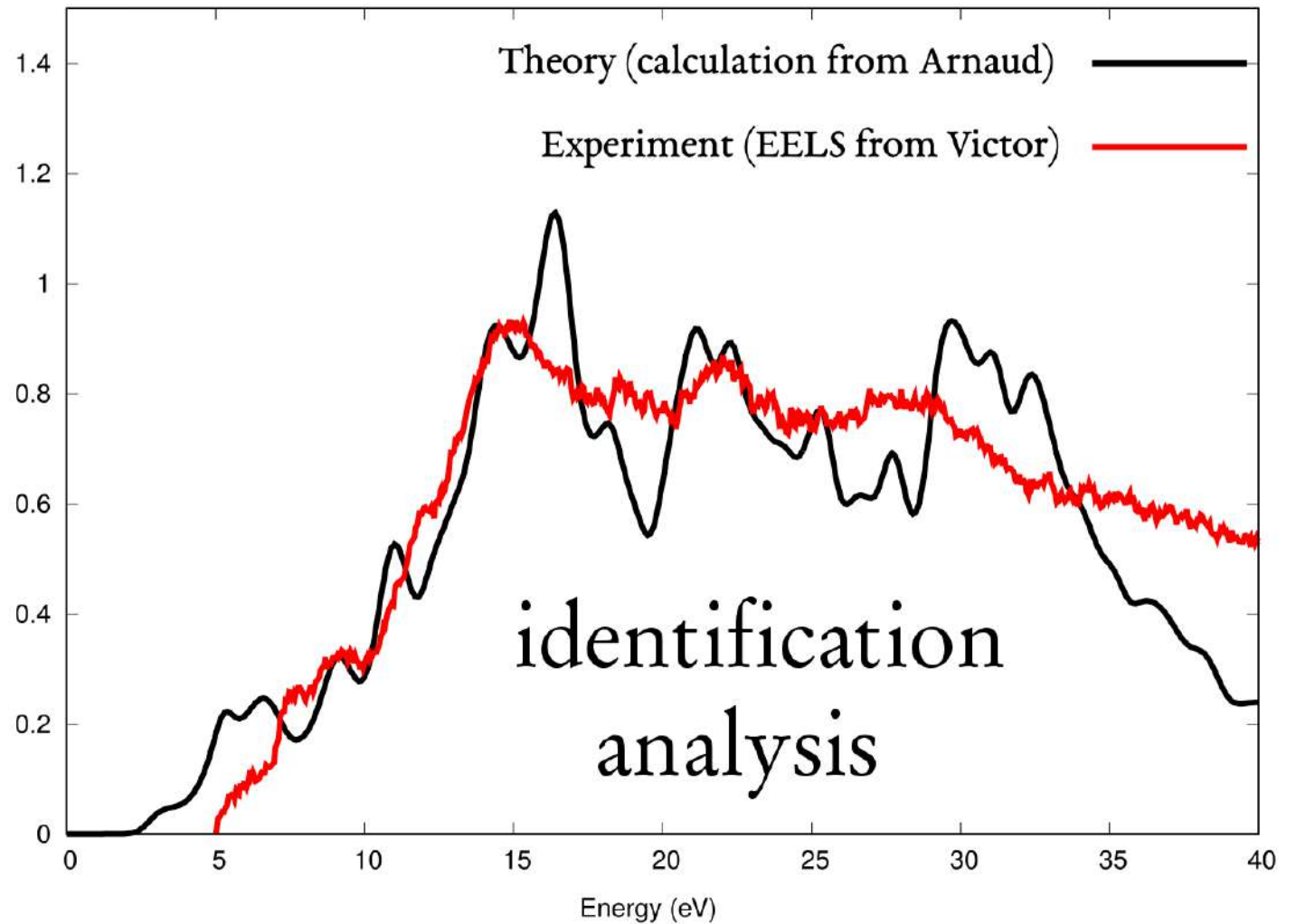
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