

Ferenc Krausz

Date of birth: 17 May 1962

Place of birth: Mór (Hungary)

Nationality: Hungarian, Austrian

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Max Planck Institute of Quantum Optics

Laboratory for Attosecond Physics

Hans-Kopfermann-Str. 1, 85748 Garching (Munich), Germany

Ludwig-Maximilians-Universität München

Chair of Experimental Physics – Laser Physics

Centre for Advanced Laser Applications

Am Coulombwall 1, 85748 Garching (Munich), Germany

Center for Molecular Fingerprinting

Czuczor utca 2–10, 2nd floor, 1093 Budapest, Hungary

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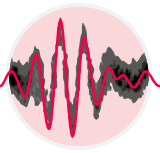


appointments

- Since 2025** Chair Professor // Department of Physics, University of Hong Kong (HKU), www.physics.hku.hk
- Since 2019** Co-Founder & CEO // Center for Molecular Fingerprinting (CMF), Budapest, www.cmf.hu
- Since 2015** Founding Director // Centre for Advanced Laser Applications (CALA), LMU Munich, www.cala-laser.de
- 2010–2019** Director // Munich-Centre for Advanced Photonics (MAP)
- 2006** Co-Founder // Munich-Centre for Advanced Photonics (MAP)
- Since 2006** Founding Director // International Max Planck Research School of Advanced Photon Science (IMPRS-APS), www.mpg.de/APS
- Since 2004** Full Professor // Chair of Experimental Physics – Laser Physics, Ludwig-Maximilians-Universität München (LMU), www.physik.lmu.de/en
- Since 2003** Director // Max Planck Institute of Quantum Optics (MPQ), www.mpg.de/en
- 1999–2004** Full Professor // Technische Universität Wien (TUW), Department of Electrical Engineering
- 1996–1998** Assistant Professor // Technische Universität Wien (TUW), Department of Electrical Engineering

— first electric field trace of visible light, measured in 2004 —

Prof. Dr. Ferenc Krausz // Chair of Experimental Physics – Laser Physics, LMU // Laboratory for Attosecond Physics, MPQ // Centre for Advanced Laser Applications, LMU Ludwig-Maximilians-Universität München // Faculty of Physics // Am Coulombwall 1 // 85748 Garching (Munich), Germany // +49.89.289-14013 // krausz@lmu.de
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The University of Hong Kong // 415/B, Chong Yuet Ming Physics Building // Pok Fu Lam, Hong Kong // ferenc.krausz@hku.hk



academic education

- 1993** Habilitation with distinction // Technische Universität Wien, Department of Electrical Engineering
- 1991–1993** Postdoctoral fellow // Technische Universität Wien, Department of Electrical Engineering
- 1991** Ph.D. with distinction in laser physics // Technische Universität Wien, Department of Electrical Engineering
- 1988–1991** Ph.D. studies // Technische Universität Wien, Department of Electrical Engineering
- 1985–1987** Ph.D. studies // Budapest University of Technology, Institute of Physics
- 1985** Diploma with distinction in electrical engineering // Budapest University of Technology
- 1981–1985** Undergraduate studies in electrical engineering // Budapest University of Technology
Undergraduate studies in theoretical physics // Eötvös Loránd University, Budapest

scientific interest

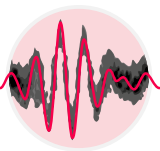
- Main fields** // Laser physics, time-resolved metrology, biomedical applications
- Research focus** // Attosecond physics and technology
// Exploring the frontiers of electronics
// Laser physics for health monitoring

major achievements

- // Co-invention of chirped multilayer mirrors and their use for the generation of few-cycle light
- // Generating and measuring controlled light waveforms and isolated attosecond pulses, developing time-resolved metrology and spectroscopy at the attosecond time scale
- // These advances heralded the emergence of a new field: **attosecond physics**

responsibilities

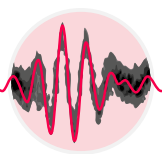
- Since 2019** // Initiating and directing the Center for Molecular Fingerprinting (CMF) in Budapest, Hungary, for the development of blood-based methods for early detection of non-communicable diseases
- Since 2009** // Initiating and directing the Centre for Advanced Laser Applications (CALA) at the LMU for the development of
(i) laser-driven brilliant X-ray and particle sources for early cancer detection and therapy and
(ii) instrumentation for electric-field molecular fingerprinting for blood-based early detection of non-communicable diseases



