





from proteins to stars

# Invisible-Light Labs

**Dr. Josiane P. Lafleur**  
**Univ.-Prof. Dr. Silvan Schmid**  
**Niklas Luhmann**

April 13, 2021

Silizium Mikro- und Nanosysteme: Perspektiven der Sensorik und Aktorik



**Dr. Josiane P. Lafleur**

Josiane has a doctoral degree in Analytical Chemistry (McGill University, Canada). Previously, she was Assistant Professor at the Department of Pharmacy at the University of Copenhagen (Denmark).

Specialty: Instrumentation for bioanalytical and environmental applications.



**Univ.-Prof. Dr. Silvan Schmid**

Silvan has a doctoral degree in Nanomechanics (ETH Zurich). He is now professor at TU Wien and head of the Research Unit of Micro- and Nanosensors at the Institute of Sensors and Actuator Systems.

Specialty: Nanoelectromechanical systems (NEMS)



**Niklas Luhmann, MSc.**

Niklas has a Master degree in Physics from the University of Konstanz (Germany) during which he worked on the very first detector prototypes. He is now pursuing his PhD on the development of the NEMILIE.

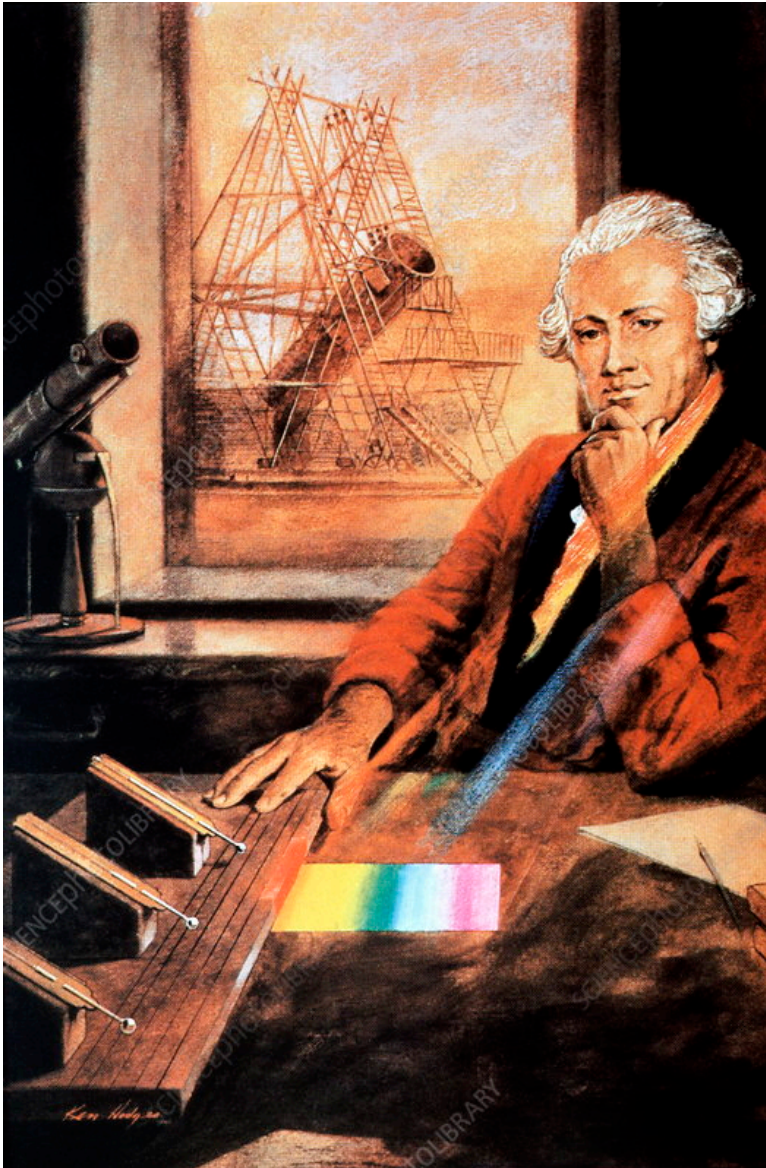
Specialty: Nanoelectromechanical systems (NEMS)



“ It is very possible that there are in nature other colors than those that we know in our world”

