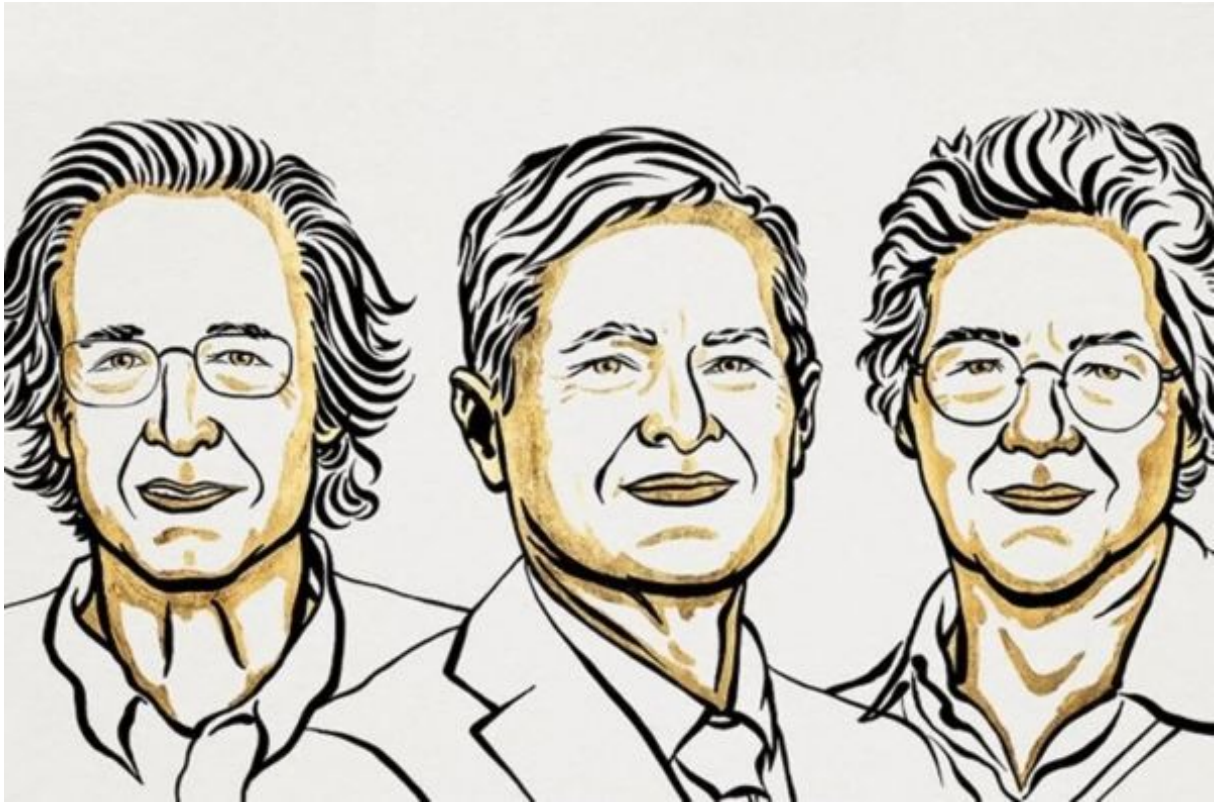

2023 Nobel Prize in Physics

Pierre Agostini, Ferenc Krausz and Anne l'Huillier receive the Nobel i¿½for experimental methods that generate attosec nd pulses of light for the study of electron dynamics in matteri¿½

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The three Nobel Laureates in Physics 2023 are being recognized for their experiments, which have given humanity new tools for exploring the world of electrons inside atoms and molecules. Pierre Agostini, Ferenc Krausz and Anne L'Huillier have demonstrated a way to create extremely short pulses of light that can be used to measure the rapid processes in which electrons move or change energy.

This morning, the Royal Swedish Academy of Sciences announced the laureates of the 2023 Nobel Prize in Physics, naming three ground-breaking scientists in the field of Attoscience, Anne L'Huillier, Pierre Agostini and Ferenc Krausz for i¿½for experimental methods that generate attosecond pulses of light for the study of electron dynamics in matter.i¿ ? ICFOnians enthusiastically congratulate these friends and colleagues for their landma

k achievements and for the highest recognition for their work that this Nobel Prize implies

The three laureates share this award in equal parts for their experiments that have produ ed pulses of light so short that they are measured in attoseconds, thus demonstrating that th se pulses can be used to provide images of processes inside atoms and molecul s. In 198**Anne L'Huillier** discovered that many different overtones of light arose when she transmitted infrared laser light through a noble gas. Each overtone is a light wave with a given number of cycles for each cycle in the laser light. They are caused by the laser light interacting with atoms in the gas; it gives some electrons extra energy that is then emitted as light. Anne L'Huillier has continued to explore this phenomenon, laying the ground for subsequent breakthroughs.

In 2001**, Pierre Agostini** succeeded in producing and investigating a series of consecutive light pulses, in which each pulse lasted just 250 attoseconds. At the same time, Ferenc Krausz was working with another type of experiment, one that made it possible to isolate a single light pulse that lasted 650 attoseconds.

The laureates' contributions have enabled the investigation of processes that are so rapid they were previously impossible to follow.

ICREA Professors at ICFO Drs. Jens Biegert and Maciej Lewenstein are both leaders in this field, and collaborate with the laureates both experimentally and theoretically. The 1994 **Physical Review A** collaboration noted in the Nobel text, co-authored by Lewenstein, Balcou, Ivanov, L'Huilier and Corkum, has been cited over 5000 times. Likewise, Biegert has mad significant contributions through a series of landmark papers in this field, and he has built world-leading attoscience infrastructure at ICFO, the only one of its kind in Spain. Here, th next generation of attosecond soft x-ray pulses are harnessed and applied to advance th frontiers of material physics and chemical imaging

Postdoctoral researchers in ICFO-Max Plank- Cellex programs over the years, generousl funded by Fundacion Cellex, have contributed to the field as well under the supervision o both ICFO Group Leaders as well as Prof Ferenc Krausz. Understandably, ICFOnians, full aware of the significance of this work, have received the news of this year's award withou surprise, but with a great deal of enthusiasm. ?

i¿½ttosecond Pulses of light are a revolutionary tool for basic and applied science since they give us for the first time a camera that is fast enough to acquire crisp images of how and where electrons move,i¿½ explains Biegert. i¿½This is important since the motion of electrons determine literally everything, from how a chemical reaction happens, how we metabolize, or how materials and sensors work. Many experimental and theoretical scientists, represented by this year's laureates, are contributing to this extremely fast-growing new field of sciencei¿½.