- Since 2006** // Establishing and directing the International Max Planck Research School of Advanced Photon Science, offering a world-class graduate training and education program for some 50 Ph.D. students from all over the world
- // Establishing, coordinating, and (since 2010) directing the cross-disciplinary research activities of some 40 groups from 9 departments at the LMU and the Technical University of Munich, and the MPQ, in the areas of physics, chemistry, biology and medicine
- Since 2004** // Coordinating and directing the research of some hundred researchers and technical staff at the LMU-MPQ Laboratory for Attosecond Physics

honors

- 2026** Member of the Luxembourg Academy of Sciences and Arts, Luxembourg
- 2026** Member of the National Academy of Sciences, USA
- 2025** Member of the Bavarian Academy of Sciences and Humanities, Bavarian State Government, Germany
- 2025** Fellow of the Max Planck School of Photonics, Max Planck Society, Germany
- 2025** Bayrischer Digitalpreis, B.DiGiTAL, Bavarian State Government, Germany
- 2025** Semmelweis Budapest Award, Hungary
- 2024** Order of Saint Stephen of Hungary, The Head of the House of Habsburg-Lorraine, Hungary
- 2024** Grand Decoration of Honour in Gold with Sash for services to the Republic of Austria
- 2024** Honorary Doctorate Degree, Budapest University of Technology and Economics, Hungary
- 2024** Neumann Professorship, Budapest University of Technology and Economics, Hungary
- 2024** Bavarian Maximilian Order for Science and Art, Bavarian state government, Germany
- 2023** Nobel Prize in Physics, Royal Swedish Academy of Sciences, Sweden
- 2023** Frontiers of Knowledge Award, BBVA Foundation, Spain
- 2022** Wolf-Prize in Physics, Wolf Foundation, Israel
- 2022** Einstein-Lecture, Freie Universität Berlin, Max Planck Society, Germany
- 2019** Vladilen Letokhov Medal, the European Physical Society & the Russian Academy of Sciences
- 2018** János Arany Award for Outstanding Scientific Performance, the Hungarian Academy of Sciences, Hungary
- 2016** Member of Leopoldina, the German National Academy of Sciences, Germany
- 2015** Thomson Reuters Citation Laureate in Physics, USA
- 2014** Listed in The World's Most Influential Scientific Minds 2014, Thomson Reuters, USA
- 2013** Otto-Hahn-Preis of the DPG, GDCh and the city of Frankfurt (on the Main), Germany
- 2013** King Faisal International Prize for Science, Saudi Arabia
- 2012** Knight's Cross of the Order of Merit of Hungary
- 2012** Member of the Academia Europaea, United Kingdom

