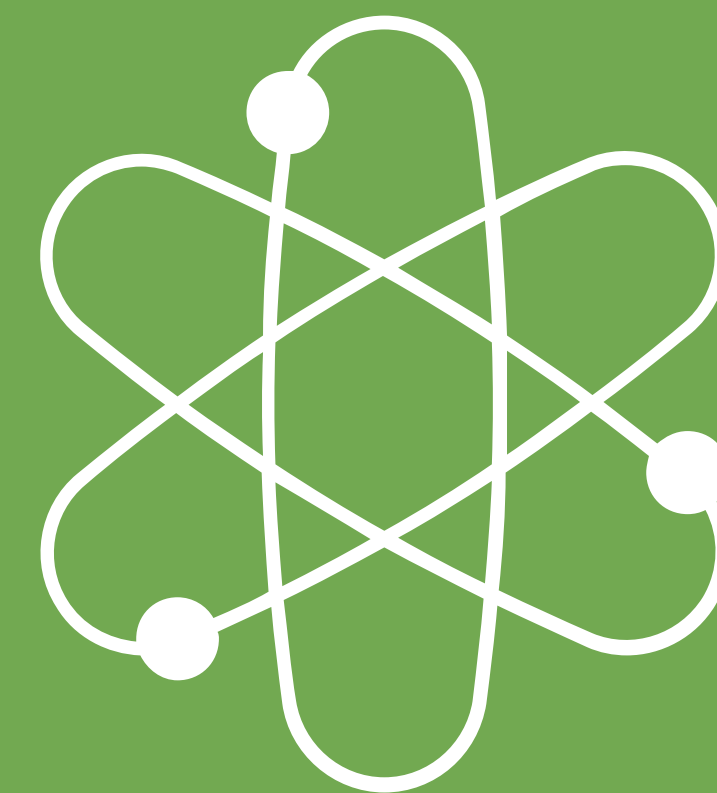


THE
NOBEL
PRIZE

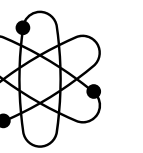
PHYSICS PRIZE 2023

•

Electrons in pulses of light



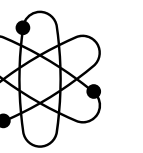