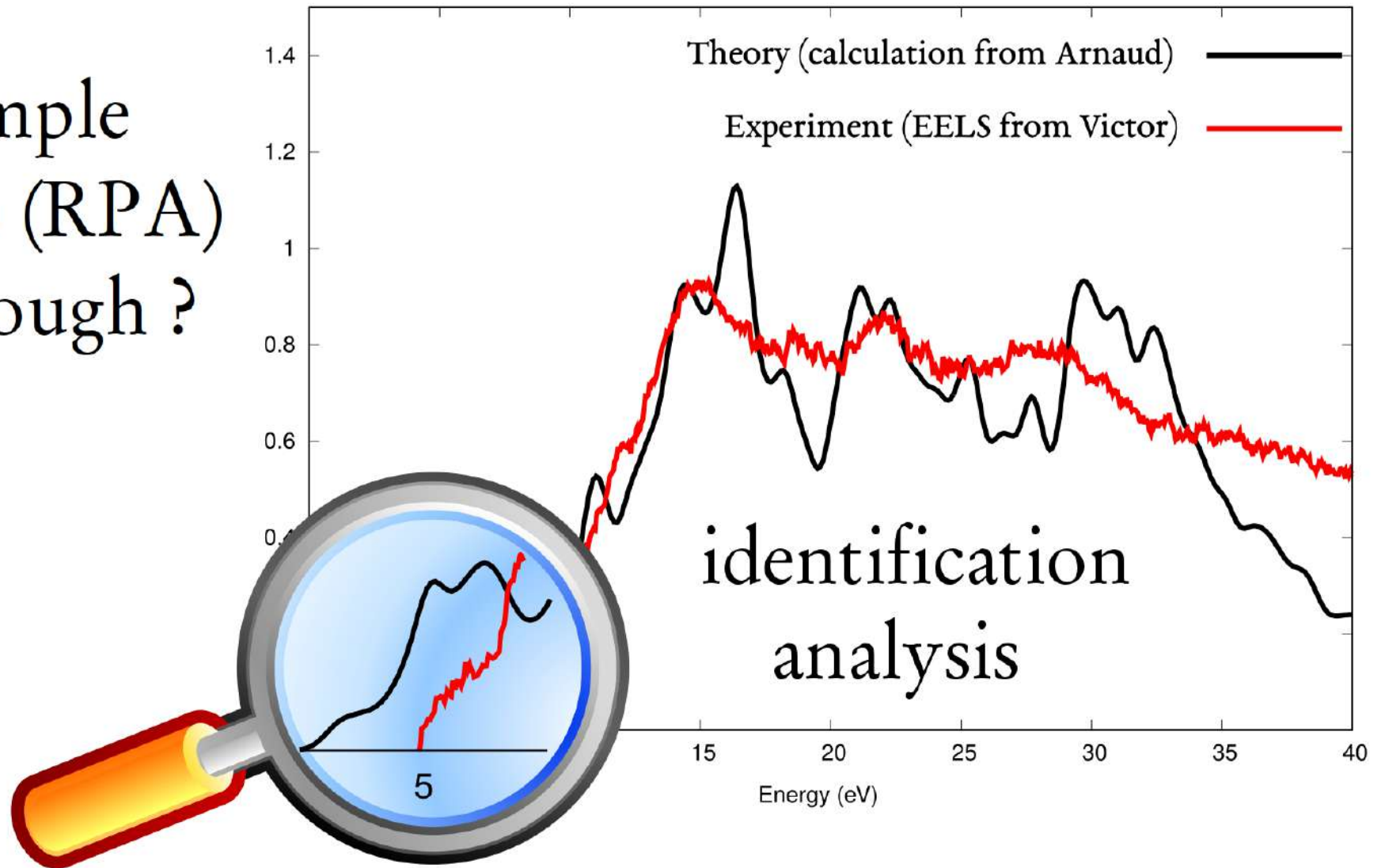
Is a simple
approach (RPA)
good enough ?