Émilie du Châtelet

Dissertation sur la nature et la propagation du feu, 1737

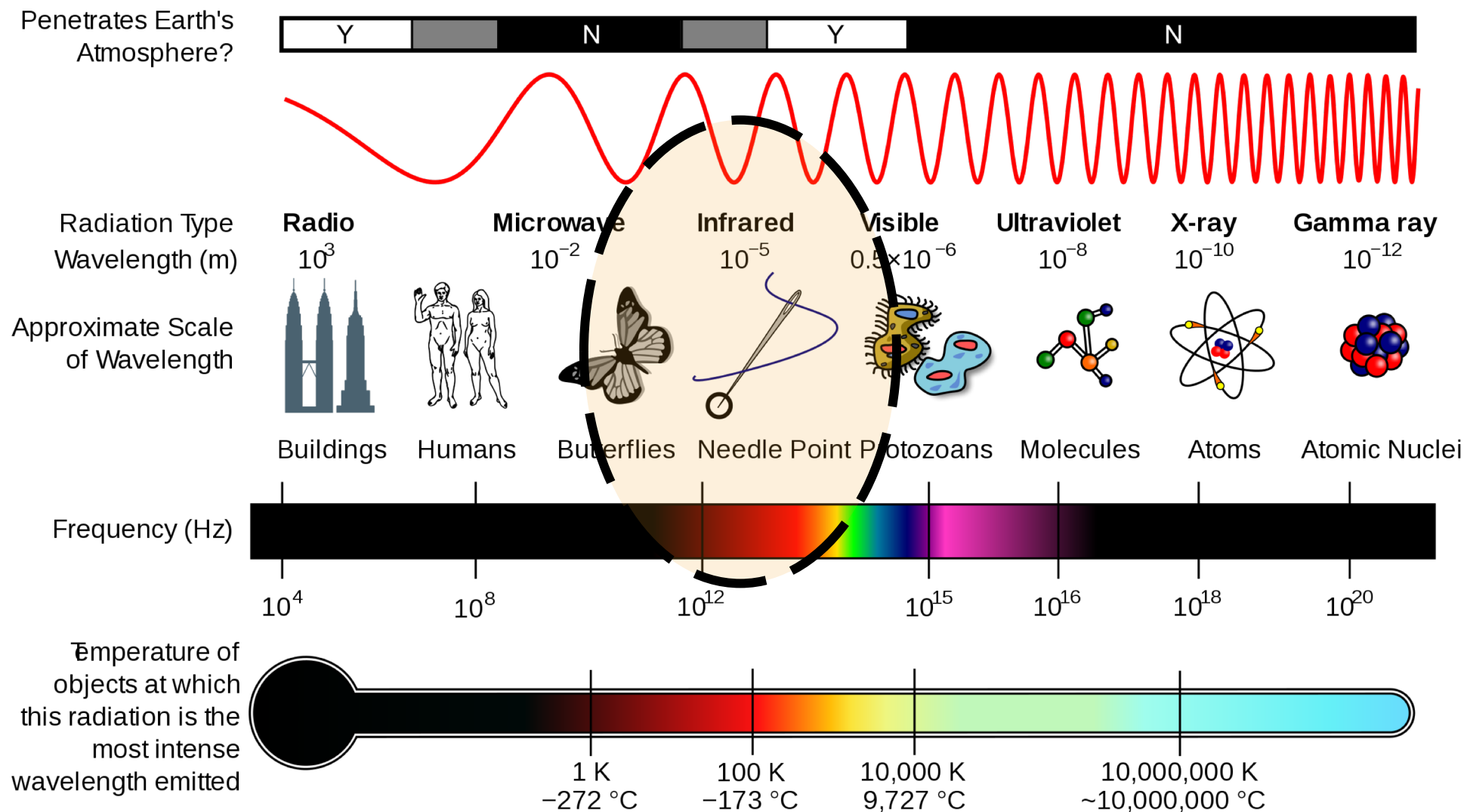


“ It being now evident that there was a refraction of rays coming from the sun, which, though not fit for vision, were yet highly invested with a power of occasioning heat”

## Sir William Herschel

Experiments on the Refrangibility of the Invisible Rays of the Sun.

*Philosophical Transactions of the Royal Society of London*  
Vol. 90 (1800), pp. 284-292



## Chemicals

307M, 6.8% CAGR



- Process control
- Quality control
- Automotive paints
- Polymers

## Pharmaceuticals

365M, 6.8% CAGR



- Drugs discovery
- Quality control
- Morphological analysis
- Characterization

## Food & Agriculture

186M, 6.3% CAGR



- Air quality
- Water quality
- Food spoilage
- Food fraud & contamination

## Environmental

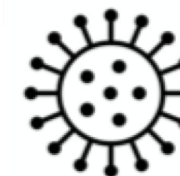
158M, 5.9% CAGR



- Breath analysis
- Pollution monitoring
- Workplace hazard monitoring
- Explosive detection
- Bio/chemical agent detection

## Biological

137M, 7.3% CAGR



- Virus identification
- Bacteria typing
- In vivo imaging

**SPiegel** Wissenschaft

Umweltverschmutzung

## Selbst in Sibirien schneit es Mikroplastik

Der Nordosten Russlands zählt zu den am dünnsten besiedelten Regionen der Erde. Und doch finden Forscher auch hier mikroskopische Plastikteilchen im Schnee. Die Partikel reisen Tausende Kilometer durch die Luft.