Nobel Prize lessons



The Nobel Prize in Physics

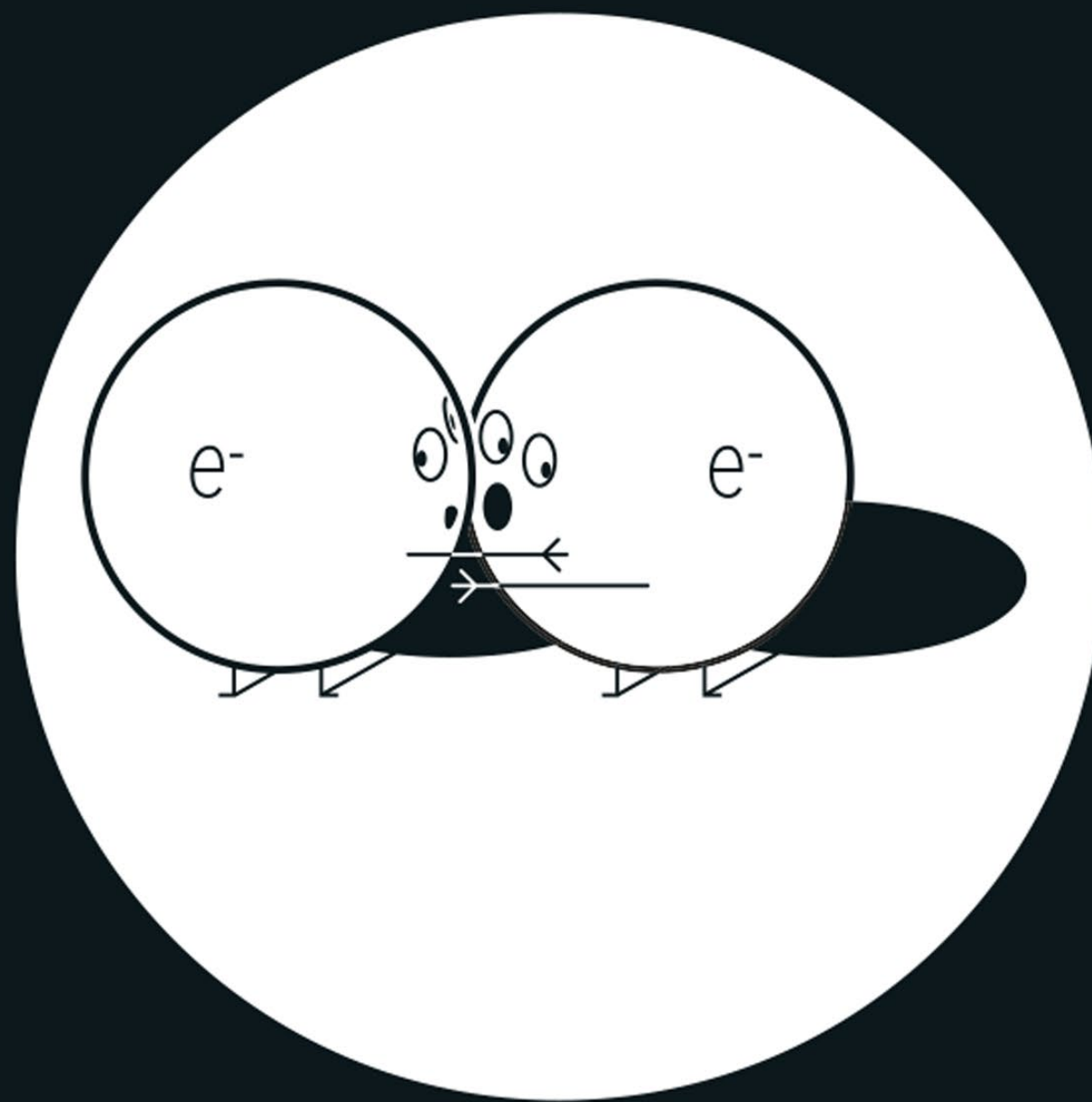
“to the person who made the most important discovery or invention in the field of physics”





