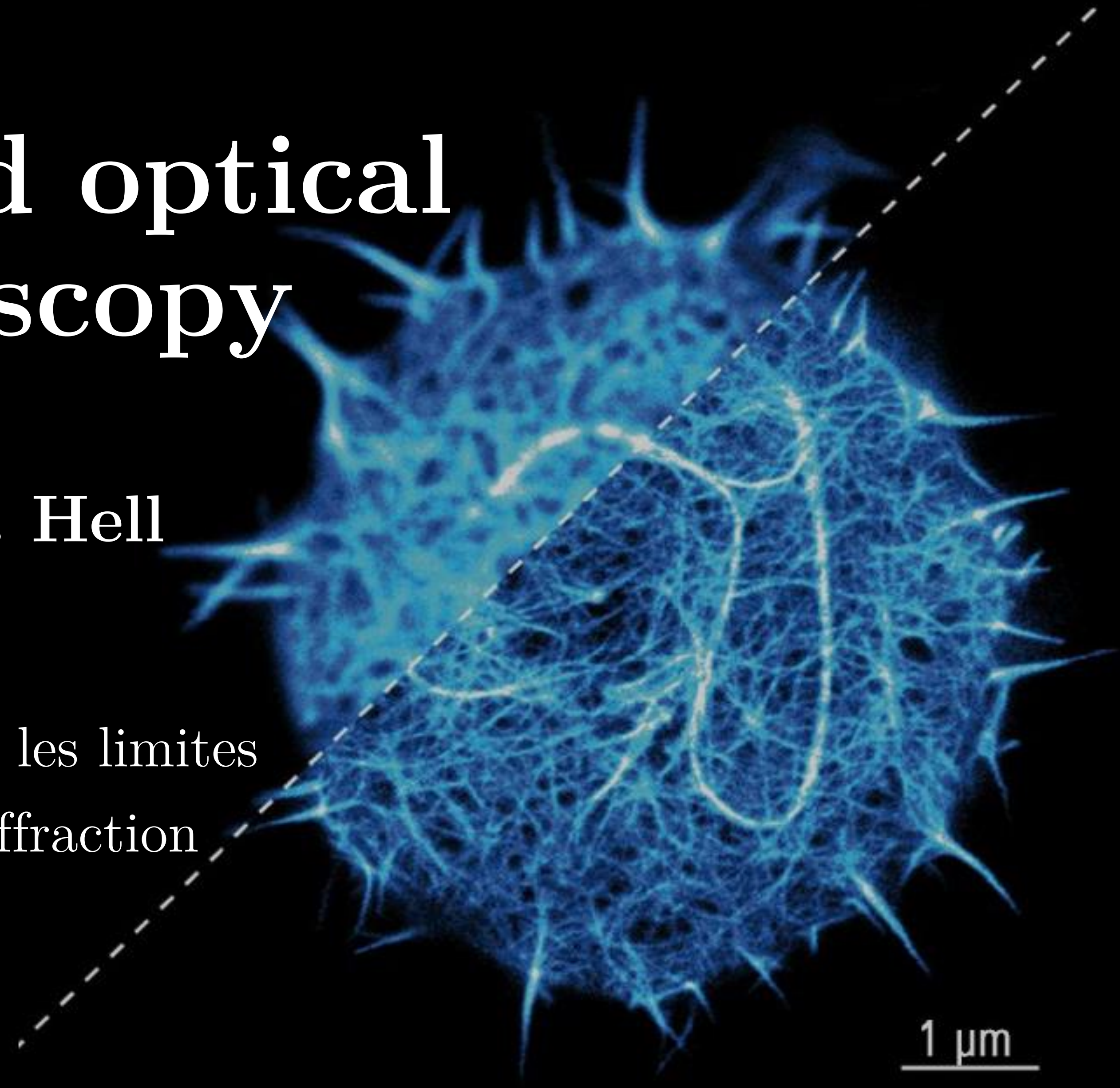
Far-field optical nanoscopy

S.W. Hell

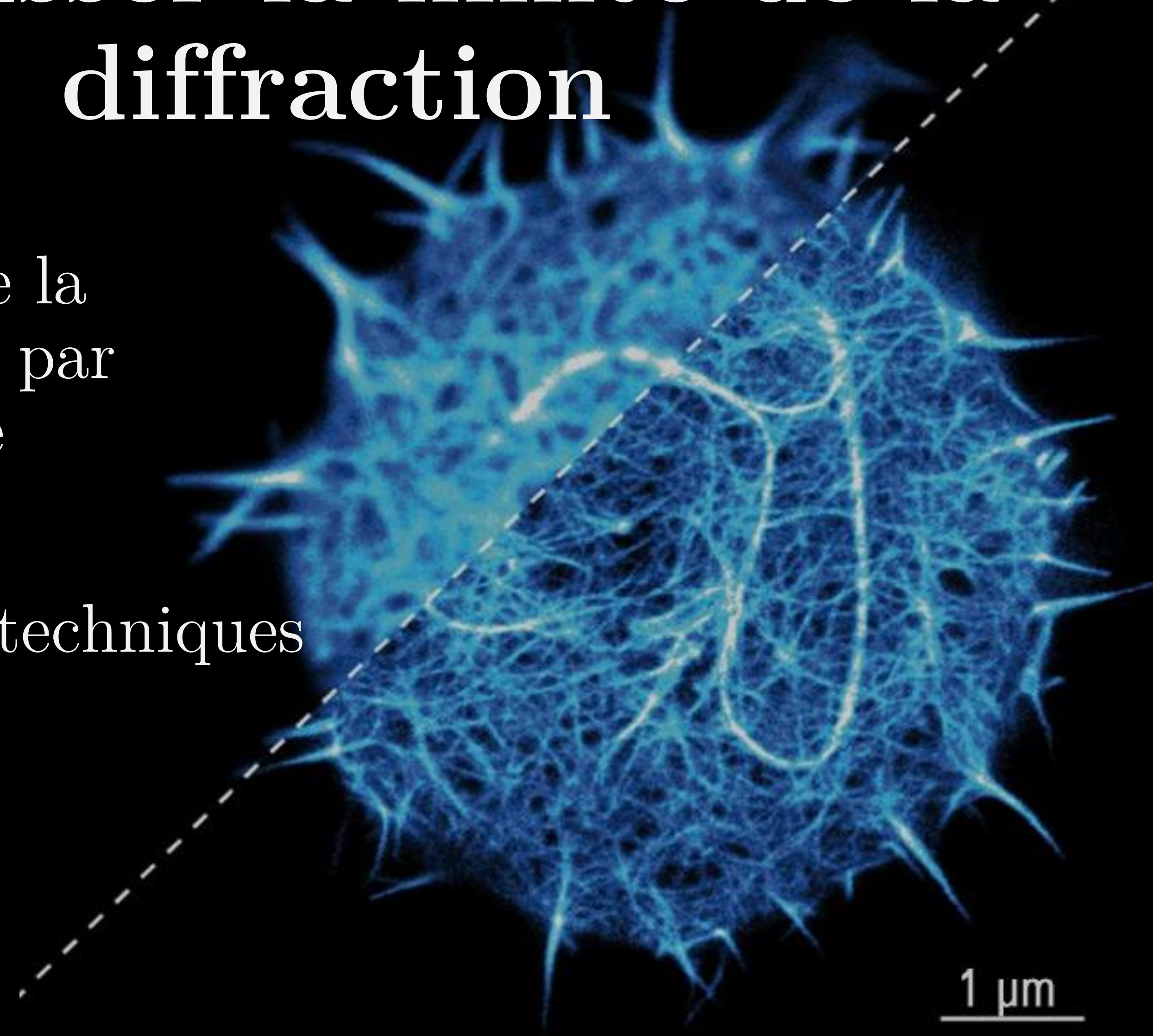
Repousser les limites de la diffraction



