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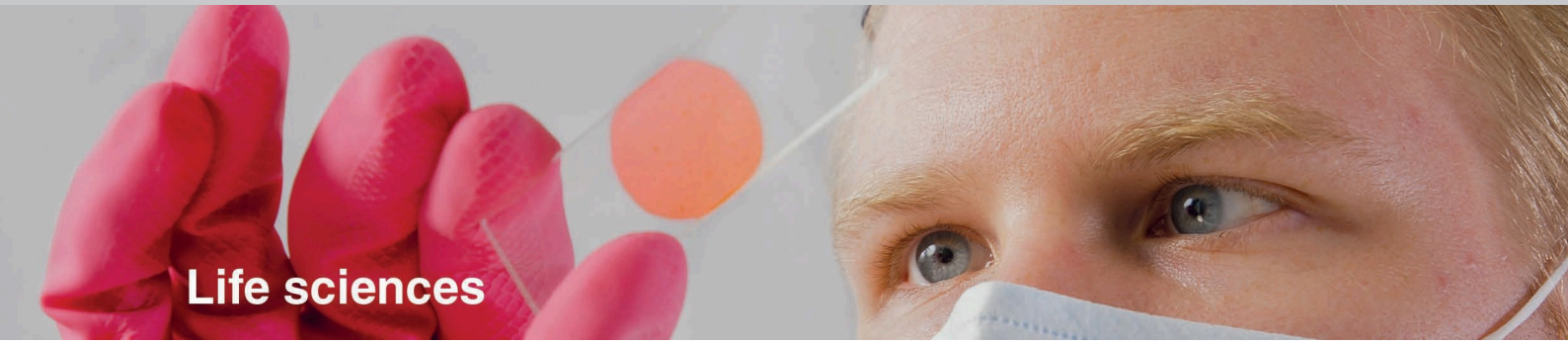
Solutions for life sciences
- Label free bio imaging

RENISHAW
apply innovation™

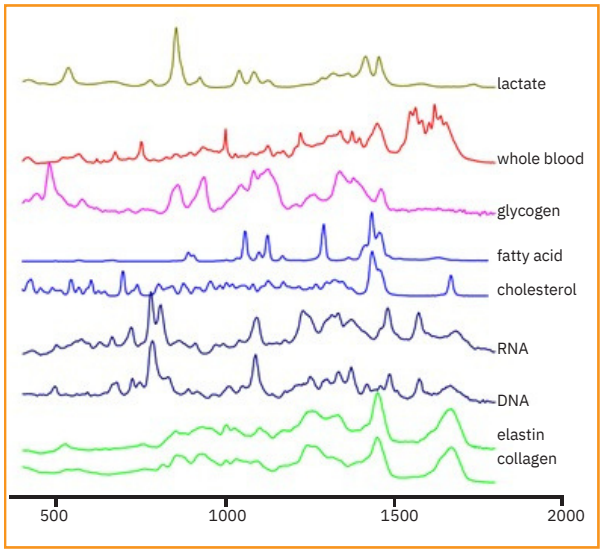
Raman imaging for biological applications. No stains. No labels.



Raman spectroscopy is an information-rich, label-free, non-invasive imaging technique that is ideal for life sciences research. It uses laser light scattering to provide a chemical fingerprint at each point of the analysed area and identifies the molecules present in samples.

Label-free, information-rich imaging

- Rapidly image biological samples.
- Explore the chemical processes within your sample.
- Minimal sample preparation.
- Non-contact and non-destructive analysis. Does not require chemical labelling or stains.
- Differentiate cell types and anatomical tissue layers.
- Image the distribution of biomolecules in whole organisms.
- Study chemical processes and the effects of therapeutic drugs and agents on cells.
- Image biomolecule interactions taking place during cell division and other dynamic cellular processes.



These Raman spectra demonstrate the range of different biological components that can be discriminated using Raman spectroscopy.