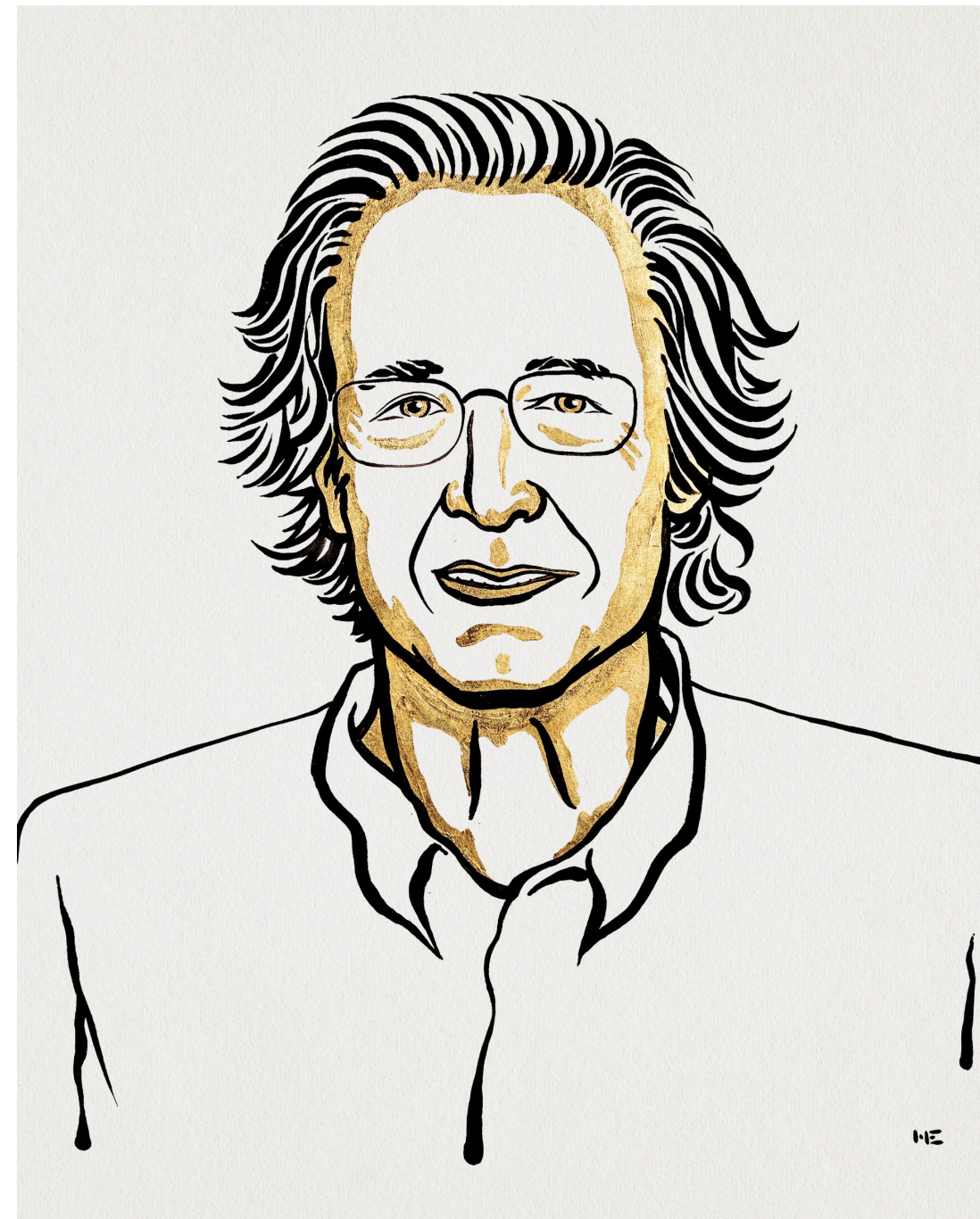
Physics prize 2023

The 2023 physics prize recognises experiments with short pulses of light that can capture momentary images of the movements of electrons.