22.03.2021, 21.06 Uhr



S

**SPiegel** Wissenschaft

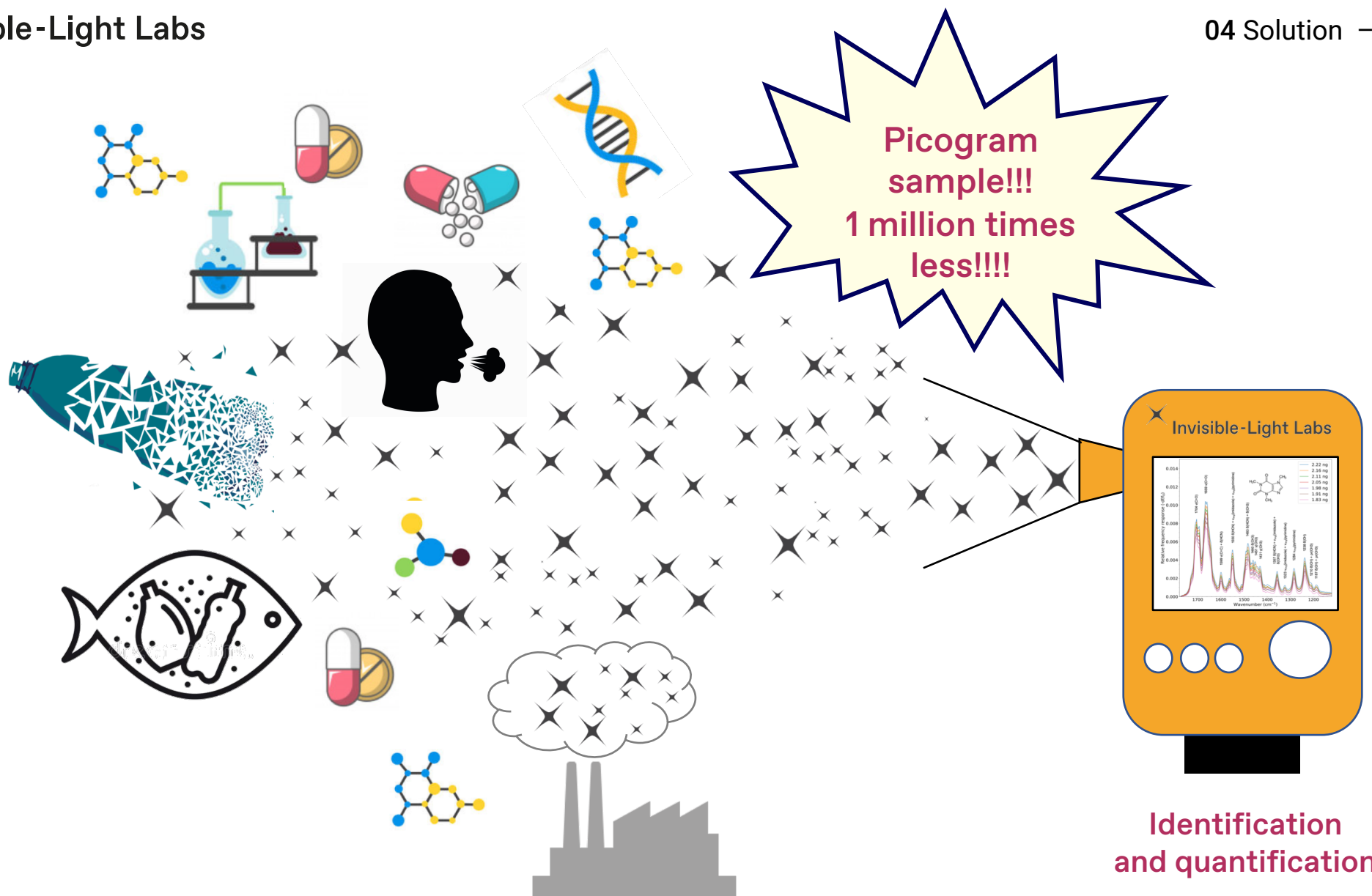
Chemie in der Landwirtschaft

## Pestizide bedrohen die Tierwelt

Pestizide schädigen Bienen, Schmetterlinge und andere nützliche Insekten - und zwar stärker als angenommen. Eine Forschergruppe hat Hunderte Studien zum Einsatz von Schädlingsmitteln analysiert. Die Ergebnisse sind dramatisch.

