

# **Spectroscopy and Dynamics Group Meeting 2026**

## **Research Keywords Glossary**

Prepared by the members of the SDG Committee

In this booklet, we endeavoured to provide the new and the younger members of our community with a collection of easily accessible short descriptions of various terms that are likely to appear throughout the Meeting. Each keyword is accompanied with a name(s) of a member(s) of our community whose research relates to it. The short definitions are only meant to provide the very basic understanding to the reader so as not to distract during listening to a presentation or viewing a poster. The readers are therefore strongly encouraged to seek further explanation by talking to other scientists present at the meeting.

This is the third edition of the Glossary, the initial one was met with praise and proved useful at the 2024 Meeting. We kept the scope of this document quite limited to prevent it from becoming too unwieldy and ultimately useless as a quick reference. The contents, nonetheless, have been updated and broadened to include each year's Invited Speakers. Those from this year's meeting have their names underlined to aid swift reference. Thank you to everyone who provided us with keywords. When more than one person gave the same keyword, we tried to put as many people underneath it as possible. There are also plenty of terms that could apply to a large part of our entire community but including everyone was impossible. We are open to comments and critiques, please find Maksymilian Roman to discuss any issues that you may have spotted. Encouraged by previous years' reception, we hope that this "living document" continues to be a useful reference for the newest members of our ever-growing SDG Community. In spirit of this, we have now uploaded this Glossary to our new website, which can be found at: <https://spectroscopyanddynamics.uk>

We would like to thank again the group of people directly responsible for putting the initial Glossary together; Natércia, Kelechi, Joseph, and Maks; as well as other members of the Committee for their support for the initial idea and the execution. We would also like to acknowledge the help Mike Ashfold lent in curation of the original document. Finally, thanks to Maks for updating the 2026 version.

The SDG Committee

The keywords are presented alphabetically, starting with the keyword itself in **bold** followed by the relevant scientist(s) underneath (current year's invited speakers are underlined), and finally the short definition.

### **Action Spectroscopy**

Caroline Dessent, Anouk Rijs, Jemma Gibbard

A type of spectroscopy in which the spectrum is recorded using an action induced in the target molecule by light as the measurement. Typical actions include bond breaking, losing a tag atom, or photodetachment of an electron.

### **Anions**

Cate Anstöter, Jan Verlet, Jemma Gibbard

Ions with net negative electrical charges.

### **Anion photoelectron spectroscopy**

Helen Fielding, Jan Verlet

Photoelectron spectroscopy applied to photodetachment of an electron from an anion to form a neutral species.

### **Aromaticity**

Cate Anstöter

Property of conjugated cycloalkene rings in which stabilisation of the system is achieved through delocalisation of the electrons across the  $\pi$  orbitals.

### **Astrochemistry**

Jutta Toscano, Brianna Heazlewood

The study of chemical composition and evolution of environments beyond terrestrial atmosphere.

### **Atmospheric aerosols**

Maria Sanz

Suspension system of small particles in the atmosphere, typically solid or in the form of a micelle with an aqueous centre and an organic outer layer. Their presence or lack of highly influences the Earth's climate.

### **Auger-Meitner effect**

Michael Burt

A phenomenon during which a vacancy caused by the detachment of a photoelectron from an inner-shell orbital is filled by a higher energy (i.e., residing in a higher shell) electron. The subsequent release of energy can lead to an ejection of another electron, referred to as an "Auger electron".

### **Breath analysis**

Hendrik Nahler

A method of detecting the composition of the air breathed out by a patient in order to find signature compounds that could inform about the state of the patient.

### **Cavity enhanced laser induced fluorescence**

Hendrik Nahler

A combination of a cavity ring down spectroscopy and laser induced fluorescence performed simultaneously with a single laser pulse.

### **Cavity-enhanced spectroscopy**

Marissa Weichman, Hendrik Nahler

A highly sensitive form of absorption spectroscopy which uses the pathlength-enhancement of light through the sample afforded by an optical cavity to dramatically enhance absorption signals.

### **Charge-exchange reaction**

Brianna Heazlewood, [Jutta Toscano](#)

A transfer of a charge from an ion to a neutral particle during a collision.

### **Chiroptical spectroscopy**

[Fabrizio Santoro](#)

Spectroscopic methods that help distinguish chiral structures and processes thanks to the fact that chiral molecules respond differently to left and right circularly polarized light.