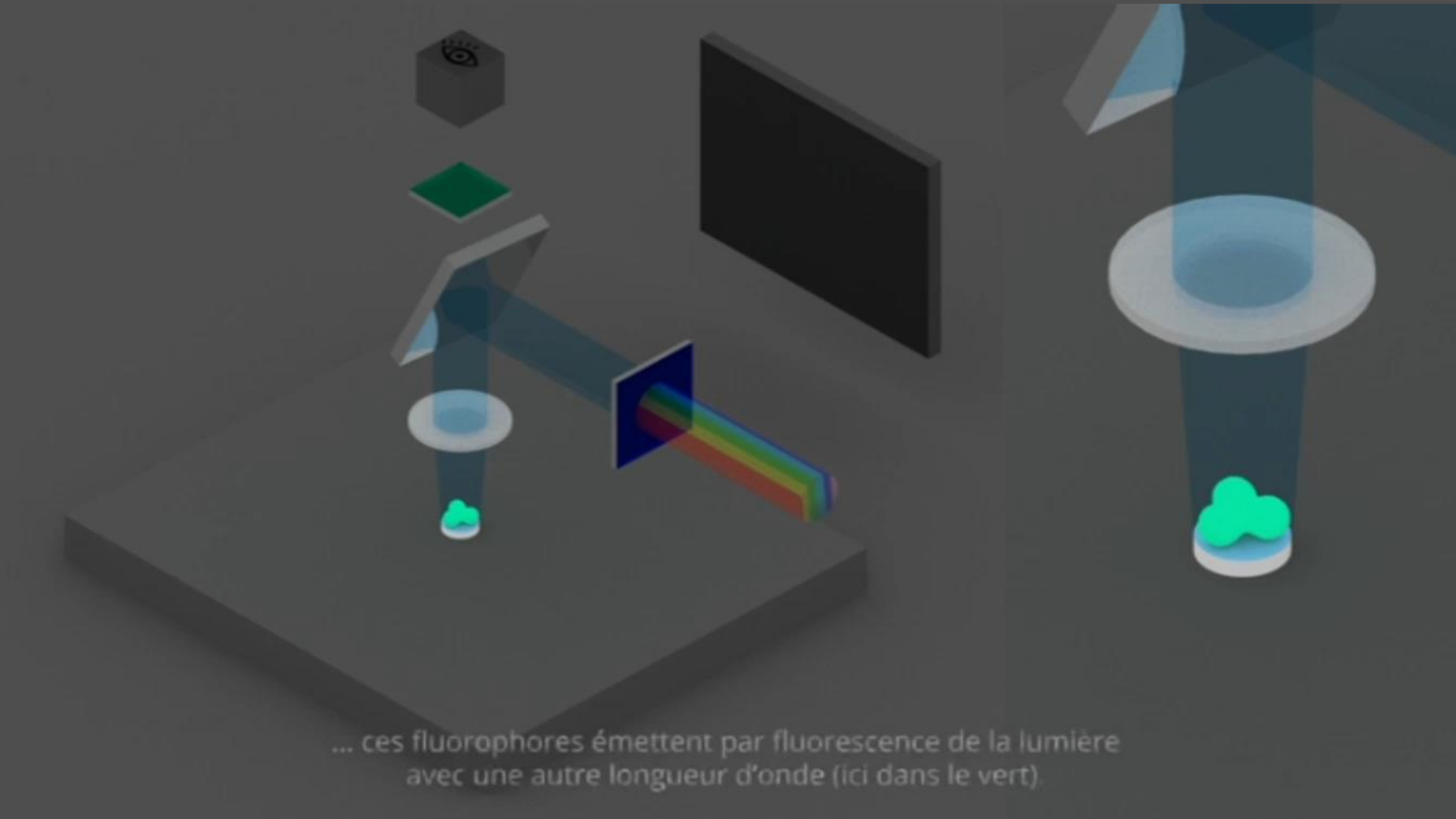
Repousser la limite de la diffraction

I. Contexte de la microscopie par fluorescence