24.06.2014, 14.10 Uhr



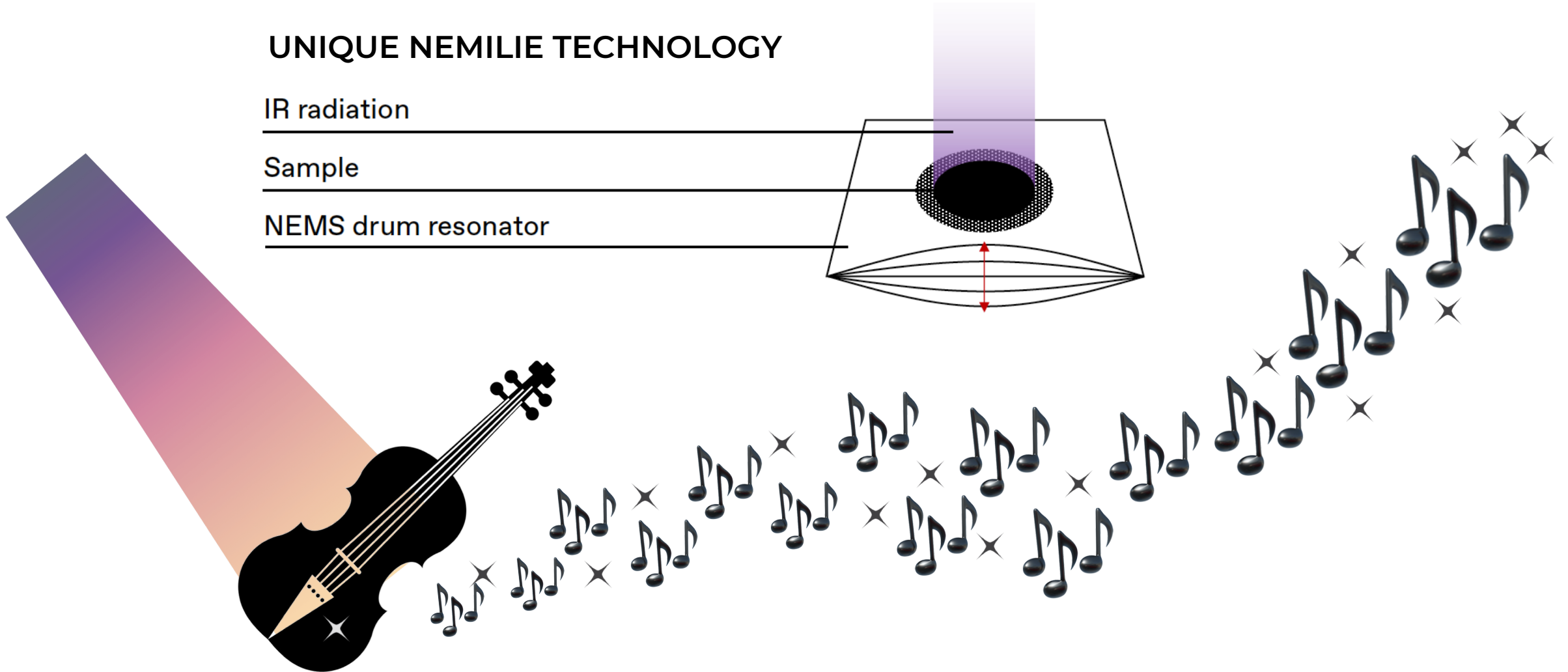


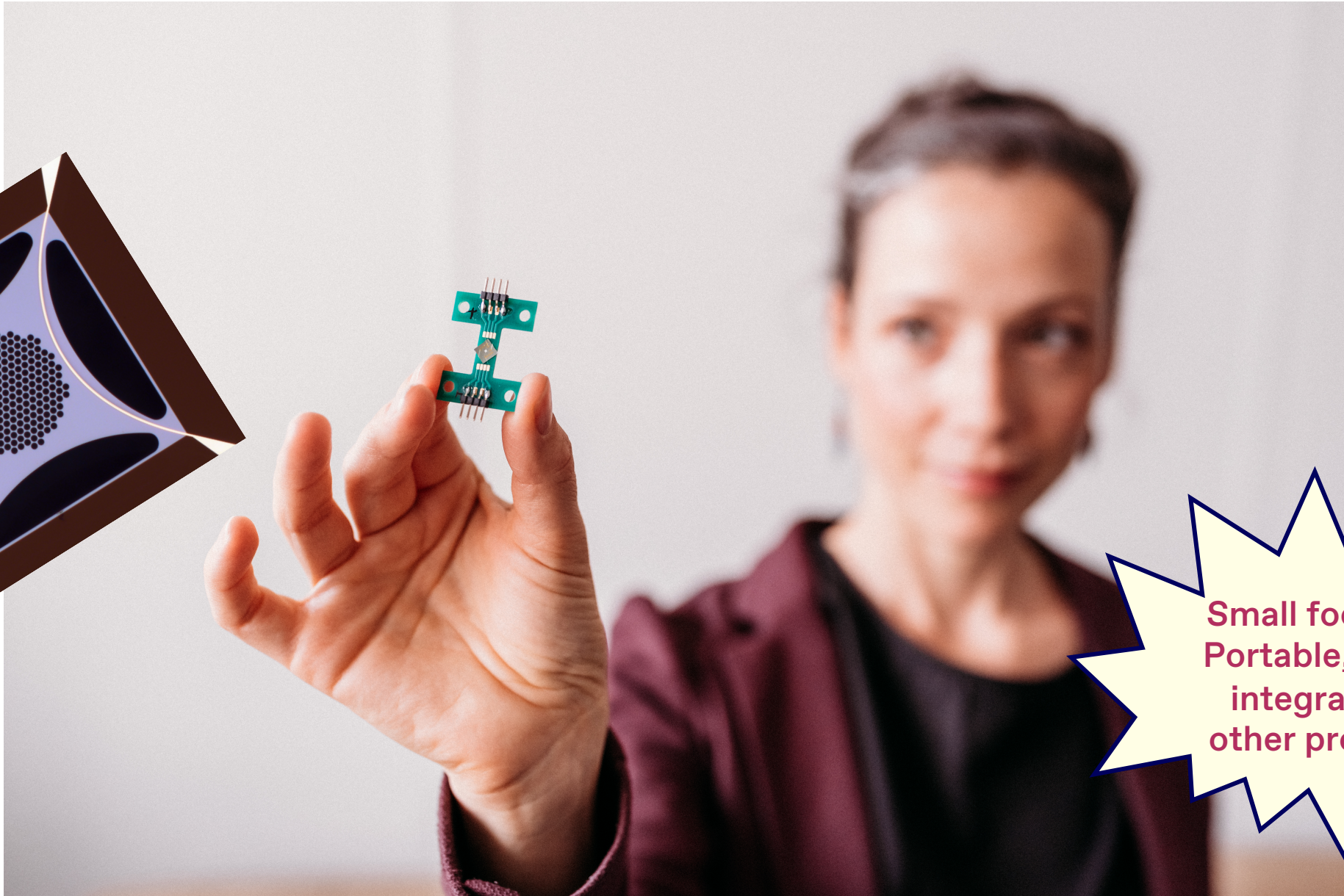