### **Cold target recoil ion momentum spectroscopy (COLTRIMS)**

Michael Burt

A spectroscopic imaging technique that investigates the fragmentation dynamics of small molecular systems. A combination of electric and magnetic fields projects the fragment ions and electrons onto position-sensitive detectors, enabling their three-dimensional momenta to be captured and correlated.

### **Collision induced dissociation**

Caroline Dessent, Anouk Rijs

Fragmentation of, typically, peptides or proteins *via* collisions with neutral molecules and atoms (e.g., He, Ar, or N<sub>2</sub>). Combined with tandem mass spectrometry provides a very powerful identification technique.

### **Conical intersections**

Basile Curchod, Mario Barbatti

Regions of the nuclear configuration space where *\*adiabatic\** electronic states are degenerate. Conical intersections explain the ultrafast funnelling between electronic states suffered by electronically excited molecules.

### **Coulomb crystal**

Brianna Heazlewood, [Jutta Toscano](#)

A collection of spatially trapped ions which arrange themselves in latticed structures that balance the external electric fields of the trap with the coulombic repulsion of the ions.

### **Coulomb explosion**

Claire Vallance

A process in which rapid ionisation of condensed matter from intense external electric fields (like those from a laser) causes the Coulombic repulsion of the formed ions to overcome the strength of the chemical bonds holding the matter together, resulting in an explosion of ions and electrons.

### **Covariance mapping**

Claire Vallance

Covariance is a scalar that measures the statistical relationship between two random variables. Covariance mapping is a matrix that expands this onto regions of random functions.

### **Cryogenic buffer gas cooling**

Marissa Weichman

A nearly universal means of cooling gas-phase molecules to cryogenic temperatures by thermalizing collisions with an inert buffer gas (typically helium) in a cell, used to prepare dense, cold ensembles of molecules.

### **Cryogenic ion vibrational predissociation spectroscopy**

Andrew Ellis

An IR spectroscopy method in which the sample is first prepared by electrospray ionization and then trapped and cooled in an ion trap. The targeted ions are tagged and the loss of the tagged is the action measured during the irradiation with an IR laser.

### **Delta self-consistent field (SCF)**

Laura Ratcliff

An extension of the DFT methods to calculate the energies of molecules with excited states made of highly hybridized molecular orbitals (e.g., molecules adsorbed on metal surfaces).

### **Density functional theorem (DFT)**

Laura Ratcliff

A computational chemistry method of calculating the chemical structure of collections of particles based on the assumption that all observables of a quantum system can be determined by functionals of the spatially dependent electron density.

### **Droplet-microfluidics**

Anouk Rijs

A microscale technology in which tiny droplets (usually  $10^{-9}$  to  $10^{-18}$  L in volume) are manipulated in a controlled fashion through systems of integrated microchannels (10s to 100s of micrometres in diameter).

### **Effusive beam**

Kenneth McKendrick

An expansion of gas from a high-pressure region into a low pressure through an orifice forming a non-directed stream of thermal particles.

### **Electron diffraction**

Derek Wann

A method that can determine geometric structural information from the diffraction of electrons through solids, liquids and gases.

**Electron ionisation**

Claire Vallance

Ionisation induced by collision with high energy electrons.

**Electrospray ionisation**

Anouk Rijs, Jemma Gibbard

Ionisation of liquid samples using high voltages that result in creation of charged liquid droplets that undergo stages of contraction and evaporation to eventually yield charged particles.

**Electrostatic deflection**

Jutta Toscano

Use of transverse electric fields for deflecting beams of charged particles. Used commonly in time-of-flight mass spectrometry to extend the free flight path.

**Excited-state calculations**

Graham Worth

Methods of calculating the electronic structure of excited states.

**Excited states of molecules**

Mario Barbatti, Various

States of a molecule where one or more electrons have higher energy than in the ground state, often leading to increased reactivity and different physical properties.

**Femtosecond lasers**

Dave Townsend, Corinna Kufner

Lasers capable of emitting pulses with durations of the order of femtoseconds.

**Femtosecond spectroscopy**

Vasilios Stavros, Corinna Kufner

Spectroscopic study of chemical processes (typically reactions) in the time domain using ultrafast lasers in a pump-probe-style experiment.