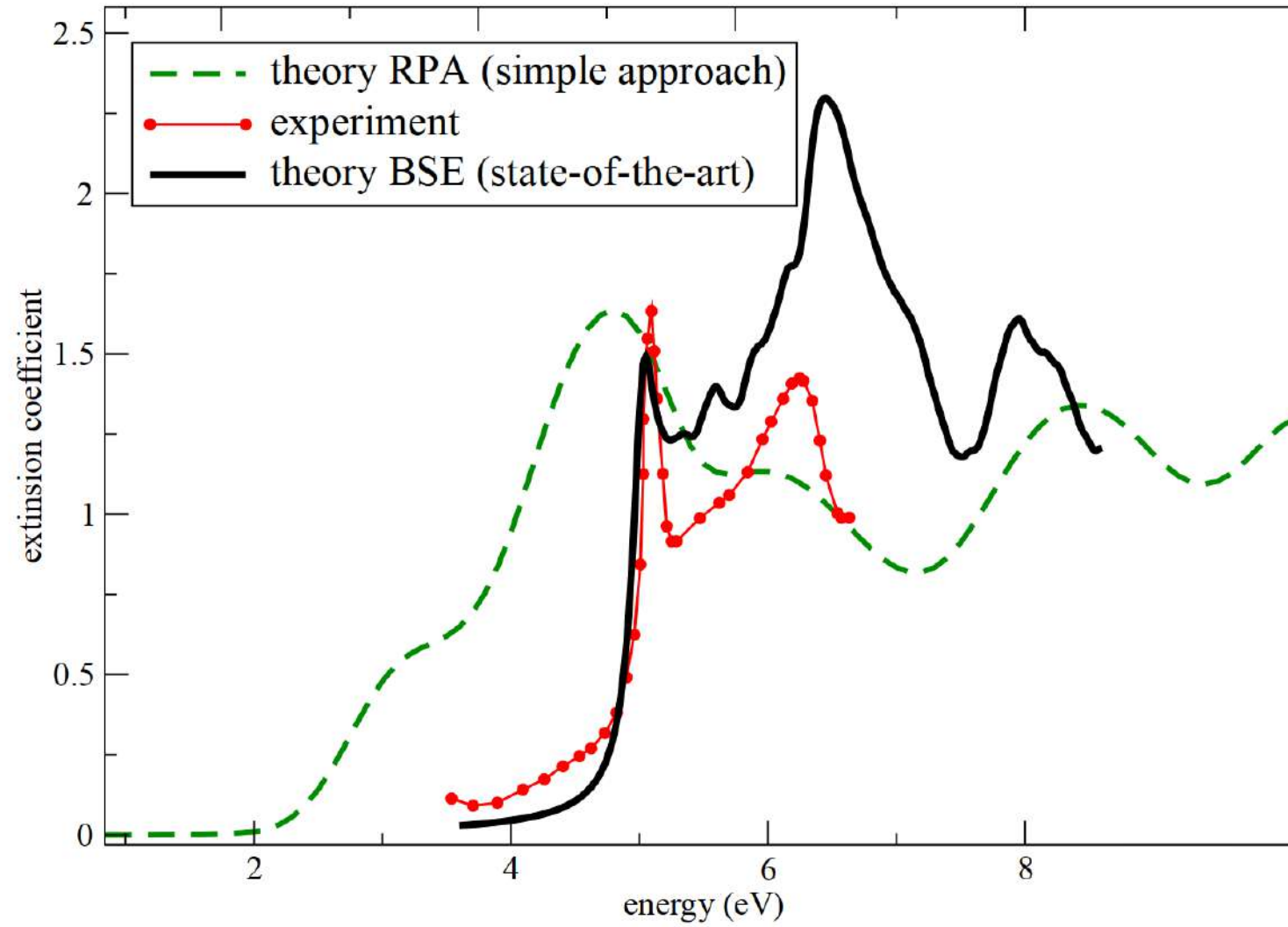
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