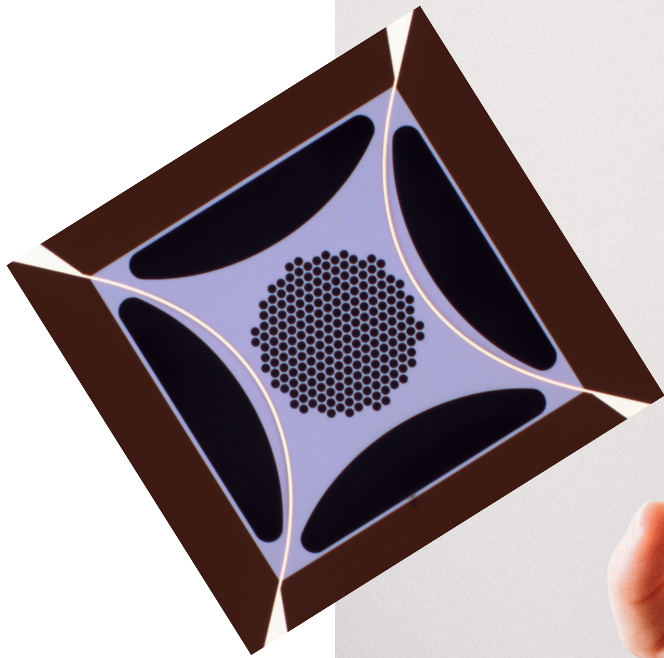
## UNIQUE NEMILIE TECHNOLOGY