**Femtosecond time-resolved photoelectron spectroscopy**

Dave Townsend, Helen Fielding, Vasilios Stavros, Jan Verlet, Russell Minns

An ultrafast, pump-probe version of photoelectron spectroscopy useful for probing the transient species formed along a reaction coordinate.

**Free jet expansion**

Kenneth McKendrick

An expansion of gas from a high-pressure region into a low pressure without confinement once the beam exits the nozzle.

**Frequency doubling/second harmonic generation**

Kenneth McKendrick

A process in which the frequency of a laser beam is doubled inside a nonlinear material (typically a crystal) through combination of two photons to form a new one with double the energy.

### **Frequency modulated (IR) spectroscopy**

Kenneth McKendrick

An adaptation of classic IR spectroscopy in which the frequency of the laser is rapidly changed around a central frequency resulting in sidebands. The signal is then recorded as changes to those frequencies caused by absorption in the sample.

### **Gas electron diffraction**

Derek Wann

A term typically used to describe an experiment where a time-averaged structure in the gas phase is determined. It can be thought of as analogous to the use of single crystal X-ray diffraction for gaseous species. The raw data consist of concentric rings (like a powder diffraction pattern) because the molecules are randomly oriented in the gas sample.

### **Gas-liquid scattering**

Kenneth McKendrick

Reactive or nonreactive collisions of gas particles with liquid surfaces. The mechanisms are influenced by the lack of long-range order in the liquid and its relatively good ability to accept and redistribute the kinetic energy of the impacting particle.

### **Gas-solid scattering**

Kenneth McKendrick

Reactive or nonreactive collisions of gas particles with solid surfaces. The mechanisms are influenced by the long-range order in the solid structure and its relatively weak ability to accept and redistribute the kinetic energy of the impacting particle.

### **Helium droplets**

Shengfu Yang

Droplets of cold Helium formed *via* free jet expansion, typically used for hosting, and cooling other material that can be then studied with minimal perturbation from Helium.

### **High harmonic generation**

Russell Minns, Helen Fielding

Formation of high odd harmonics of the optical frequency of a laser pulse through a non-linear interaction with a (typically) low pressure gas.

### **Hückel theory**

Cate Anstöter

A method of predicting the energies and shapes of  $\pi$ -electron molecular orbitals in conjugated molecules based on separating the  $\sigma$ - and  $\pi$ -electrons into separate frameworks – it's assumed that only the latter contribute to the properties of the molecule

### **Imaging**

Kenneth McKendrick, Claire Vallance, Dave Townsend

A process of mapping the spatial position of a phenomena/event onto a two-dimensional space, typically done as recording the position of photons emitted through a process with a camera.

### **Infrared depletion (action) spectroscopy**

Andrew Ellis

A type of action spectroscopy, in which the action is typically a predissociation of intermolecular bonds in a cluster or complex of molecules.

### **Infrared multiphoton dissociation (IRMPD)**

Anouk Rijs

A resonant technique in which infrared photons absorption leads to fragmentation of a (ionic) sample *via* excitation to higher vibrational states.

### **Inner shell spectroscopy**

Michael Burt

A spectroscopic technique involving resonant absorption of high-energy (XUV or X-ray) photons. These detach photoelectrons from atomic core orbitals, which can result in an Auger-Meitner effect. The detached electron is also sensitive to the electronic state of the molecule, enabling this technique to be combined with photoelectron spectroscopy.

### **Intramolecular vibrational relaxation / intramolecular vibrational energy redistribution (IVR)**

Marissa Weichman

The process by which energy deposited into a specific vibrational mode of a molecule is statistically redistributed into the manifold of other vibrational modes. This could happen in a collision-less manner (induced by anharmonic coupling) or in a collision-assisted manner (particularly at high pressures or in solution) where vibrational energy redistribution is occurring alongside energy loss to surroundings.

### **Ion mobility – mass spectrometry (IM-MS)**

Anouk Rijs

A type of mass spectrometry in which ions are separated based on their masses and their interactions with a collision gas.

### **Ion trapping**

Brianna Heazlewood, Andrew Ellis, [Jutta Toscano](#)

A method of spatial confinement of charged particles using combinations of electric and magnetic fields, as well as laser cooling.

### **Ion-neutral reaction dynamics**

Brianna Heazlewood, [Jutta Toscano](#)

The dynamics of reaction between an ion and a neutral species, characterised by cross-sections larger than those for neutral-neutral reactions, resulting from the long-range attraction between the ion and a neutral.