2023 physics laureates

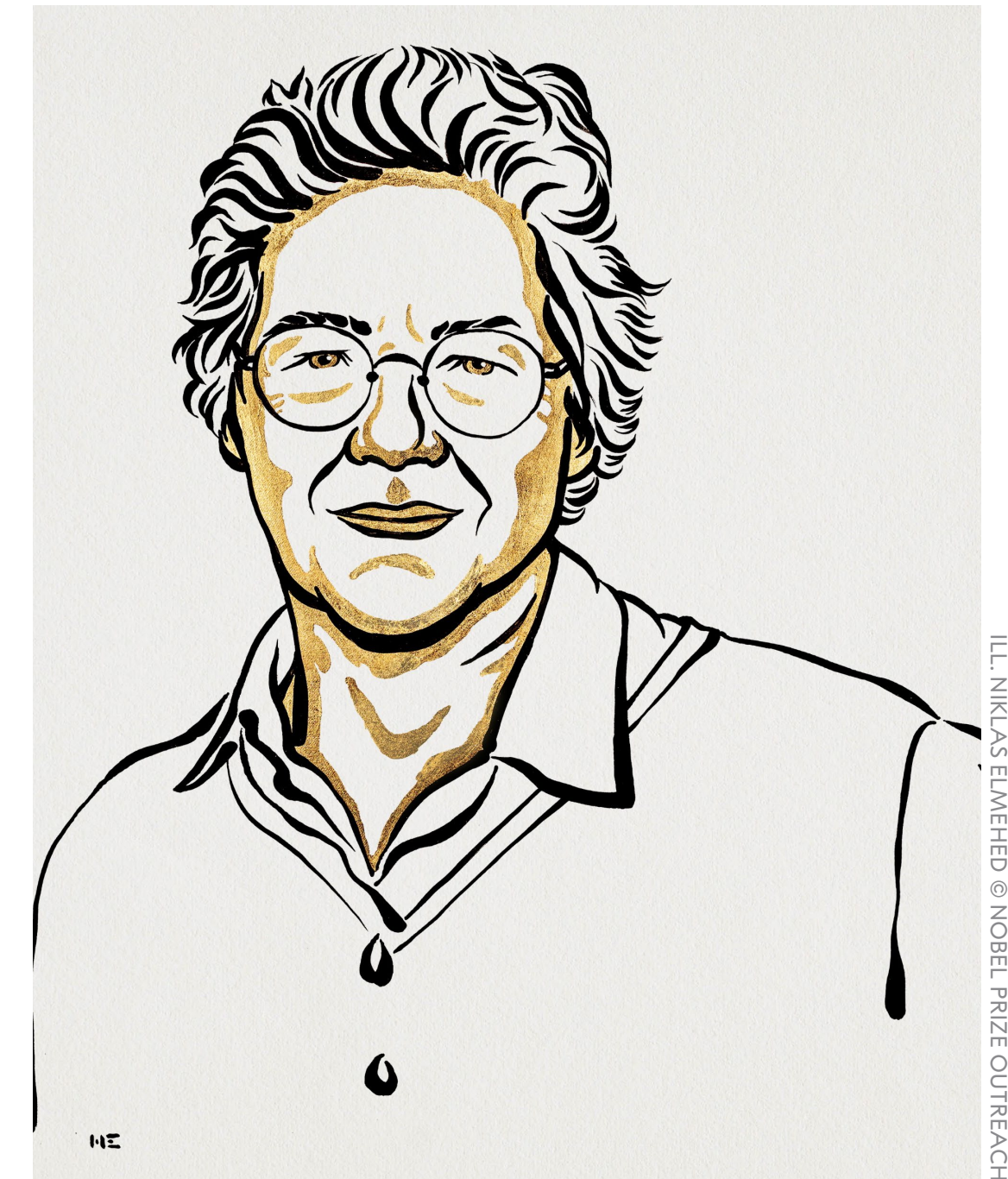
"for experimental methods that generate attosecond pulses of light for the study of electron dynamics in matter"



Pierre Agostini
Born: 1941, French
protectorate of Tunisia
(now Tunisia)



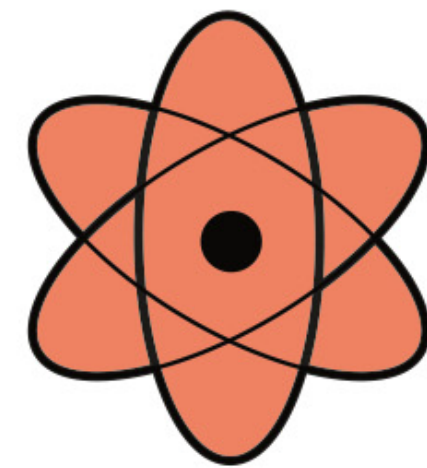
Ferenc Krausz
Born: 1962, Hungary



Anne L'Huillier
Född: 1958, Frankrike

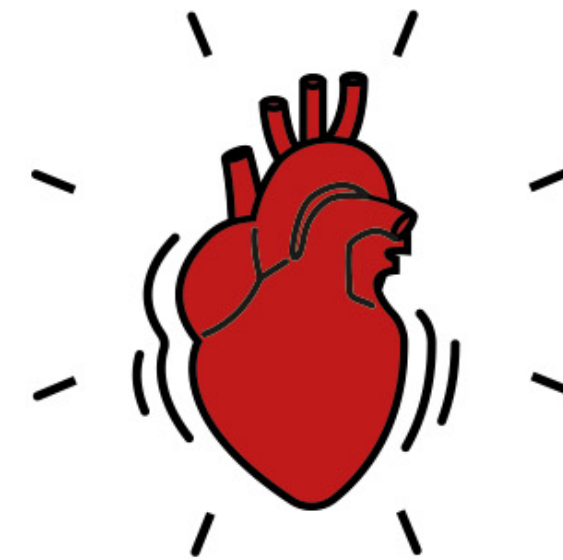
Time scales

How fast do the electrons in an atom move?