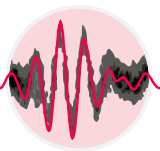


- 2012** Member of the European Academy of Sciences (EURASC), Belgium
- 2011** Bundesverdienstkreuz am Bande (Order of Merit of the Federal Government), Germany
- 2011–2025** Member of the Russian Academy of Sciences, Russia (resigned in February 2025)
- 2011** Falling-Walls Lecturer, falling-walls.com/lectures/ferenc-krausz, Germany
- 2010** Honorary Professorship at the Shanghai Institute of Optics and Fine Mechanics, China
- 2010** Visiting Professorship, King Saud University, Saudi Arabia
- 2010** Distinguished Visiting Professorship, POSTECH, South Korea
- 2009** Fellow, Optical Society of America, USA
- 2009** Honorary Professorship, Xian Institute of Optics, Chinese Academy of Sciences, China
- 2009** Honorary Citizen, City of Mór, Hungary
- 2009** ERC Advanced Investigator Grant, European Union
- 2007** Member of the European Academy of Sciences and Arts, Austria
- 2007** Member of the Hungarian Academy of Sciences, Hungary
- 2006** Gottfried Wilhelm Leibniz-Prize, Deutsche Forschungsgemeinschaft, Germany
- 2006** Prize of the City of Vienna for Natural and Technical Sciences, Austria
- 2006** Progress Medal of the Royal Photographic Society, United Kingdom
- 2006** Manne Siegbahn Memorial Lecture, Royal Swedish Academy of Sciences, Sweden
- 2006** Max von Laue Memorial Lecture, Physikalische Gesellschaft zu Berlin, Germany
- 2006** James Frank Memorial Lecture, Israel Academy of Sciences, Israel
- 2006** Quantum Electronics Award, IEEE Laser and Electro-Optics Society, USA
- 2005** Honorary Doctorate Degree from the Budapest University of Technology, Hungary
- 2005** Honorary Professorship at the Technische Universität Wien, Austria
- 2003** Member of the Austrian Academy of Sciences, Austria
- 2003** Julius Springer Award in Applied Physics, Springer, Germany, USA
- 2002** Wittgenstein Award, Federal Ministry of Science and Education, Austria
- 1998** Carl Zeiss Award, Ernst Abbe Foundation, Germany
- 1996** START Award, Federal Ministry of Science & Education, Austria
- 1994** Fritz Kohlrusch Award, Austrian Physical Society, Austria

list of publications

www.attoworld.de/publications/ferenc-krausz.html

— first electric field trace of visible light, measured in 2004 —



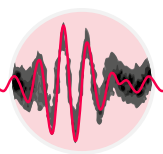
Ferenc Krausz, his coworkers & collaborators have advanced the femtosecond-scale control of the amplitude and frequency of laser light, serving as the basis for femtosecond technology¹, to the attosecond-scale control of the oscillating laser fields, underlying attosecond technology². The resultant controlled attosecond light force enabled them to access atomic-scale electron motions and make them perceivable to human observation. These advances³⁻⁷ marked the birth of a new discipline, attosecond physics, on the turn of the millenium.

Attosecond physics provides, for the first time, direct access to electronic and concomitant nuclear motions that occur in attosecond-femtosecond and picometer-nanometer dimensions of time and space. Electronic motions underlie chemical reactions just as they do information technologies based on electronic and optical signal processing. They constitute the primary steps of any change in the physical, chemical, and biological properties of materials and living organisms. The capability of observing and controlling them hence impacts the development of new materials, understanding biological function and malfunction, advancing information processing to its ultimate frontiers and exploring novel physical metrologies for medicine.

Ferenc Krausz and his coworkers have contributed to the establishment, validation and first applications of attosecond physics with milestones including:

- // the generation and measurement of the first light pulses shorter than one femtosecond³ and their use for capturing intra-atomic electron motion in real time⁴
- // the control⁵ and measurement⁷ of light fields, permitting the extension of the synthesis of electromagnetic waveforms from microwave to light frequencies^{14,18}
- // the use of the attosecond force that controlled light waveforms exert on electrons^{5,6,14,18} (a) for establishing attosecond technology based on isolated attosecond pulses^{6,11} synchronized to the controlled light force, allowing for the (b) control of electrons in atoms^{14,18}, molecules⁸, solids¹⁵, as well as in vacuum¹⁹
- // the establishment of attosecond spectroscopy, allowing to (i) capture shake-up, cascaded Auger decay, tunneling⁹, the photoelectric effect¹² and wavepacket motion¹³ and field-induced shifts of energy levels¹⁴ in atoms, (ii) control Angstrom-scale electron transport^{10,16} in solids as well as their optical properties^{15,17,18}
- // electric-field-resolved molecular fingerprinting of biofluids for detecting and monitoring changes in the health state of living organisms^{20,21}.

With these advances, Ferenc Krausz has inspired and influenced the work of a research community that is now running several hundred ultrafast laser laboratories all over the world. Until May 2026, his work has been cited more than 58 (Web of Science) / 93 (Google Scholar) thousand times with an h-index of 109 (WoS) / 132 (GS).