### **Kinetic models**

[Jutta Toscano](#)

Mathematical descriptions for variation of reactants and products abundance across the course of a reaction.

### **Laser cooling**

[Katrin Dulitz](#), Brianna Heazlewood



An experimental technique which makes use of light pressure to dissipate energy from atoms and molecules. It relies on efficient optical cycling between states to ensure the scattering of a large number of photons.

### **Laser-induced fluorescence (LIF)**

Kenneth McKendrick, Hendrik Nahler

A spectroscopic method in which fluorescent photons emitted from a gas sample after irradiation with a laser beam of a wavelength matching a rovibronic transition of the gas molecules are recorded.

### **Laser pump-probe experiment**

Claire Vallance, Vasilios Stavros, Corinna Kufner

A time-resolved experiment in which (typically) two laser pulses are used, the first excites the sample to a desired state, the second detects it.

### **Linear-response time-dependent density functional theory**

Basile Curchod

An electronic-structure method developed to extract excitation energies and oscillator strengths for molecular systems. LR-TDDFT should not be confused with TDDFT, which is the generalization of density functional theory to time-dependent processes.

### **Linear vs non-linear spectroscopy**

Fabrizio Santoro

For a single incident (typically weak) EM field – like a single photon – the matter typically responds in a linear manner hence “linear spectroscopy”. “Non-linear spectroscopy” refers to non-linear response of the matter either because of interaction with many fields (*i.e.*, multiple photons) or high field strengths.

### **Liquid helium nanodroplet**

Andrew Ellis

Droplets formed during free-jet expansion of He using nozzles cooled down to about 10 K. Usually used as hosts for molecules and clusters, providing them with very cold environments which results in no electronic or vibrational and only very little rotational excitation.

### **Liquid-microjet photoelectron spectroscopy**

Helen Fielding

Photoelectron spectroscopy applied to studying the electronic structure of very thin (micrometre) jets of liquids in vacuum.

### **Machine learning**

Dave Townsend, Scott Habershon

A branch of artificial intelligence design that aims to mimic the way in which humans learn by finding patterns and relationship in data.

### **Magnetic guide**

Brianna Heazlewood

A device which utilises the response of low- and high-field seeking molecules to guide them along a preferred spatial trajectory.

**Magnetic nanoparticles**

Shengfu Yang

Nanoparticles that can be manipulated using magnetic fields, typically consistent of a magnetic metal (iron, nickel, *etc.*) and a component possessing some chemical functionality.

**Micro-nanoplastics**

Shengfu Yang

Tiny particles of plastic material (diameter < 1 mm) that have a destructive influence on marine and terrestrial life. Typically divided into primary (designed specifically as microplastics) and secondary (formed during degradation of bulk plastic) microplastics.

**Microsolvation**

Maria Sanz

A method of calculating solvent effects on molecules using a few explicit solvent molecules in the immediate vicinity of the molecule and an implicit solvent bath beyond.

**Molecular clusters**

Andrew Ellis

Relatively small aggregates of particles that are held together by forces similar to those holding bulk matter together (van der Waals forces, ionic, metallic, or covalent bonds).

**Molecular complexes**

Andrew Ellis

A system of weakly (typically non-covalently) bonded molecules.

**Nanoparticles**

Shengfu Yang

Tiny particles ranging between 1 and 100 nm, classified based on their properties, shape, and sizes.

**Nanowires**

Shengfu Yang

Chains of nanoparticles with typical widths of a few nm and lengths of up to 1000s of nm. Contrary to bulk material, the electrons are quantum confined across the width which leads to many interesting properties.

**Neural networks**

Dave Townsend, Scott Habershon

A type of machine learning model which is based on the principles of operation of neurons in a human brain. Information is being passed between layers of nodes (each node being an equivalent of a neuron) provided that the value is higher than a pre-determined threshold of each node. Real data is used to train the model and adjust the threshold and weighting applied to the passed data at every node until the output data is accurate.

**Non-adiabatic dynamics**

Graham Worth, Dave Townsend, Mario Barbatti, [Fabrizio Santoro](#)

Dynamics of electronic excited states that overcome the Born-Oppenheimer approximation of stationary nuclei, allowing for internal conversion or intersystem crossings during relaxation.