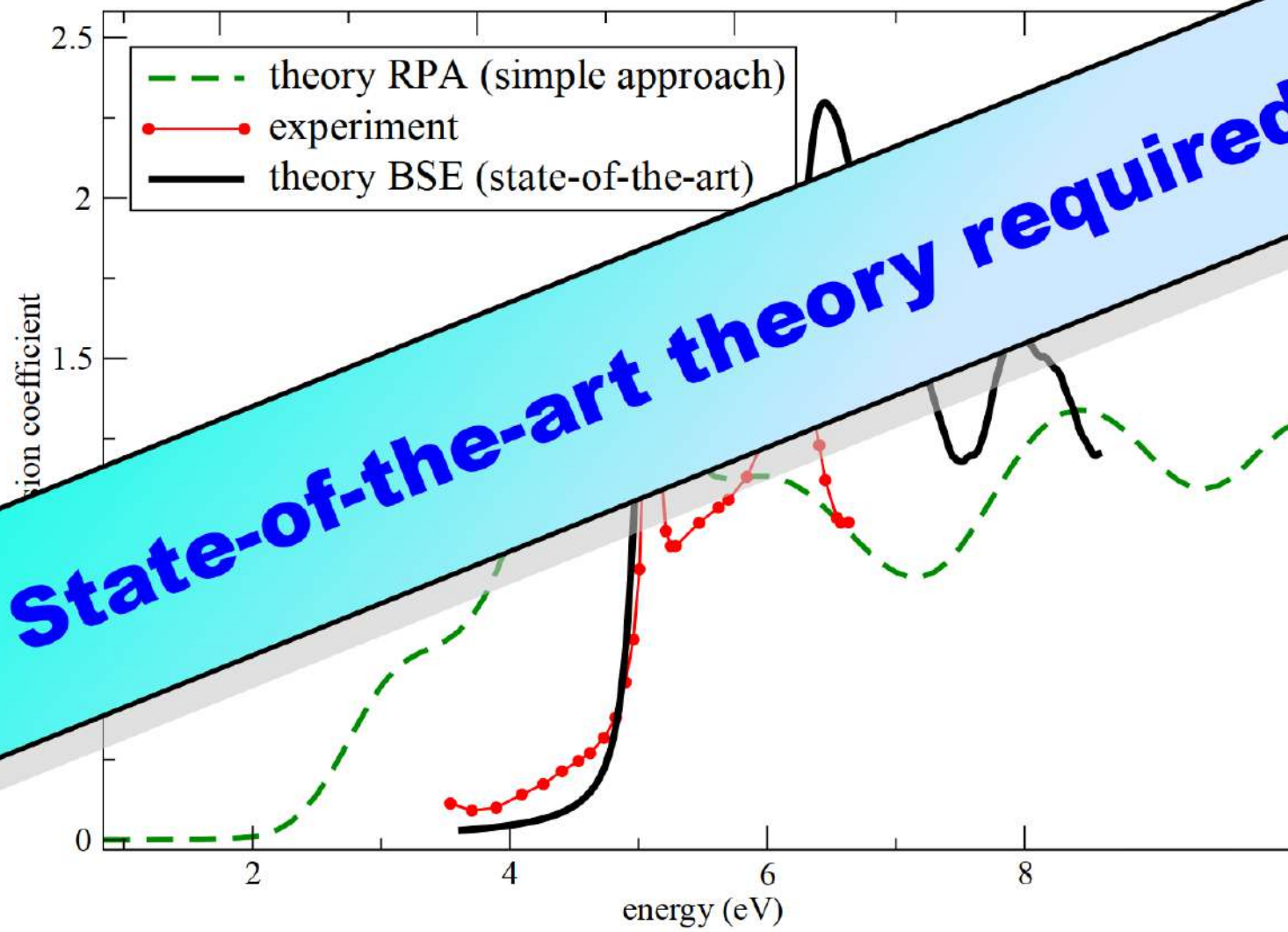
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Optical properties of Silver Chloride