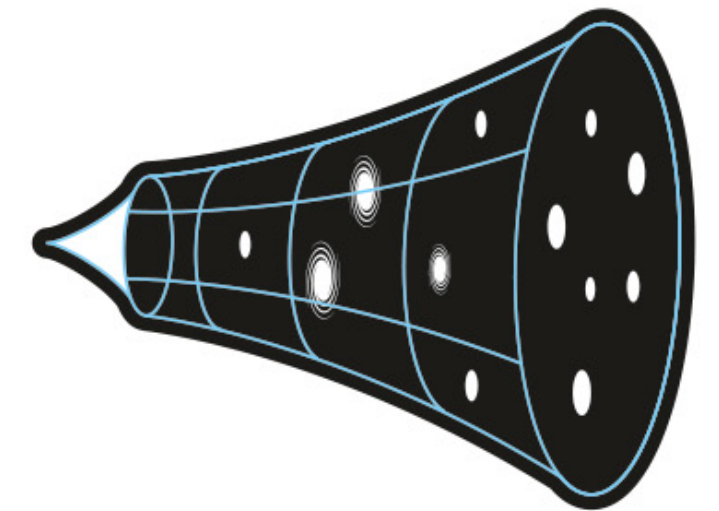
ATTOSECOND

1/1,000,000,000,000,000,000
SECOND



HEARTBEAT

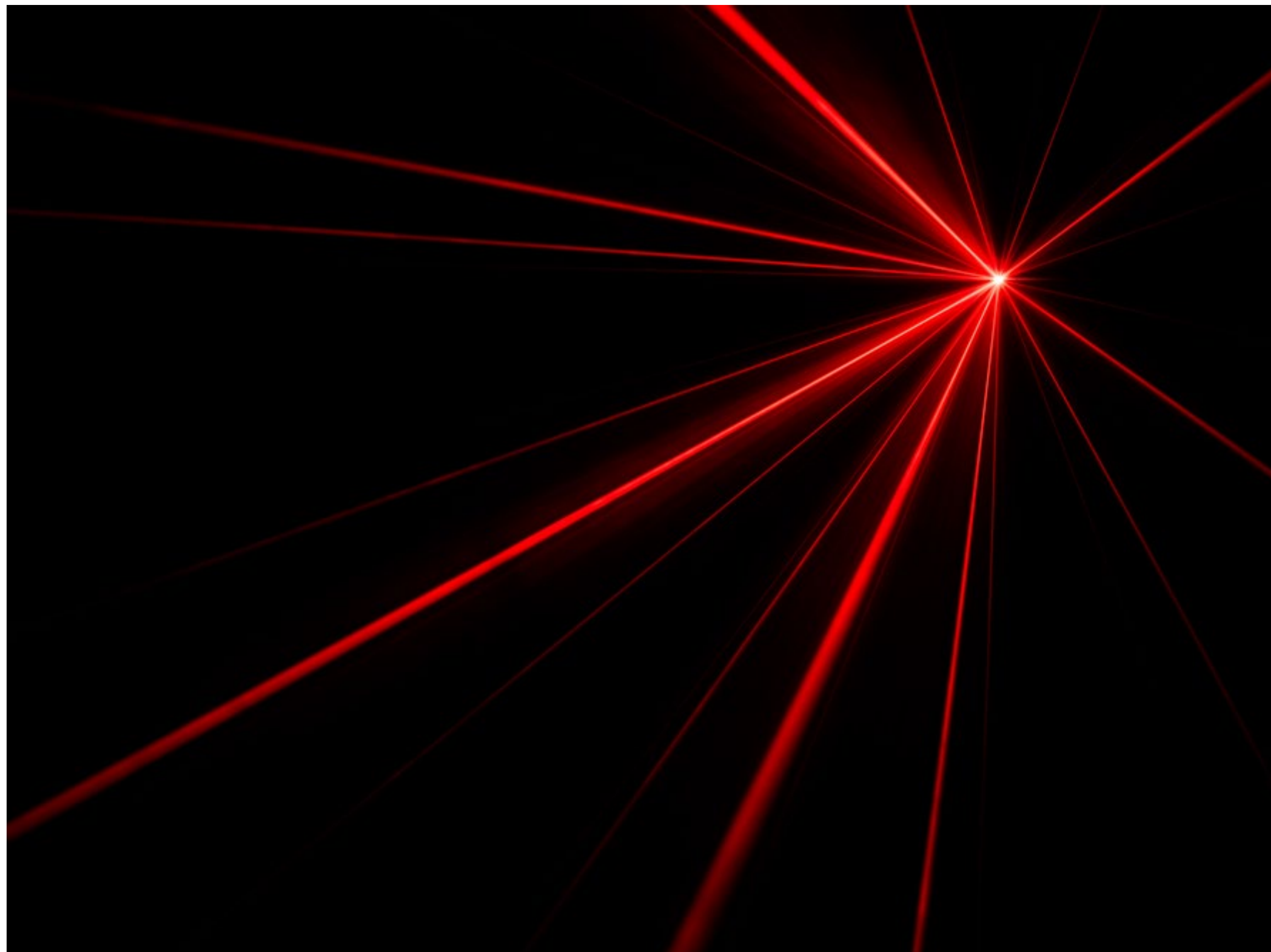
1 SECOND