### **Non-covalent interaction**

Maria Sanz, Anouk Rijs

Interactions that do not involve sharing of electrons, but rather some more dispersed variations of electromagnetic interactions, i.e., electrostatic effects,  $\pi$ -effects, van der Waals forces, or hydrogen bonding.

### **Oligonucleotides**

Anouk Rijs, Fabrizio Santoro

A short stranded, usually synthetically created DNA or RNA molecules. Typically used for modulating gene and protein expression.

### **Optical cavity**

Marissa Weichman

A device which uses mirrors to trap light in a confined region of space. The simplest geometry is the Fabry-Perot cavity, constructed from two parallel planar mirrors.

### **Origins of life**

Corinna Kufner

A broad series of hypotheses aiming to explain the source of living organisms in the Universe. In our context it is the exploration of the origins of life's building blocks with photochemical and photodynamic experiments.

### **Particle beam**

Kenneth McKendrick, Brianna Heazlewood

A beam of rotationally cooled particles travelling with nearly unified velocities and without collisions formed by expansion of high-pressure gas into a low-pressure vessel through a small aperture.

### **Photochemistry**

Claire Vallance, Russell Minns, Caroline Dessent, Vasilios Stavros, Corinna Kufner, [Fabrizio Santoro](#)

Study of chemical behaviour induced by electromagnetic radiation (typically visible, but also UV or IR).

### **Photoelectron angular distribution**

Dave Townsend

The distribution of directions (with respect to a defined frame of reference) into which ejected photoelectrons scatter.

### **Photoelectron circular dichroism**

Dave Townsend

A method of studying chirality of gas samples, by measuring the forward-backward asymmetry in the angular distributions of photoelectrons scattered from a gas sample using circularly polarized light.

**Photoelectron imaging**

Helen Fielding, Vasilios Stavros, Jan Verlet, Jemma Gibbard

A technique where imaging detectors record the positions of ejected photoelectrons, showing patterns in their kinetic energy (radial distance from centre of the image) and angular distribution (direction from centre of the image).

**Photoelectron spectroscopy**

Russell Minns, Helen Fielding, Vasilios Stavros, Jan Verlet

A method that measures the kinetic energy of electrons ejected from the target via the photoelectric effect in order to measure the binding energy of the electrons in the target substance. It could be used to identify the chemical composition of the sample.

**Photoionisation**

Russell Minns, Vasilios Stavros

Ionisation through irradiation with photons.

**Photophysics**

Caroline Dessent, Vasilios Stavros

Exploration of fundamental physical processes induced by light interaction with matter.

**Polariton**

Marissa Weichman

Hybrid light-matter state formed from strong interactions between a molecular optical transition and a confined mode of light inside an optical cavity.

**Polycyclic aromatic hydrocarbons (PAHs)**

Maria Sanz

Organic molecules containing multiple aromatic rings, prevalent in the interstellar medium and considered as starting material for life.

**Potential energy curve/surface**

Mario Barbatti, Various

A graph of potential energy of a system as a function of one (curve), two (surface) or more (multidimensional surface) reaction coordinates. Typical coordinates include bond angles, bond lengths, or internuclear distances.

**Prebiotic chemistry**

Corinna Kufner

Chemistry of the processes that occur before formation of living organisms. Focused on the pathways in which simple compounds are converted into complex molecules necessary for life such as amino acids or nucleotides.

**Product branching ratios**

Jutta Toscano, Brianna Heazlewood

For reactions that can yield more than one product, it is the fraction of the total reaction yield of a given pathway.

**Protein / peptide aggregation**

Anouk Rijs

A phenomenon in which mis-folded protein chains aggregate together to form large clumps inside or outside cells. It is thought to influence the development of diseases classified as amyloidosis (e.g., ASL, Alzheimer's disease, or Parkinson's disease).

**Quantum chemical calculations**

Maria Sanz, Caroline Dessent, Mario Barbatti

A collection of computational methods for solving the Schrodinger equation for particles with more than one electron, that give information on the energies and structure of these particles. Different methods make different approximations when trying to solve the Schrodinger's equations in question.

**Quantum dynamics simulations**

Graham Worth, [Fabrizio Santoro](#)

A computational method of simulating processes where non-adiabatic quantum effects become dominant (e.g., internal conversion or intersystem crossing).

**Quantum scattering calculations**

Kenneth McKendrick

A series of computational methods which seek to calculate the observable results of molecular collisions by solving either the time-dependent or the time-independent Schrödinger equations.