Optical properties of Silver Chloride





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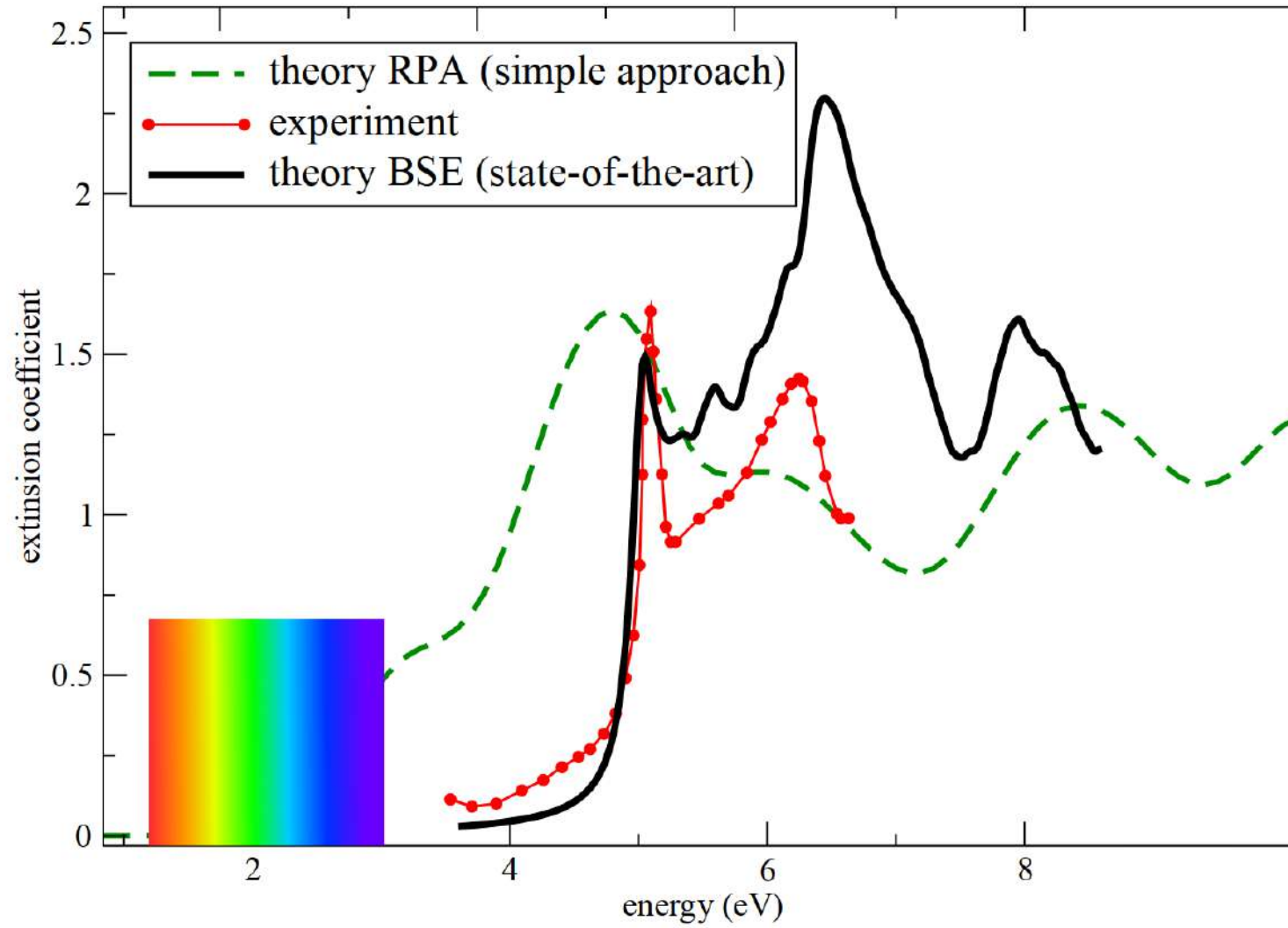




- **Influence de la structure**
- **Nanostructures d'argent**
- **Défauts non responsables de l'absorption**
-



Optical properties of Silver Chloride



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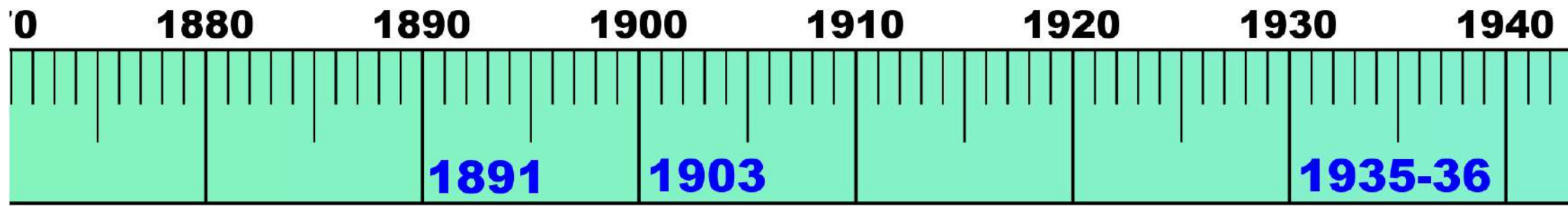