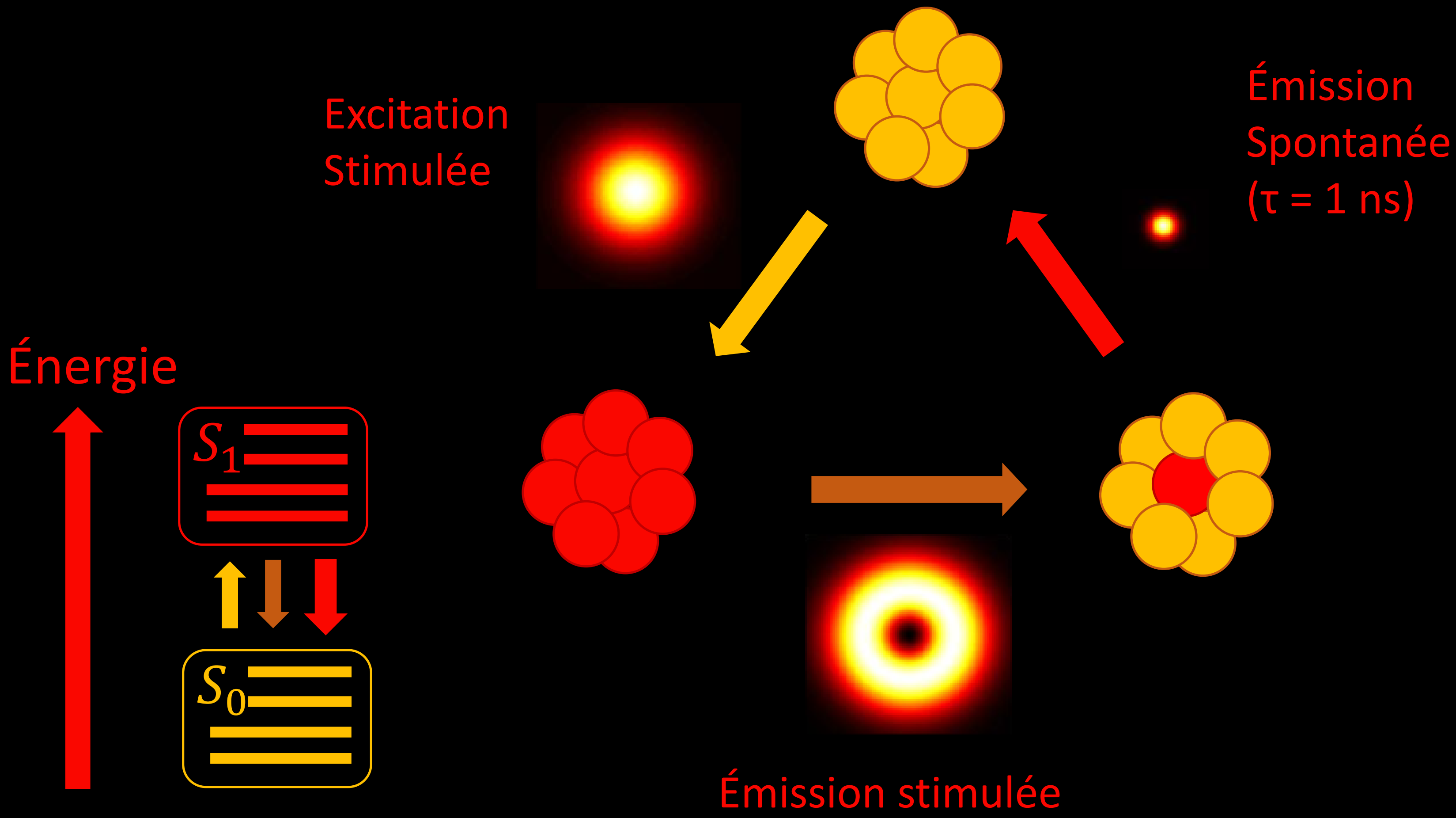
II. Différentes techniques innovantes
   1. STED
   2. GSD
   3. PALM



Contexte de la microscopie par fluorescence :