**Quantum vortices**

Shengfu Yang

A local quantization of angular momentum seen in superfluids, where the superfluid circulates around a defect. The defect can be filled with other particles.

**Quantum yield**

Anouk Rijs

The number of times an event induced by adsorption of a photon occurs per an absorbed photon. Can apply to any photoinduced process, such as photodissociation or photoionisation.

**Quasi-classical trajectory (QCT)**

Kenneth McKendrick

A procedure for calculating trajectories in which the quantization of the reactants is taken into account, but in which the course of the reaction is treated classically.

**Reaction rate**

[Jutta Toscano](#), Brianna Heazlewood

The speed with which a reaction occurs, typically viewed as the increase of the concentration of products or the decrease of the concentration of reactants over time.

**Relativistic electron diffraction (also described as femtosecond electron diffraction)**

Derek Wann

A specific time-resolved electron diffraction experiment where electrons of energies  $\sim 3\text{-}5$  MeV are used. This reduces space-charge repulsion that can happen with less energetic electrons, and which leads to a limit in the time resolution achievable.

### **Resonance enhanced multiphoton ionisation (REMPI)**

Kenneth McKendrick, Brianna Heazlewood, [Jutta Toscano](#)

A spectroscopic method in which the molecule is first excited to an intermediate state by resonant absorption of 1 or more photons of the same wavelength followed by ionisation using further photons of the same or different wavelengths. The number of photons is noted as  $(x + y)$ , where  $x$  indicates the number of excitation photons and  $y$  the number of ionization ones. Additionally, if the excitation and ionization photon are of a different wavelength, a prime (') is added to the  $y$ ,  $(x + y')$ .

### **RNA Damage and Repair**

Corinna Kufner

The range of environmental (UV radiation, oxidative stress) and biological (ribonucleases, ribotoxins, CRISPR-Cas systems) factors that result in damaging the structure of the RNA and its subsequent repair through internal mechanisms in the cell.

### **Rotational spectroscopy**

Maria Sanz

Measurement of energies of transitions between rotational states of a molecules using (typically) microwave or far-IR radiation.

### **Scattering mechanism**

Kenneth McKendrick

A means of describing the interaction of an impinging particle on a target surface by considering various pre- and post-collision parameters (kinetic energy, internal energy, angular and speed distributions, etc.)

### **Spin isomerism**

[Jutta Toscano](#)

A type of isomerism where a particle with a single structure can have different nuclear or electron spin states. A classic example are the two nuclear spin isomers of  $\text{H}_2$ : ortho- and parahydrogen.

### **Stark decelerator**

A series of electrodes which are turned on sequentially when a beam of polar particles passes through, the timing of which is chosen to decelerate (or accelerate) the molecules by removing (or imparting) kinetic energy as the molecules pass through the electric field gradient.

### **Stark effect**

[Jutta Toscano](#)

A splitting of spectral lines of particles caused by strong external electric field.

### **Strong field ionisation**

Michael Burt

An ionization process whereby bound electrons subjected to a strong (intense) laser field tunnel through (or surpass) a potential barrier that is suppressed by the laser field.

### **Superfluid**

Shengfu Yang

A fluid with zero viscosity, meaning it flows without loss of kinetic energy. Typically achieved in liquid Helium cooled to cryogenic temperatures.

### **Surface dynamics**

Hendrik Nahler, Kenneth McKendrick

The dynamics of processes occurring on the interface between phases of matter (e.g., gas-solid or gas-liquid).

### **Surface Hopping**

Mario Barbatti

A computational technique in which the system transitions between different potential energy surfaces to simulate nonadiabatic processes in molecular dynamics.

### **Threshold photodetachment spectroscopy**

Katrin Dulitz

Frequency-resolved spectroscopy of negative ions near the photodetachment threshold which is the minimum energy required to eject a photoelectron. The measured observable is the number of ejected photoelectrons or, more frequently, the number of remaining negative ions. At threshold, the shape of the photodetachment spectrum is typically given by Wigner's threshold law. The technique is in analogy to the threshold photoionisation spectroscopy of neutral atoms and molecules.

### **Surface processing of plastics**

Shengfu Yang

Modification of the properties of a plastic surface by addition of, for example, evenly spread nanoparticles.