IR radiation

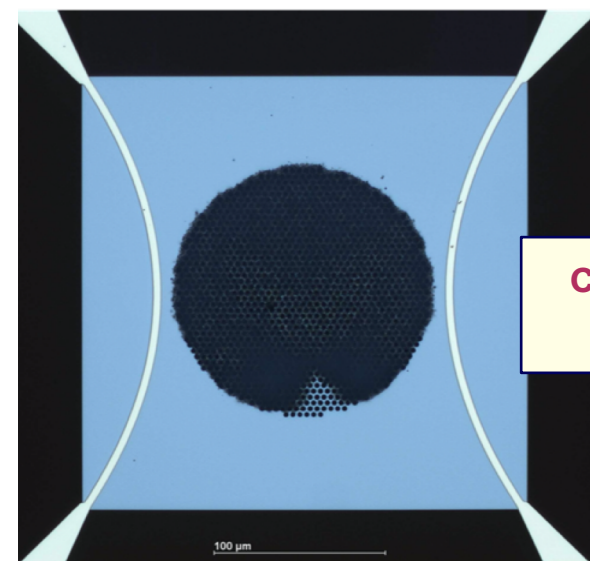
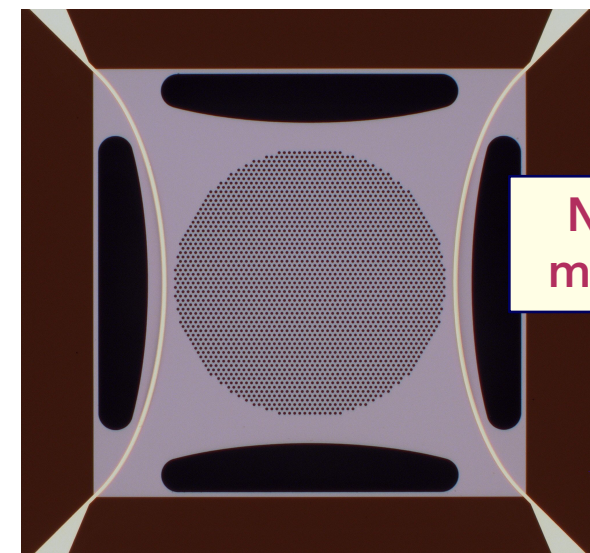
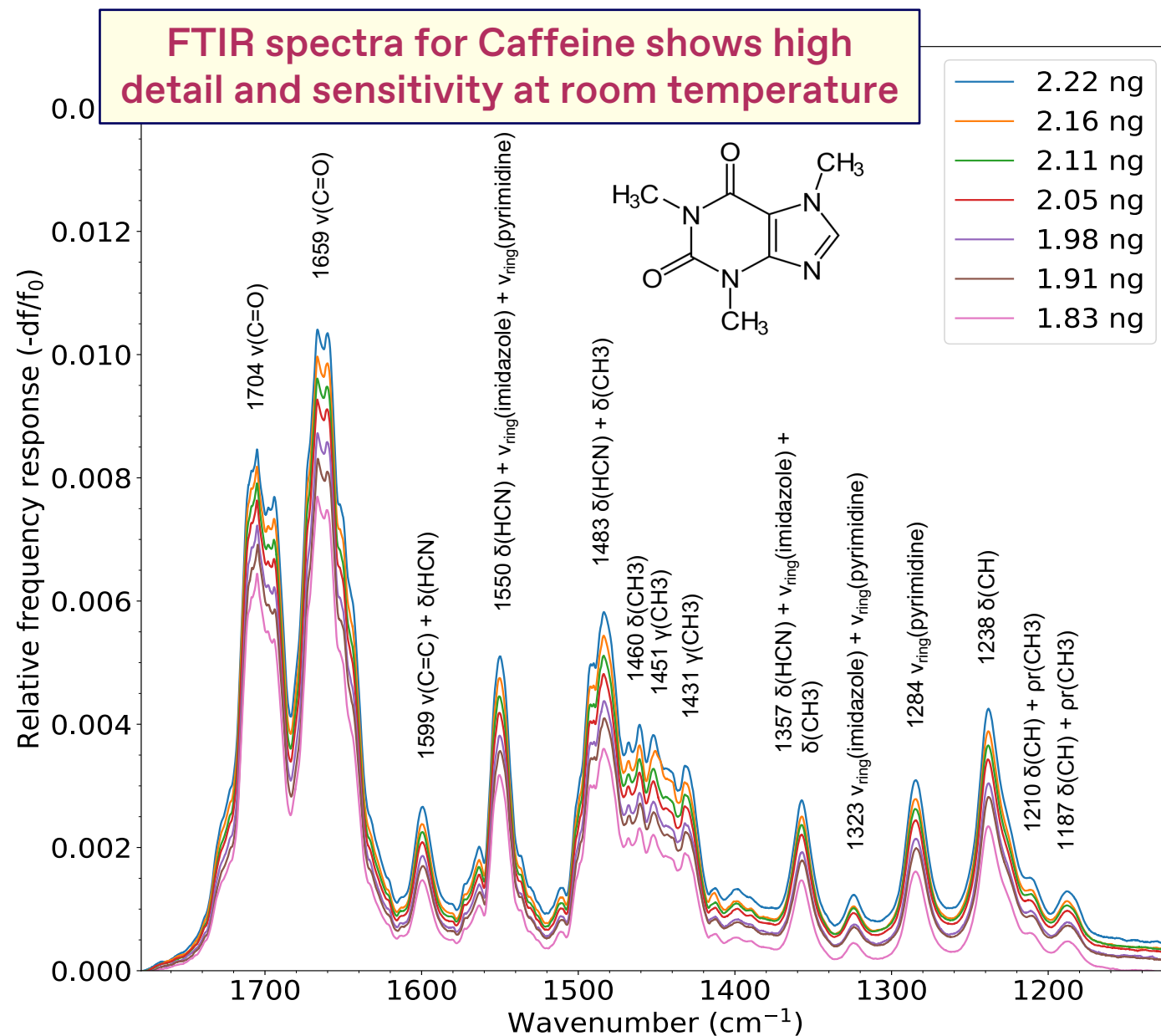
Sample