Innovations de la technique STED



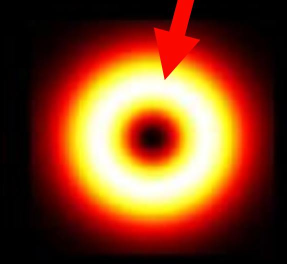
Innovations de la technique STED

Longueur
D’onde

Incertitude sur
la position

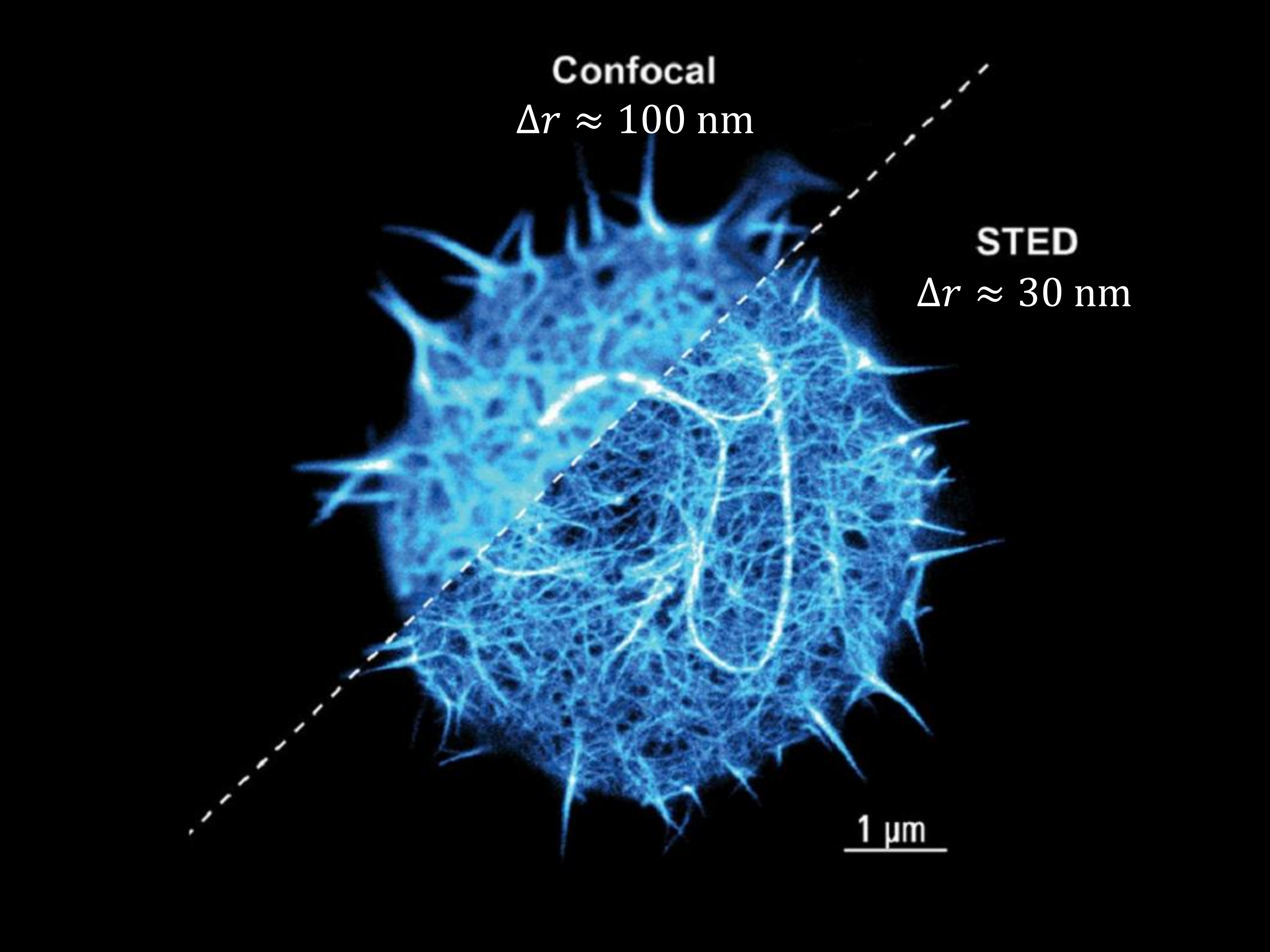
$$\boxed{\Delta r \propto \frac{\lambda}{\sqrt{1+\frac{I_{max}}{I_s}}}}$$