**Promising to understand and
to tackle more realistic systems
to describe the first color photo**

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**Promising to understand and
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**Lippmann
Interferential**



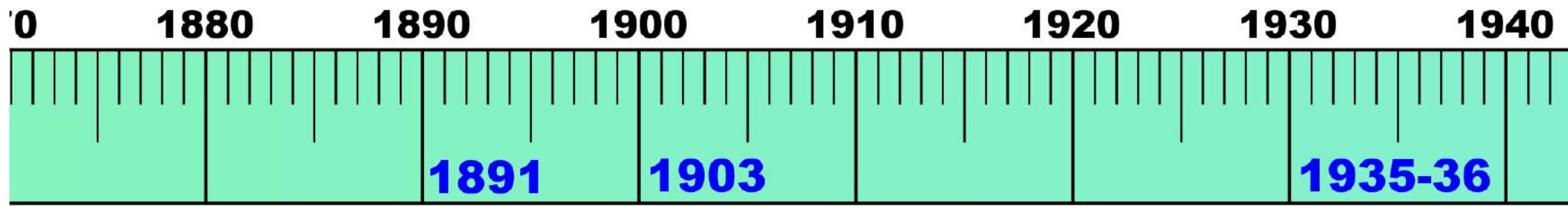
**Nobel in
Physics
1908**

**Autochrome
Lumière**



**Kodachrom
& Agfacolor**





Lippmann Interferential



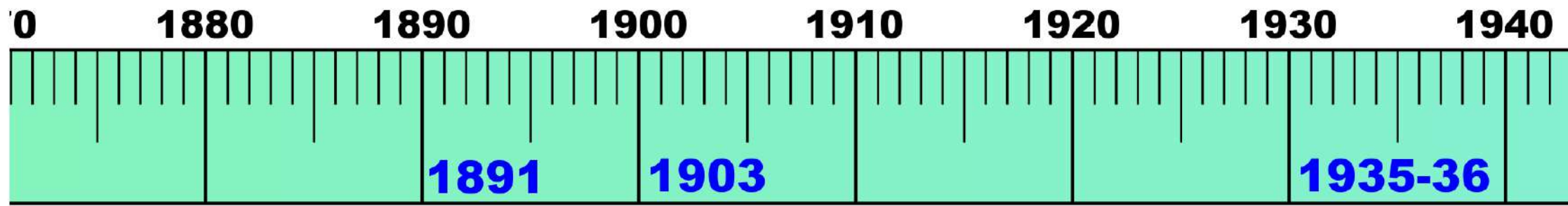
Nobel in Physics 1908

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**Lippmann
Interferential**



**Nobel in
Physics
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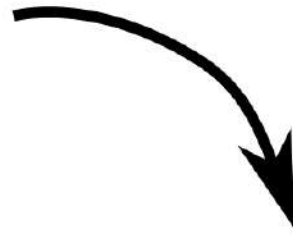
**Kodachrom
& Agfacolor**



forefather of
holography



forefather of
holography

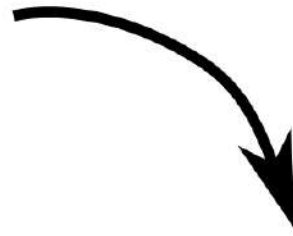


encryption





forefather of
holography



encryption

3D cinema



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original procedure understood and controled

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original procedure understood and controlled

(state-of-the-art) theoretical calculations can be used as reference

ideal AgCl ✓

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original procedure understood and controlled

(state-of-the-art) theoretical calculations can be used as reference

ideal AgCl ✓

```
graph TD; A[ideal AgCl ✓] --> B(new theoretical development for non-trivial effects); A --> C(bigger (and more complex) systems nano-cluster and aggregates);
```

new theoretical development
for non-trivial effects

bigger (and more complex) systems
nano-cluster and aggregates

ENIGME

original procedure understood and controlled

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new theoretical development
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bigger (and more complex) systems
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EQUIPENIGME

ENIGME

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new theoretical development
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EQUIPENIGME





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