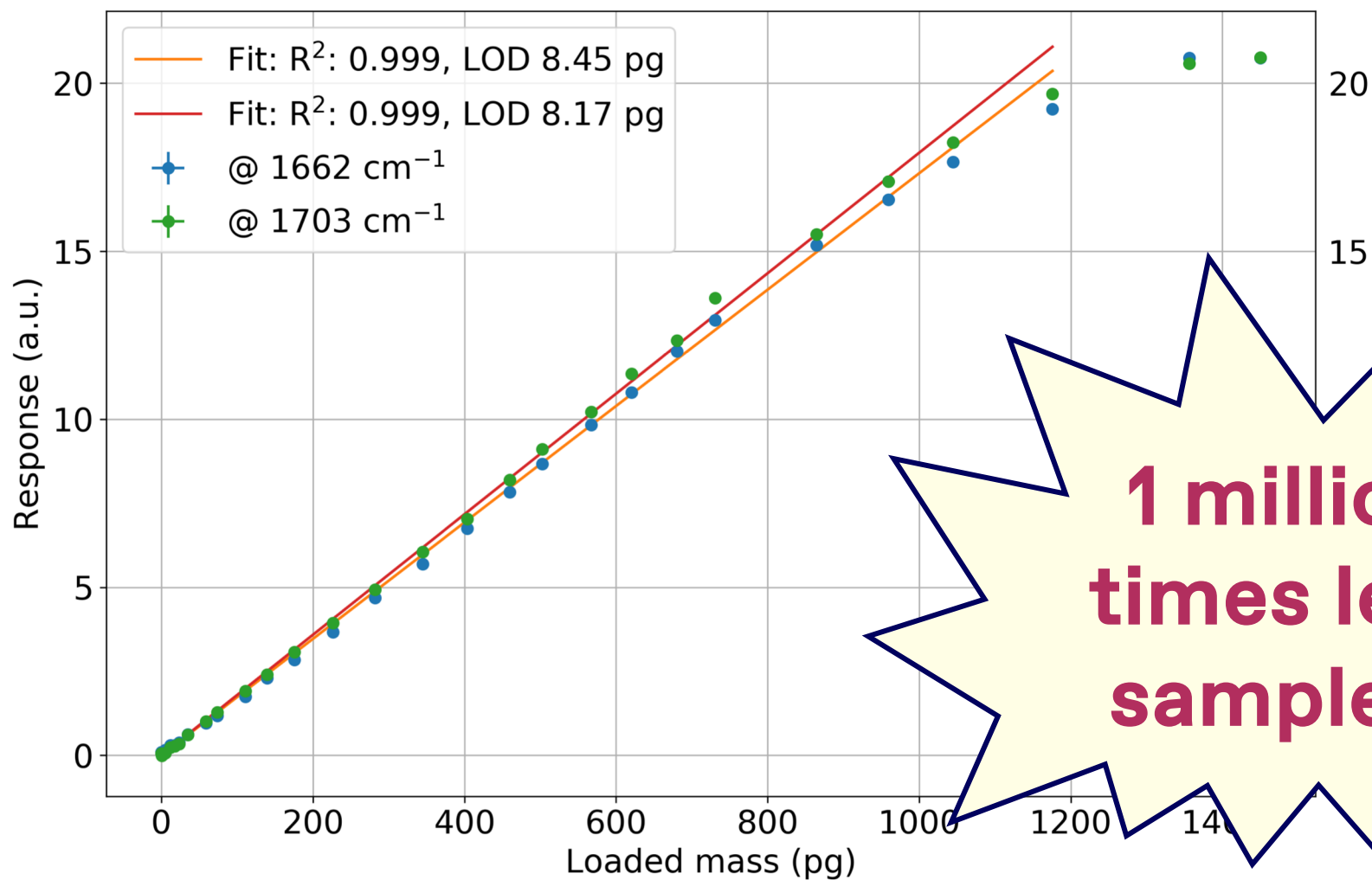
NEMS drum resonator





Small footprint.  
Portable, can be  
integrated in  
other products.





**1 million  
times less  
sample!!!**

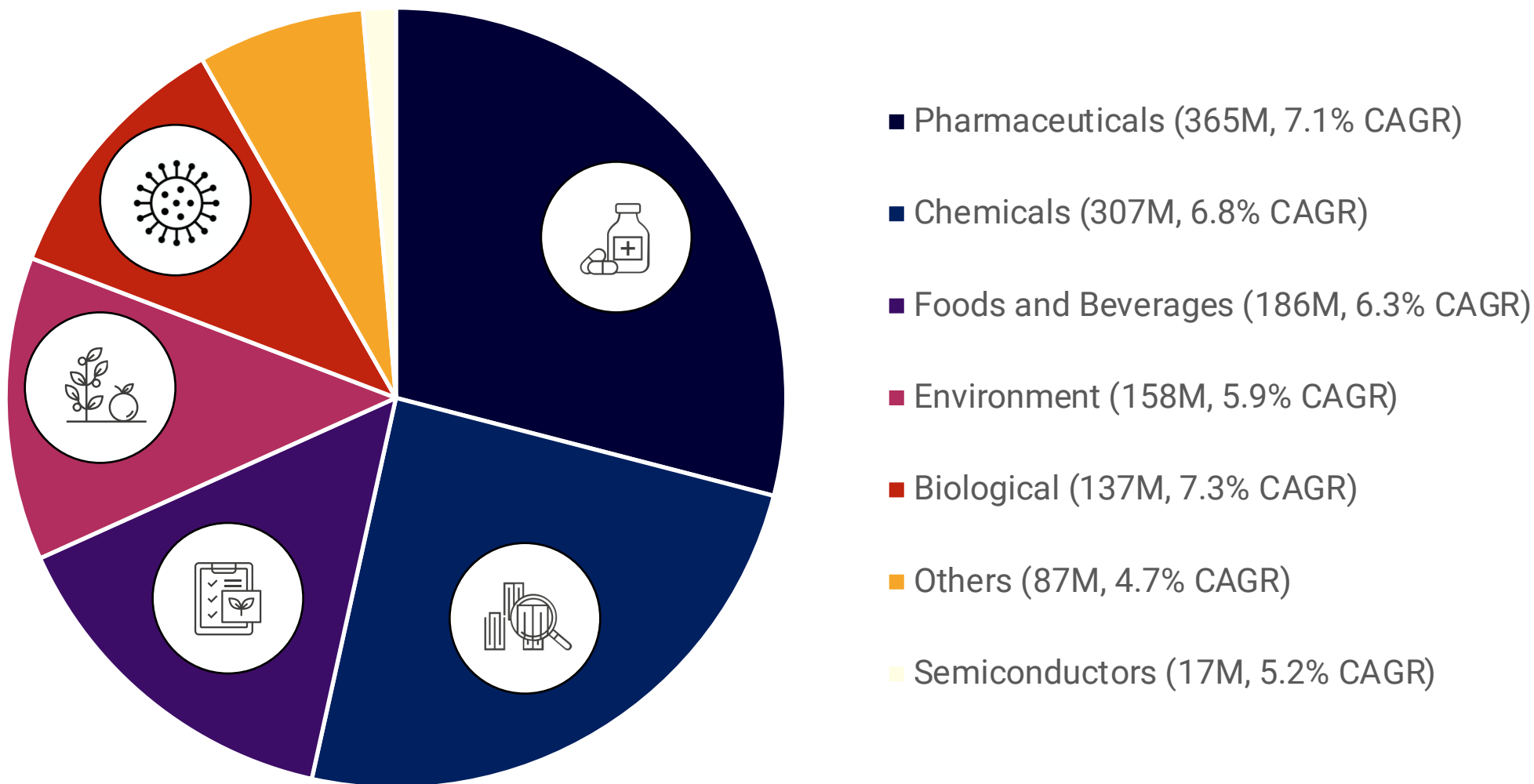
## *“A Rebirth of IR Spectroscopy?”*

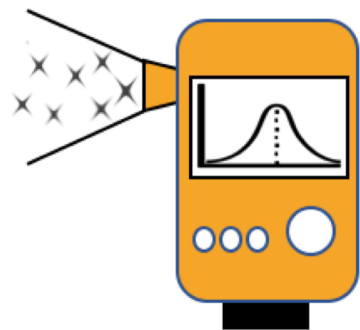
“To put it mildly, you are not going to get that kind of sensitivity with any classic IR technique, and this would seem to open the door to putting such sensors in all sorts of apparatus.”