Renishaw's inVia Raman microscope is ideal for life sciences research

- Highly sensitive confocal Raman microscope.
- Supports a range of advanced Raman image generation techniques.
- Analyse sensitive or delicate samples without harming them. Perform high speed mapping using line illumination to minimise power density.
- Generate high spatial resolution confocal 2D and 3D images which reveal cellular and tissue architecture. Scrutinise small features.
- Collect chemical information from larger areas, from whole cells to tissue sections.
- Easy-to-use live cell incubator to maintain cellular health during live cell Raman analysis.
- LiveTrack for the rapid analysis of uneven biopsied samples.

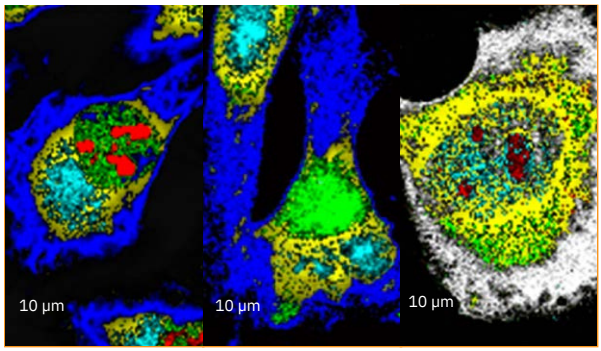
The inVia Qontor confocal Raman microscope.

Applying innovation to biological imaging Example applications

Cell imaging Extract chemical information without the need to manipulate genes, or use stains or antibodies. This helps ensure the results reflect the true chemistry of the cells.

- Identify and differentiate cancer cells from normal cells, stem cells from differentiated cells and different sub-states in a cell population (e.g. stem and progenitor cells).
- Identify cells without known markers, based on their inherent chemical profiles. There is no need to conjugate with antibodies or manipulate genes.
- Study individual cells within a population and determine cell-to-cell variability. For example, analyse the distribution of lipids and DNA in healthy and abnormal cells.
- Study live cells using a cell incubator to control temperature, CO2 concentration and humidity, to keep cells in their normal physiological states during analysis.

Download further details about cell imaging with the inVia confocal Raman microscope at **www.renishaw.com/cells**



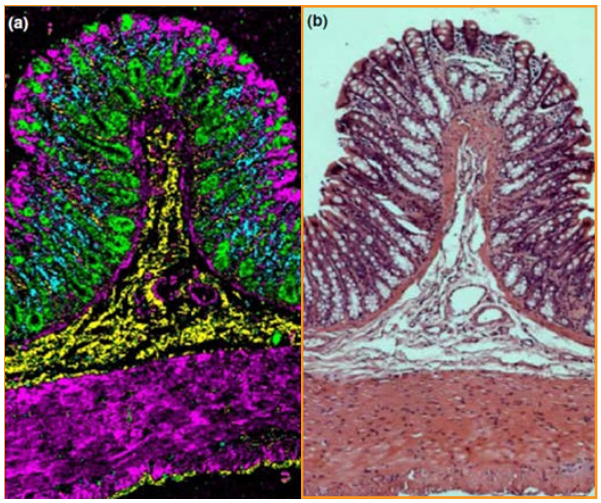
Raman image of human osteosarcoma (bone cancer) cells. Compare the size and distribution of organelles and biomolecules in normal and abnormal cells. Normal, autophagic and apoptotic MG-63 cells are shown from left to right.

Tissue imaging

Extract a full spectrum of chemical information (from entities such as nucleic acids, proteins and lipids) without the need for targeting biomolecules, markers, stains or dyes. Clearly visualise tissue morphology with Raman images.

- Accurately distinguish, identify and demarcate pre-cancerous, cancerous and healthy tissues, without the need for fluorescent or colorimetric labelling.
- Study the development of an organism, the pathogenesis of diseases and tissue's response to drugs or stimulants.
- Study the concentration, distribution, conformation, redox and spin states, and orientation of biomolecules.
- Generate Raman images whilst avoiding photothermal damage to the tissue.