Intensité
maximale

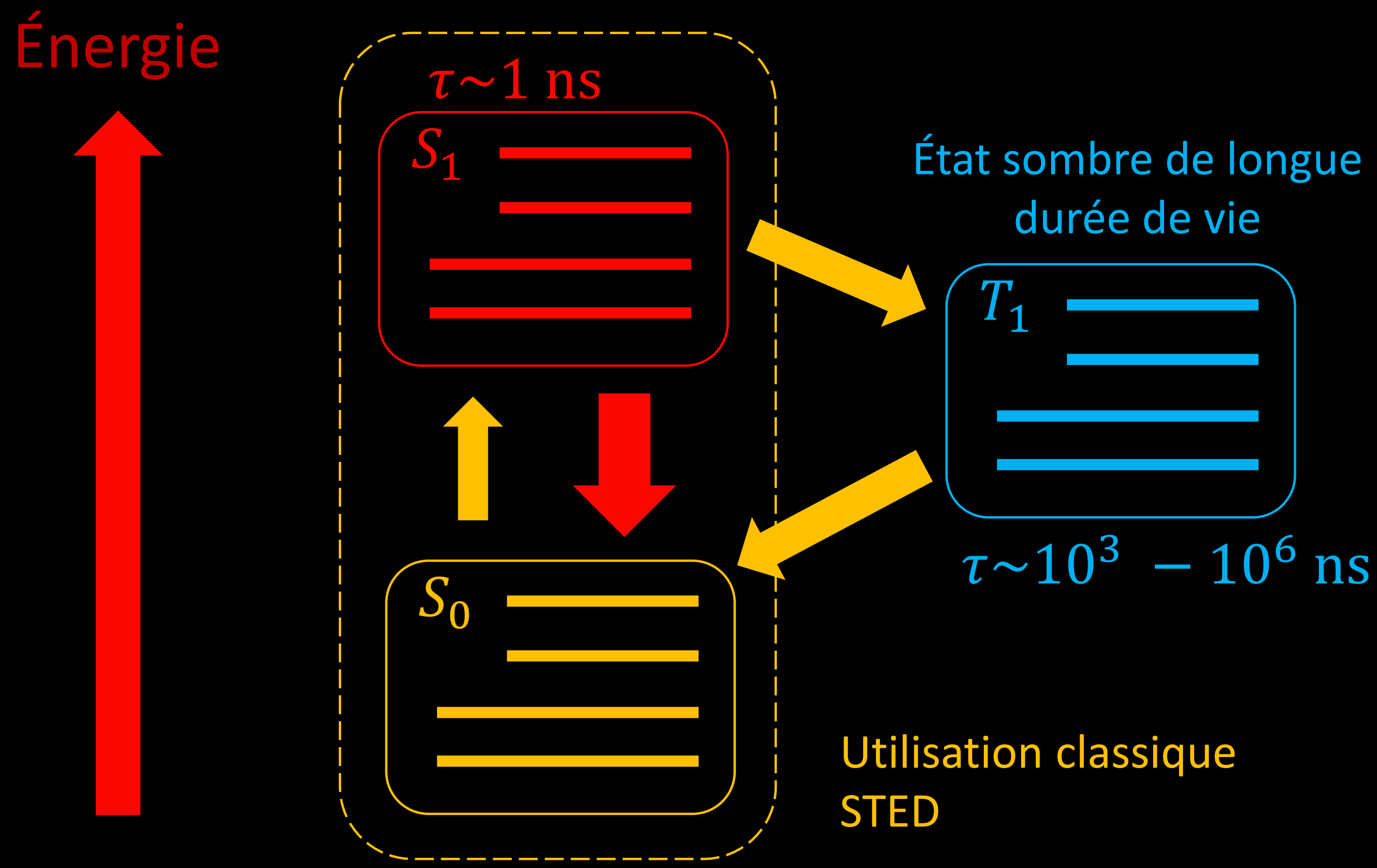


Intensité seuil

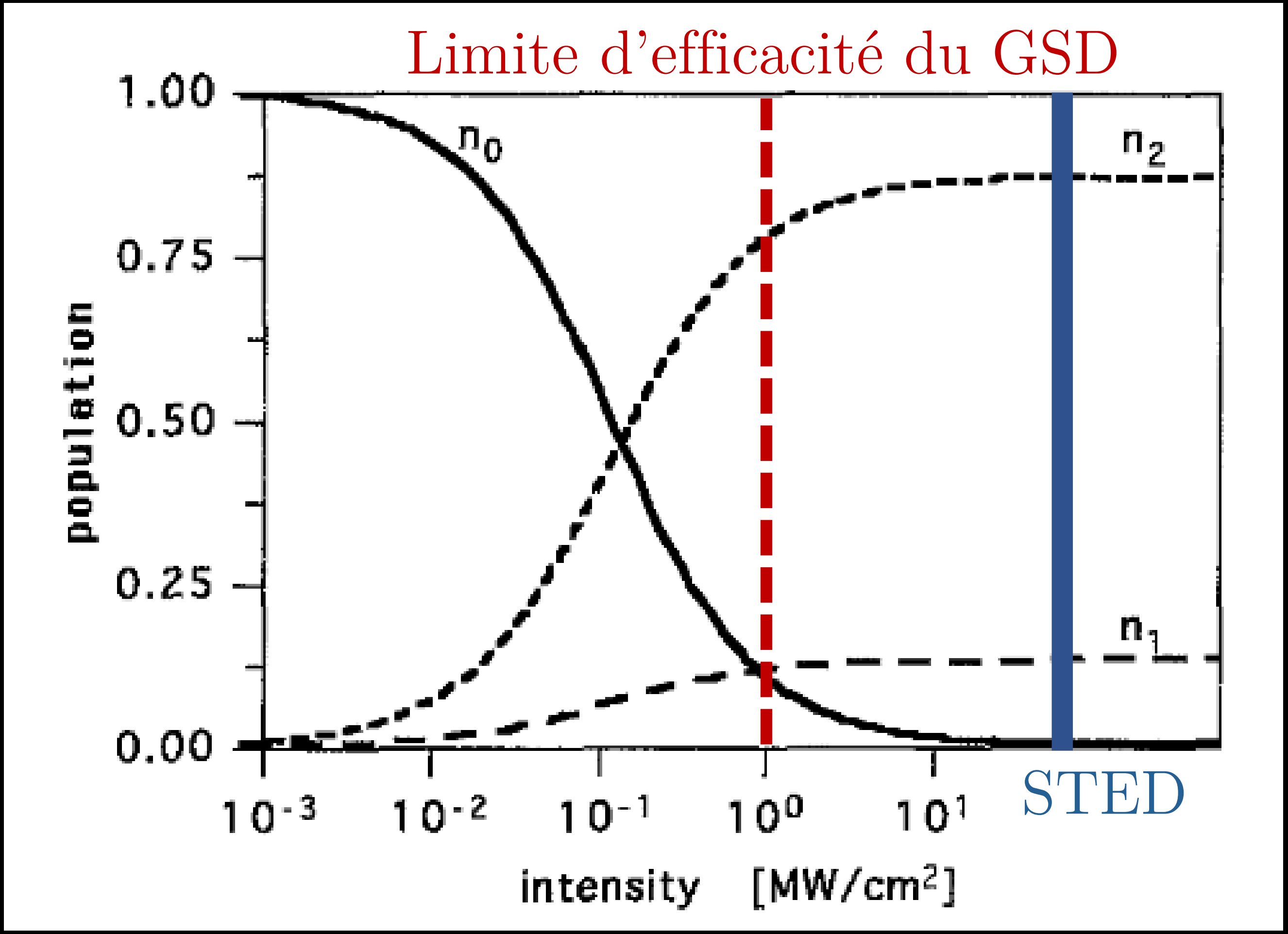
$$I_s = \frac{1}{\sigma\tau}$$


Confocal
$\Delta r \approx 100$ nm
STED