AGE OF THE UNIVERSE

1,000,000,000,000,000,000
SECONDS

Laser pulses

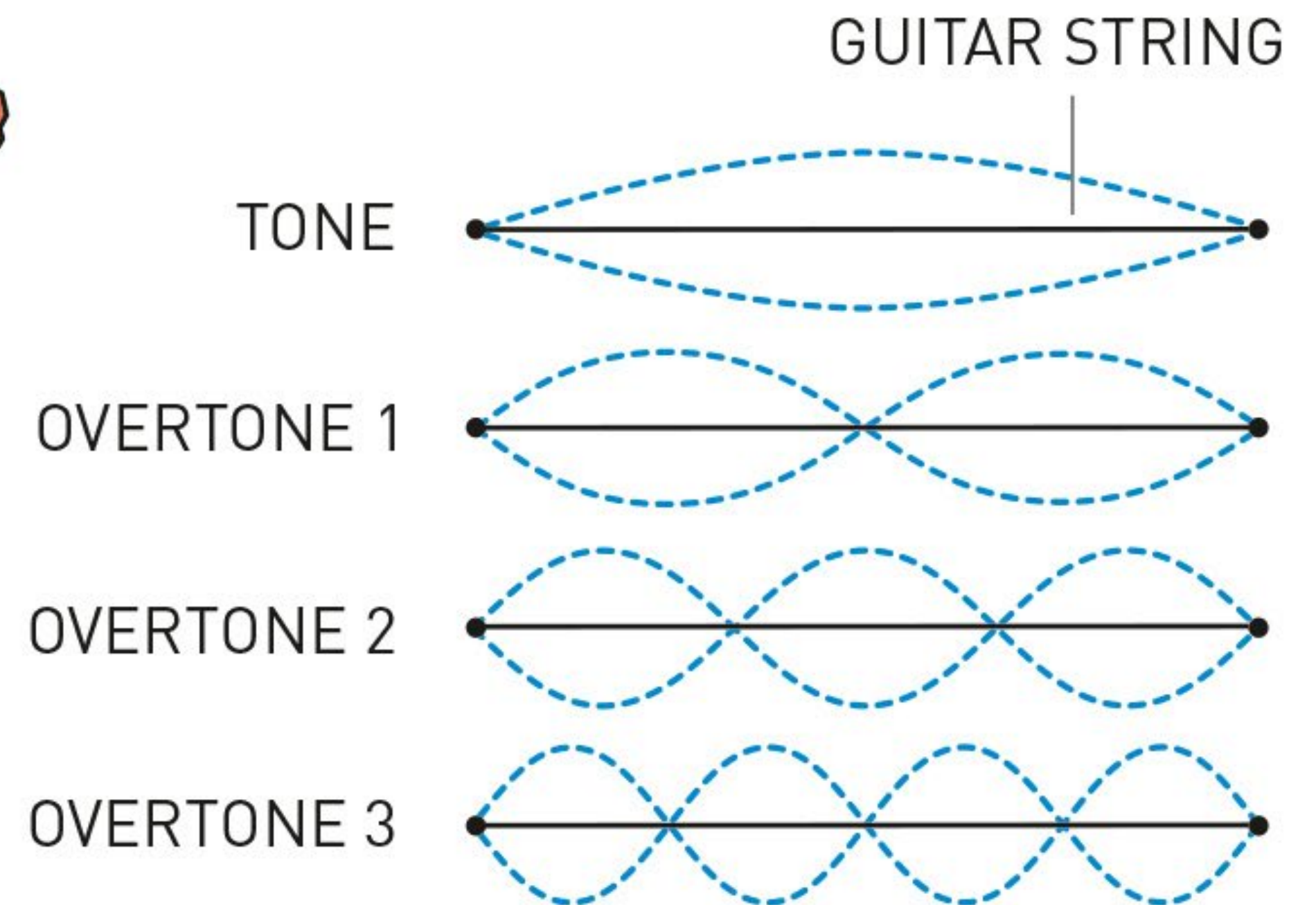
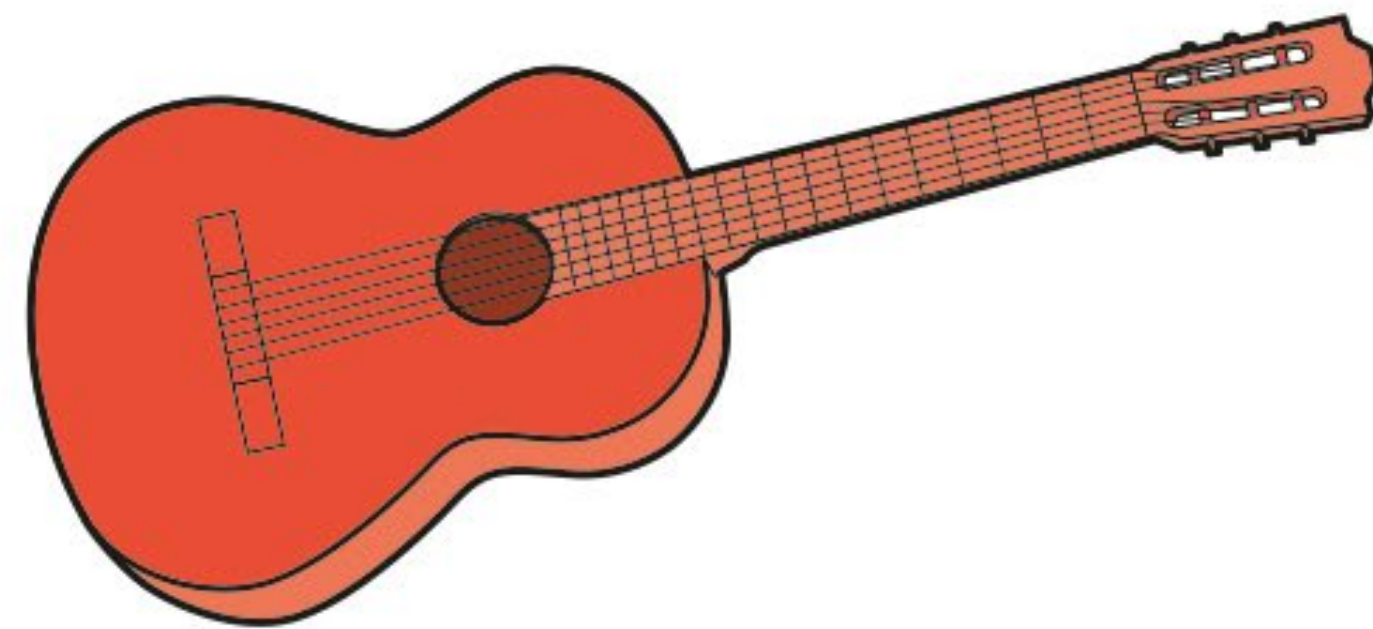


Pulses of laser light can help us capture rapid events.
Capturing the movements of the electrons in an atom demands extremely rapid pulses.