### **Sympathetic cooling**

Jutta Toscano, Brianna Heazlewood

The kinetic cooling of non-laser-cooled species through elastic collisions with laser-cooled particles (for example in an ion trap).

### **Tandem mass spectrometry (MS/MS)**

Anouk Rijs

A type of mass spectrometry in which a sample undergoes two stages of analysis. After the first ionisation and analysis, selected product ions are analysed again in the second stage. This improves the resolution and sensitivity of the technique compared to conventional spectrometry.

### **Thioflavin T (ThT) fluorescence assay**

Anouk Rijs

The use of Thioflavin T as a probe and characterise the inhibition and formation of amyloid fibrils based on the characteristic blue shift in the fluorescence spectrum of bound ThT.

**Time-of-flight mass spectrometry**

Claire Vallance, Brianna Heazlewood, [Jutta Toscano](#)

An adaptation of the mass spectrometry technique that separates ions and/or ionic fragments from a sample based on their mass-to-charge ratio after initial acceleration to the same kinetic energy.

**Time-resolved spectroscopy**

Dave Townsend, Vasilios Stavros, Corinna Kufner

Spectroscopy done using pump-probe techniques to study time-sensitive processes, oftentimes done on a very fast scale (<ns).

**Tomography**

Dave Townsend

A method of imaging a sample by sections using a penetrating wave probe. In chemistry, this can be used to map out species distribution in a sample or study molecular structures.

**Trace gas detection**

Hendrik Nahler

A collection of methods which allow scientists to detect very small amounts of gases in larger samples. Examples include cavity ring down spectroscopy or cavity enhanced laser induced fluorescence.

**Transient absorption spectroscopy**

Marissa Weichman, Vasilios Stavros, Helen Fielding, Corinna Kufner

A pump-probe spectroscopic technique used to measure the spectral absorption signatures that appear in the probe spectrum following photoexcitation or photoinitiation of chemistry with a pump pulse.

**Transmission electron microscopy (TEM)**

Anouk Rijs

A microscopy technique in which a beam of electrons is transmitted through an ultrathin film sample and the imaging is governed by the interaction between the sample and the electrons.

**Ultrafast electron diffraction (time-resolved ED)**

[Pedro Nunes](#), Derek Wann

A femtosecond scale, pump-probe experiment using diffracted electrons for discerning dynamic changes in the structure of materials. Recently a novel application of this technique used MeV electrons aimed at microjet to study water structure.

**UV Photodissociation**

Anouk Rijs

A resonant method in which adsorption of high energy ultraviolet photons from a laser source leads to dissociation.

**Velocity-map imaging**

Claire Vallance, Dave Townsend, Vasilios Stavros



An adaptation of ion imaging and time-of-flight mass spectrometry, a method of two-dimensional mapping of velocities (speed and direction) of products of dynamic processes.

### **Vibrational mode selective chemistry**

Marissa Weichman

The attempt to control the outcome of a reaction, or e.g. break a specific bond, by depositing energy into specific vibrational modes of reactants.

### **Vibrational polariton chemistry**

Marissa Weichman

A new field studying whether molecules whose vibrational modes are hybridized with a cavity mode can undergo reactions with different propensities than molecules in free space.

### **Vibrational strong coupling (VSC)**

Marissa Weichman

The act of forming polaritons by coupling IR-active vibrational modes of an ensemble of molecules to an optical cavity.

### **Wavepacket dynamics**

Graham Worth

Preparation of molecular wavepackets and observing their evolution, usually on a femtosecond scale, to study chemical processes in the time domain.

### **X-ray free electron laser**

Russell Minns

A type of laser where the X-ray light is produced from radiation emitted by electrons moving in an undulating manner through a series of magnets. Typically used for very sensitive X-ray diffraction experiments.

### **X-ray photoelectron spectroscopy**

Laura Ratcliff, Russell Minns, Helen Fielding

A variation of photoelectron spectroscopy which uses X-rays to probe the inner shell electrons of a particle.

### **Zeeman decelerator**

Brianna Heazlewood

A series of magnets which are turned on sequentially when a beam of paramagnetic particles passes through, the timing of which is chosen to decelerate (or accelerate) the molecules by removing (or imparting) kinetic energy as the molecules pass through the magnetic field gradient.

### **Zeeman effect**

Brianna Heazlewood

A splitting of spectral lines of paramagnetic particles caused by strong external magnetic field.