**1 Intense few-cycle laser fields: Frontiers of nonlinear optics**

T. Brabec & F. Krausz

Reviews of Modern Physics **72**, 545 (2000)

Technologies underlying the generation of few-cycle laser light and their applications for exploring the frontiers of nonlinear optics

2 Attosecond physics

F. Krausz & M. Ivanov

Reviews of Modern Physics **81**, 163 (2009)

Basic concepts and techniques of attosecond measurements

3 Attosecond metrologyM. Hentschel et al. *Nature* **414**, 509 (2001)

Generation and measurement of a light pulse shorter than 1 femtosecond

4 Time-resolved atomic inner-shell spectroscopyM. Drescher et al. *Nature* **419**, 803 (2002)

Real-time observation of electron dynamics in inner shells of atoms

5 Attosecond control of electronic processes by intense light fieldsA. Baltuška et al. *Nature* **421**, 611 (2003)

Generation of laser light with controlled waveform and its use for controlling atomic-scale electron motion

6 Atomic transient recorderR. Kienberger et al. *Nature* **427**, 817 (2004)

Demonstration of a light-field-driven “streak camera”, now the gold standard in attosecond metrology

7 Direct measurement of light wavesE. Goulielmakis et al. *Science* **305**, 1267 (2004)

Measurement of the oscillating electric field of a visible light pulse

8 Control of electron localization in molecular dissociationM. Kling et al. *Science* **312**, 246 (2006)

Electron steering inside a molecule with the controlled electric field of light

9 Attosecond real-time observation of electron tunnelling in atomsM. Uiberacker et al. *Nature* **446**, 627 (2007)

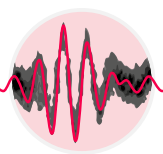
Tracking electron tunneling and intra-atomic electron interactions

10 Attosecond spectroscopy in condensed matterA. Cavalieri et al. *Nature* **449**, 1029 (2007)

Real-time observation of electron transport through atomic layers of a crystal

11 Single-cycle nonlinear opticsGoulielmakis et al. *Science* **320**, 1614 (2008)

Breaking the 100-asec barrier in light pulse generation

**12 Delay in photoemission**M. Schultze et al. *Science* **328**, 1658 (2010)

Discovery of a delay in the photo-effect, measured with a resolution better than the atomic unit of time

13 Real-time observation of valence electron motionE. Goulielmakis et al. *Nature* **466**, 739 (2010)

Tracking the sub-femtosecond oscillatory motion of an electron inside an atom

14 Synthesized light transientsA. Wirth et al. *Science* **334**, 195 (2011)

Super-octave light waveform synthesis, observation of sub-femtosecond Stark shift and ionization

15 Optical-field-induced current in dielectricsA. Schiffrin et al. *Nature* **493**, 70–74 (2013)**Controlling dielectrics with the electric field of light**M. Schultze et al. *Nature* **493**, 75–78 (2013)

Manipulation of the electric and optical properties of solids at light frequencies, paving the way towards petahertz signal metrology and processing

16 Direct observation of electron propagation and dielectric screening on the atomic length scaleS. Neppl et al. *Nature* **517**, 342 (2015)

First attosecond real-time observation of electron transport through atomic layers in a solid

17 Optical attosecond pulses and tracking the nonlinear response of bound electronsM. Hassan et al. *Nature* **530**, 66 (2016)

Attosecond pulses of visible-ultraviolet light and its applications for controlling and tracking intra-atomic electron motions

18 Attosecond nonlinear polarization and light-matter energy transfer in solidsA. Sommer et al. *Nature* **534**, 86 (2016)

First direct observation of the oscillating optical polarization and energy exchange between light and matter

19 All-optical control and metrology of electron pulsesC. Kealhofer et al. *Science* **352**, 429 (2016)

Temporal control & characterization of freely propagating ultrashort electron wave-packets

20 Field-resolved infrared spectroscopy of biological systemsI. Pupeza et al. *Nature* **577**, 52 (2020)

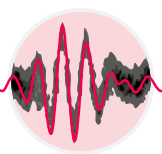
Electric-field molecular fingerprinting of biological systems for probing physiological changes of living organisms

21 Nobel Lecture: sub-atomic motions

F. Krausz

Reviews of Modern Physics **96**, 030502 (2024)