Overtone

Light waves, like sound waves, can have overtones.

Anne L'Huillier created overtones of laser light by causing it to pass through a gas.



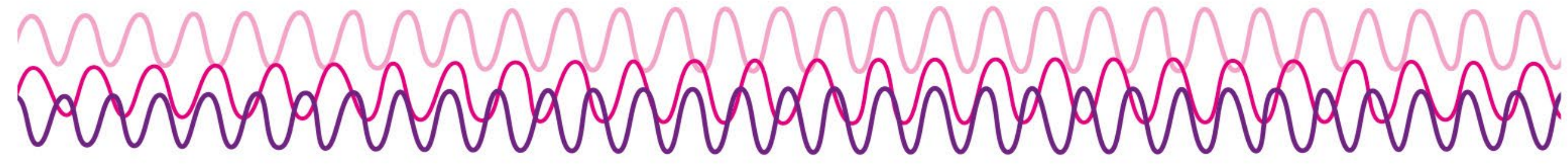
The combination of light waves

The combination of light waves of varying wavelengths can generate pulses of light.

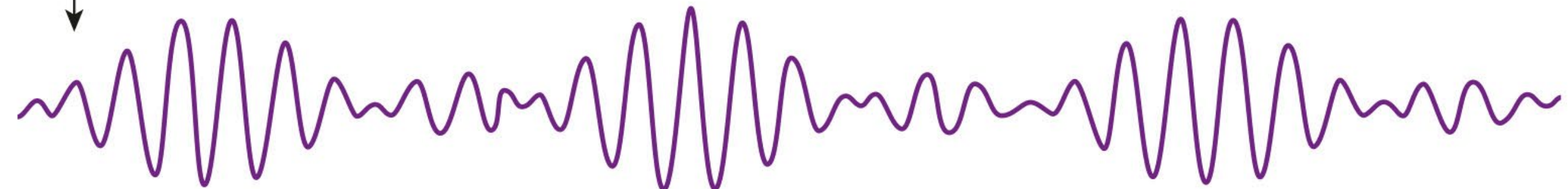
Pierre Agostini created a train of attosecond pulses of light.

Ferenc Krausz isolated a single pulse.

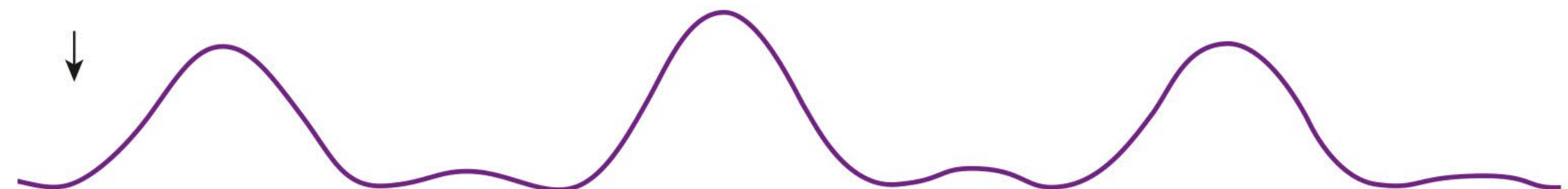
OVERTONES ARE
SUPERIMPOSED



REINFORCE OR CANCEL
EACH OTHER



ATTOSECOND PULSES



Applications

The potential to study processes inside of atoms and molecules.

Possible practical applications in a variety of fields from electronics to medicine.



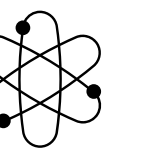


PHOTO: JOHANN MAURITSSON

“Even now, 30
years afterwards,
we are still learning
new things.”

Anne L'Huillier, 2023 Nobel Prize laureate in physics

THE
NOBEL
PRIZE

FOR THE GREATEST
BENEFIT TO
HUMANKIND

Nobel Prize lessons