$\Delta r \approx 30$ nm
1 µm

Une variante : la microscopie GSD

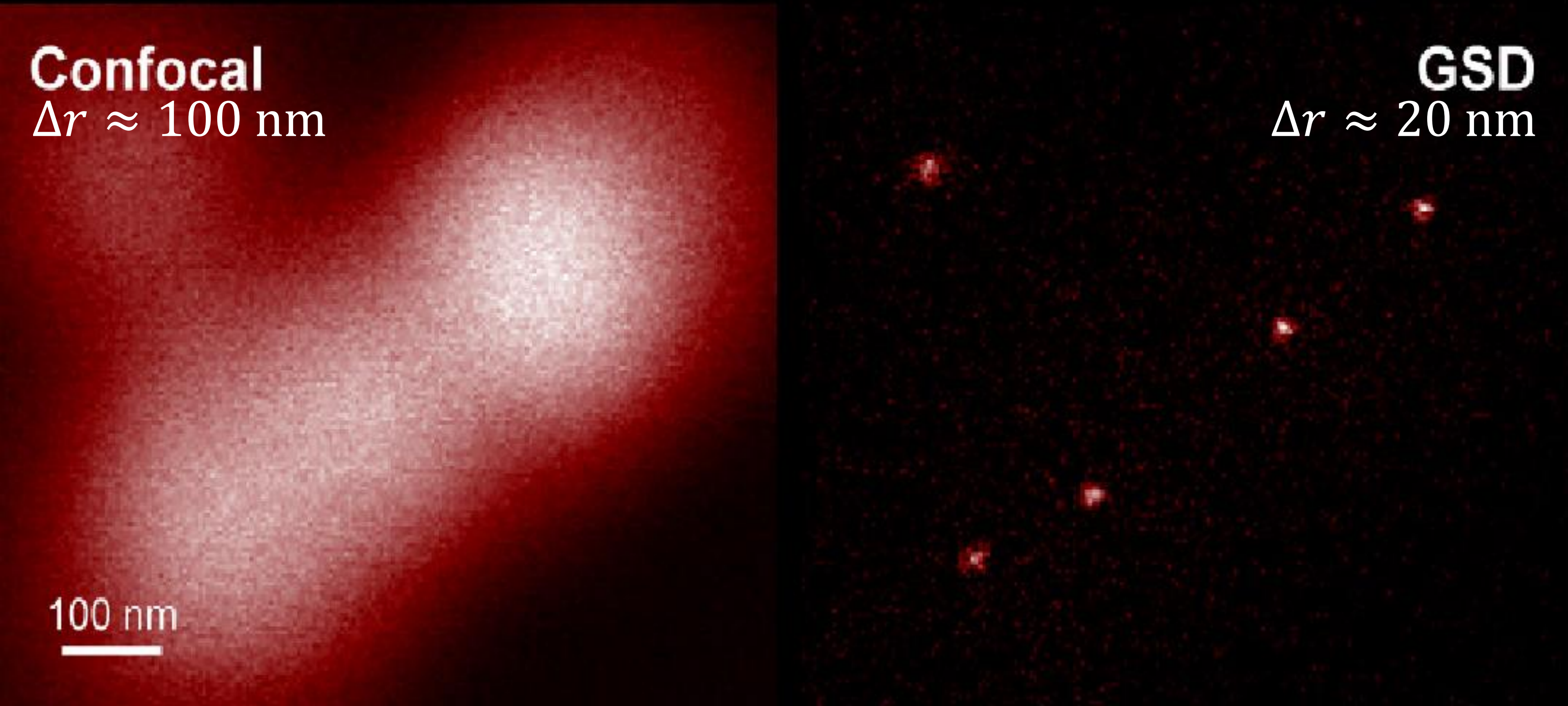


Répartition des populations dans les différents états d'énergie en fonction de l'intensité du faisceau