How the motion of electrons and the waving of light became accessible to human observation and are now controllable on their genuine – attosecond – time scale



Ferenc Krausz (* May 17, 1962 in Mór, Hungary) is a Hungarian-Austrian physicist. Ferenc Krausz is Director at the Max Planck Institute of Quantum Optics (MPQ) in Garching, Chair of Experimental Physics at the Ludwig-Maximilians-Universität München (LMU), Germany, and Founding Director of the Center for Molecular Fingerprinting (CMF) in Budapest, Hungary. He was awarded the Nobel Prize in Physics in 2023. Krausz is also the founder and chairman of the non-profit organization Science4People (S4P). S4P promotes educational and development opportunities for children and young people in war and crisis zones, with current focus on Ukraine.

Academic career

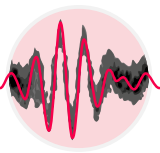
Ferenc Krausz graduated in electrical engineering from the Budapest University of Technology and completed his studies in theoretical physics at the Eötvös Loránd University in 1985. He earned his doctorate in laser physics from the Technische Universität Wien (1991), where he became professor in 1998. In 2003—2004, he was appointed director at the Max-Planck-Institute of Quantum Optics in Garching and chair of experimental physics – laser physics at the Ludwig-Maximilians-Universität München and established “attoworld” at these two sites. In 2019, attoworld was extended to a third site, the Center for Molecular Fingerprinting in Budapest, Hungary. Attoworld has been fostering the proliferation of the emerging field, attosecond science, and – since 2015 – exploring its utility for probing human health. For his contributions to establishing the field of Attosecond Science, Ferenc Krausz has been awarded the King-Faisal International Prize for Science (2013), the Wolf-Prize in Physics (2022), the BBVA Frontiers of Knowledge Award (2023) and the 2023 Nobel Prize in Physics.

Pioneer of attosecond physics

In a series of experiments performed between 2001 and 2004 Ferenc Krausz and his team succeeded in producing and measuring isolated attosecond pulses of light and applying them to observe sub-atomic motions, the motions of electrons in atoms, molecules and solids. Electronic motions are central to our life. To our biological and modern life, likewise. In molecules, they trigger the creation and breaking of chemical bonds and are responsible for all vital processes in living organisms. In nanoscale semiconductor chips, the ultrafast manipulation of the current of electrons underlies signal processing, which is behind the operation of all our electronic gadgets, mobile phones, personal computers, and the internet. Electronic motions are the primary steps in every change in the physical, chemical and biological properties of materials and living organisms. The attosecond technology born at the dawn of the Millenium makes it possible to observe and control them. The new technical capability may impact the synthesis of new materials, the understanding of biological functions and malfunctions and the further development of information processing. The laser technology of attosecond physics is now also opening new avenues in monitoring human health.

More information: www.attoworld.de





Towards a future preventive medicine

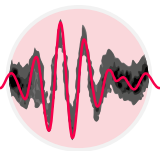
Laser technology that Krausz and his team have originally developed for exploring the world of electrons has also enabled to capture the waving of light. This capability opened the door to a new application: the probing of human health. Since 2015, the attoworld-team has been increasingly engaging in exploring this new potential offered by the laser technology that led to the birth of attosecond physics. The goal is to develop and verify a new, precise way of defining human wellness to allow observing tiny aberrations from it, which may be indicative of the unfolding of or predisposition to a severe, life-threatening disease, such as cancer, heart attack, stroke, diabetes or COPD. Diseases, which cause 17 million premature deaths on our planet, year by year.

Krausz and his attoworld team, including CMF in Budapest, have been developing an ultra-sensitive method based on infrared laser light and attosecond metrology to capture smallest deviations of the molecular composition of cell-free human blood — an approach called infrared molecular fingerprinting. They teamed up with clinicians in Munich, Budapest, and other cities of Europe to collect blood samples for testing the methods capacity to capture severe non-communicable diseases at their early stage of development, when medical intervention can be much more efficient and successful. In Hungary, Krausz and his colleagues rolled out a large-scale longitudinally study with 15.000 participants, which are donating blood regularly over a period of ten years. Encouraged by promising preliminary results, Krausz initiated the extension of the CMF project to a world-wide network of clinical studies with the aim to discover the minimum set of molecular data to be extracted from human blood that allows reliable screening for major non-communicable conditions and thereby for effectively protecting human health.