Download further details about tissue imaging with the inVia confocal Raman microscope at **www.renishaw.com/tissue**



Comparison of a Raman image and haematoxylin and Eosin (H&E) stain of a healthy rat colon crypt. The Raman false-coloured composite score image shows the different cell types and anatomical layers (a) differentiating connective tissue (yellow), muscle (purple), mucin (green) and nuclei (blue). Data courtesy of Riana Gaifulina, University College London, UK.

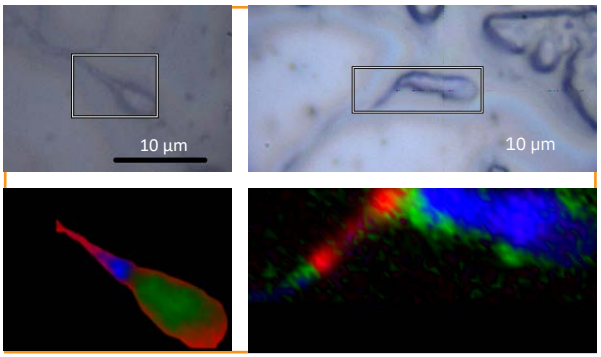
No matter how unique your requirements are, Raman Products Team can develop a custom system to meet your needs.

Redox biology

Elucidate redox states within biological systems to study redox dynamics and its effects on health regulation and diseases. Generate Raman images to visualise the spatial relationships, distribution, redox and spin states of haem proteins within biological systems.

- Identify haem proteins by their Raman spectra and determine their redox and spin states by Raman band positions.
- Reveal haem protein information within biological systems *in situ*. Raman imaging provides information on the relationship between their distribution, protein, organelle and cell functions.
- Shed light on the protein, organelle and cell functions and dynamics through redox biology.

Find out more information about Redox biology with the inVia. Download an application note and view a webinar at **www.renishaw.com/bio**



White light and Raman images of spermatozoa. In the Raman image, reduced cytochrome signals are detected in blue and red domains.

Combine Raman spectroscopy with your existing biological imaging techniques

For maximum efficiency, you can analyse your sample with two or more techniques, including upright or inverted configurations, without having to transfer the sample between instruments. With Renishaw's correlative microscopy systems, you can be confident that you are analysing the same point with both techniques.

Confocal laser scanning microscopy (CLSM)

- Add Raman imaging to your CLSM and correlate confocal fluorescence images with Raman chemical images.
- Renishaw has combined Raman spectroscopy with CLSM systems such as the Leica SP8 CLSM, the Olympus Fluoview, the Zeiss LSM and the Nikon A1 CLSM.

Epifluorescence, Differential interference contrast (DIC) and dark-field microscopy

- Perform co-located imaging using fluorescence, contrast, and Raman spectroscopy.
- Renishaw's inVia Raman systems use research grade microscopes and are compatible with epifluorescence, DIC and dark-field contrast imaging.

Combined Raman and confocal laser scanning microscope

Atomic Force Microscopy (AFM) inVia's chemical imaging capabilities can be coupled to AFMs on upright and inverted microscopes, and free standing AFMs. Standard integration packages include: Bruker (Dimension Icon FastScan Bio and BioScope Resolve), JPK (NanoWizard), Nanonics Imaging Ltd (MV2000 and MV4000) and NT-MDT (Integra).

Inverted microscopes

Combine research grade inverted microscopes and Raman spectroscopy.

The Leica DMi8 bespoke integration provides access to all ports for other techniques. Renishaw has also developed custom solutions for Zeiss, Nikon, and Olympus inverted microscopes.

Live cell incubator

- Control CO 2, humidity and temperature.
- The compact stage-top Okolab incubator is compatible with both Inverted or upright microscope.

Larger environmental chambers are also available.