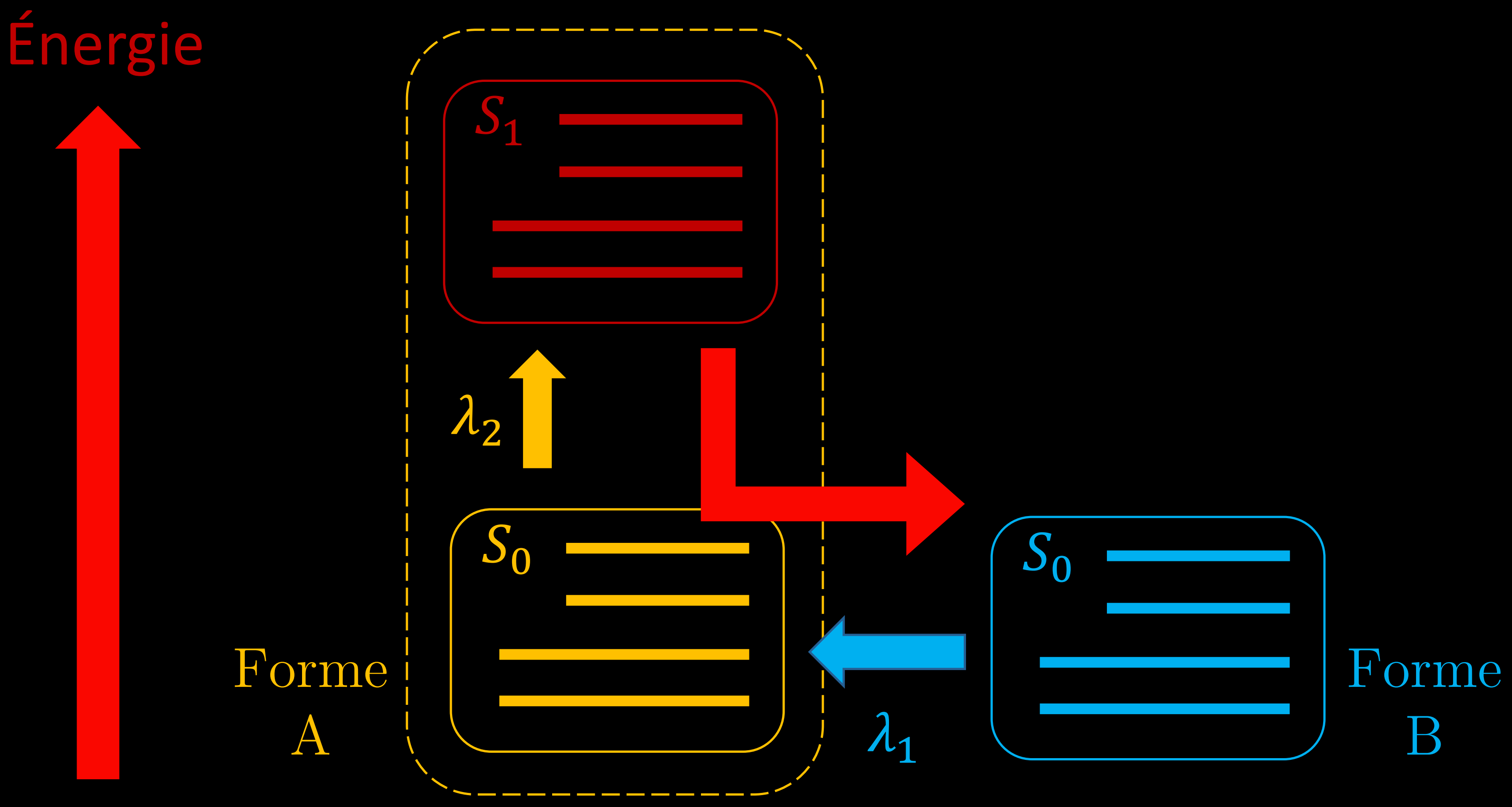


$n_{0,1,2}$: populations à l'état $S_{0,1}$ et T_1

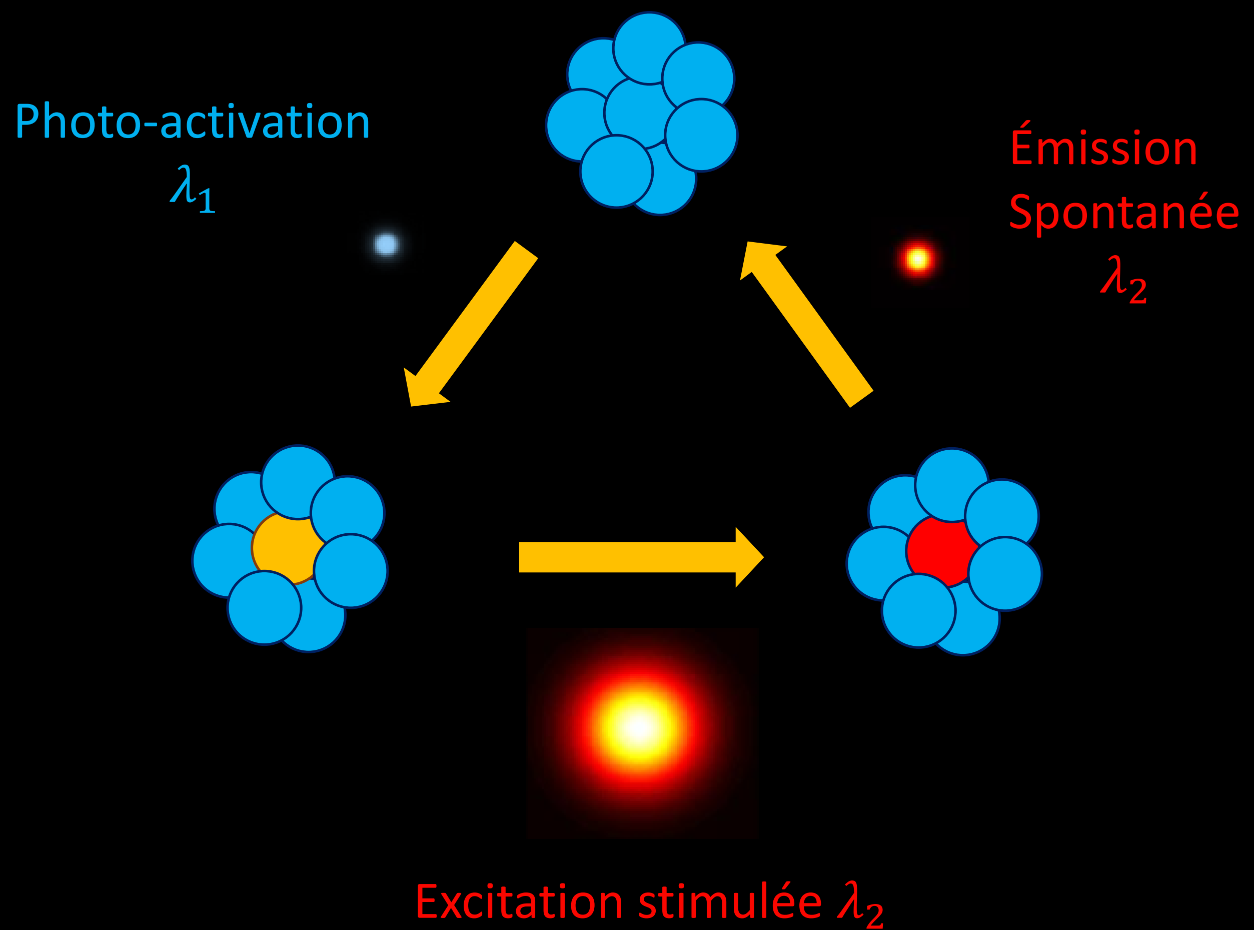
Une variante : la microscopie GSD



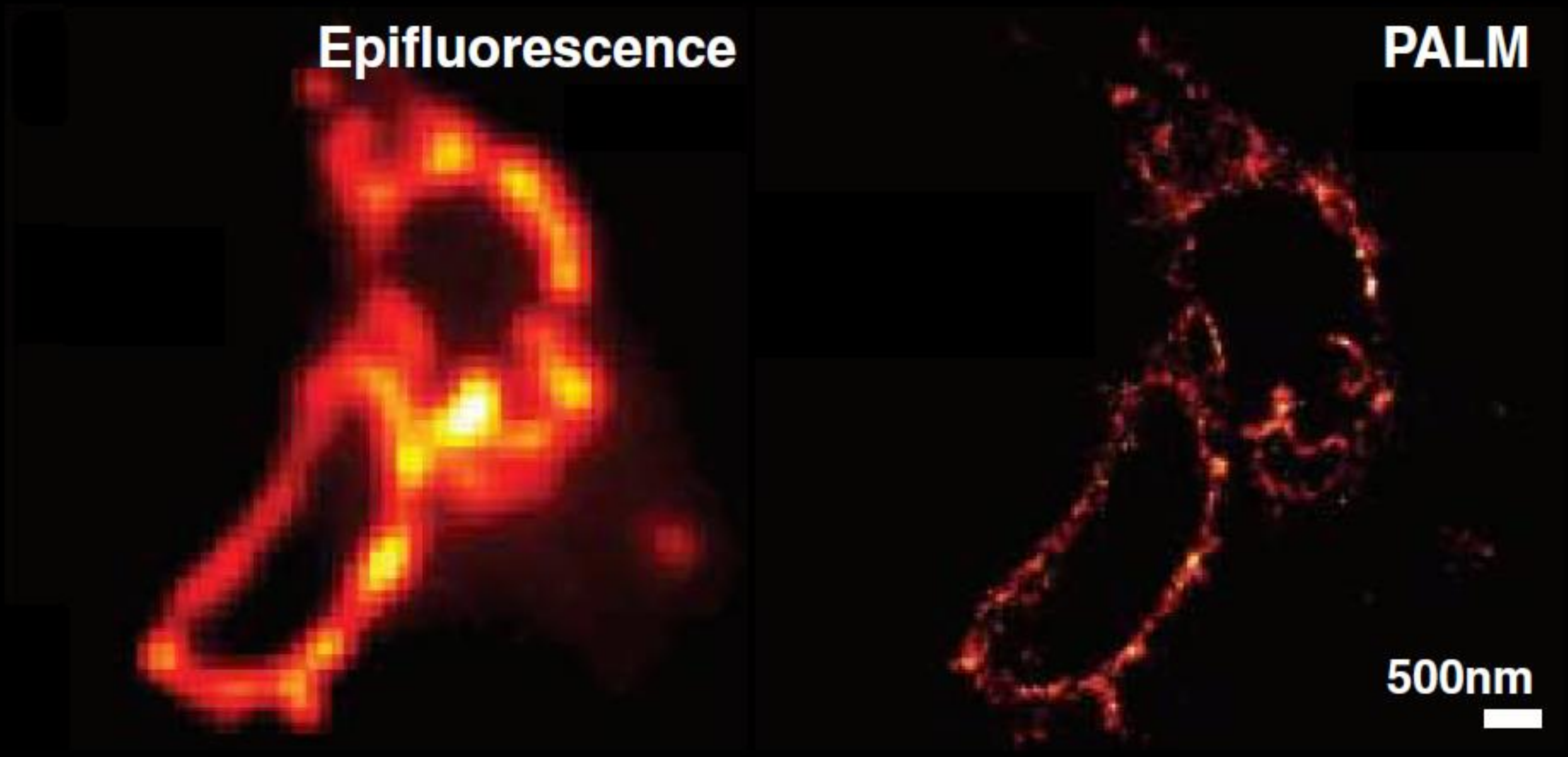
Innovations de la technique PALM



Innovations de la technique PALM



Innovations de la technique PALM



$\Delta r \approx 60$ nm $\quad\quad$ $\Delta r \approx 2$ nm

Conclusion

Diffraction

Isolement des marqueurs

STED :
Émission stimulée

GSD :
État sombre

PALM :
Conformations chimiques différentes

Sources

Far-field optical nanoscopy. S.W. Hell

Leica microsystems :

https://www.leica-microsystems.com

Ground-State-Depletion fluorescence microscopy : a concept for breaking the diffraction resolution limit.

S.W. Hell – M. Kroug

Far-field flourescence nanoscopy of diamond color centers by GSD

Eva Rittweger