More information: www.cmf.hu, www.h4h.hu/en, www.lasers4life.de/en

Contact:

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85748 Garching (Munich)
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www.attoworld.de



The Science4People humanitarian project

Together with several colleagues from the attoworld-team and with Adrienn Dávid from Ukraine, Ferenc Krausz has initiated and founded the non-profit organization Science4people. Directed by Krausz (Chair) and Dávid (Vice-Chair), Science4People promotes educational and development opportunities for children and young people in war and crisis zones, particularly in Ukraine, in cooperation with the Ukraine-based Non-Government organisation “Tabula Rasa” for future generations.

Since its founding, Science4People has launched several initiatives, actively pursued by all members of S4P and Tabula Rasa. Notable projects include SKOLA+ and SPORT+, which began in two schools in western Ukraine and are now being implemented in five schools, including one near the front line. These projects aim to help children affected by the war bridge educational gaps and deepen their knowledge. Additionally, the sports program supports children’s mental and physical well-being, providing a positive psychological balance, especially in the current stress-ridden war situation.

More information: www.science4people.org, www.tabularasa-fg.org/en

The AS250 early talent management project

The AS250 project is the latest initiative from Professor Krausz. It aims on bringing together the best educators of Hungary and Ukraine to join forces for creating a world-class talent management program in mathematics, physics and computer science for the high-school students of Hungary and Ukraine, to be made accessible to all other countries of the European Union.

The AS250 Talent Development STEM Centre in Ukraine represents a strategic opportunity for wider European educational and technological development. The Transcarpathian region of Ukraine is unique in that, because it borders four European countries. Therefore, a centre in Transcarpathia would ensure international cooperation, facilitate cross-border scientific and practical dialogue and provide access to best scientific practices for participants from across Europe. As the programme develops, other EU countries will be invited to join this innovative programme and contribute to strengthening European scientific and cultural ties.

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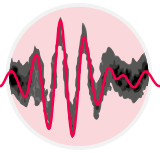
Adrienn Dávid

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Ferenc Krausz

Date of birth: 17 May 1962

Place of birth: Mór (Hungary)

Nationality: Hungarian, Austrian

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appointments

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- Since 2019** Co-Founder & CEO // Center for Molecular Fingerprinting (CMF), Budapest, www.cmf.hu
- Since 2015** Founding Director // Centre for Advanced Laser Applications (CALA), LMU Munich, www.cala-laser.de
- 2010–2019** Director // Munich-Centre for Advanced Photonics (MAP)
- 2006** Co-Founder // Munich-Centre for Advanced Photonics (MAP)
- Since 2006** Founding Director // International Max Planck Research School of Advanced Photon Science (IMPRS-APS), www.mpq.mpg.de/APS
- Since 2004** Full Professor // Chair of Experimental Physics – Laser Physics, Ludwig-Maximilians-Universität München (LMU), www.physik.lmu.de/en
- Since 2003** Director // Max Planck Institute of Quantum Optics (MPQ), www.mpq.mpg.de/en
- 1999–2004** Full Professor // Technische Universität Wien (TUW), Department of Electrical Engineering

academic education

- 1993** Habilitation with distinction // Technische Universität Wien, Department of Electrical Engineering
- 1991–1993** Postdoctoral fellow // Technische Universität Wien, Department of Electrical Engineering
- 1991** Ph.D. with distinction in laser physics // Technische Universität Wien, Department of Electrical Engineering

scientific interest

- Main fields** // Laser physics // time-resolved metrology // biomedical applications
- Research focus** // Attosecond physics and technology // Exploring sub-atomic motions // Laser physics for health monitoring

major achievements

- // Co-invention of chirped multilayer mirrors and their use for the generation of few-cycle light
- // Developed techniques for measuring controlled light waveforms and isolated attosecond pulses, establishing **attosecond physics**

more details & publications

<https://attoworld.de/team/all/ferenc-krausz.html>