*–Derek Lowe, In The Pipeline Blog*

**Science Translational Medicine**

## IR market overview by sector (M USD)





### NEMILIE

Range: UV to FIR

Sensitivity: ca.  $\mu\text{g}$  sample

Applications: Direct sampling of particulate matter (aerosols) from air and liquids



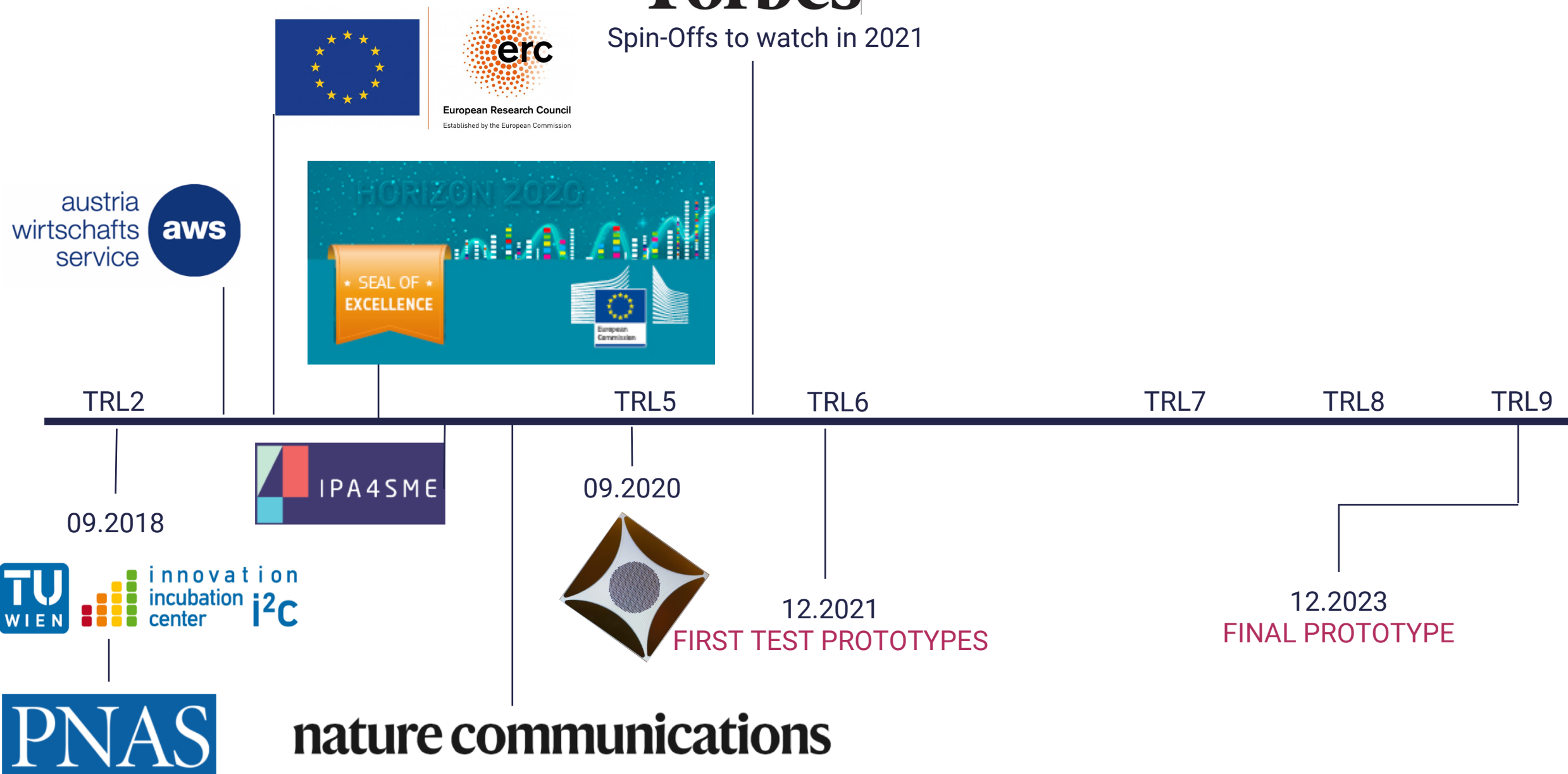
### NEMILIE LIGHT

Range: MIR to FIR

Sensitivity: 2  $\mu\text{W}/\text{Hz}^{1/2}$

Applications: Multi-purpose detector, non-contact, medical and security imaging (THz)

## Spin-Offs to watch in 2021





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