

# Investor Day

## Spectroscopy Products Division

15<sup>th</sup> May 2014

*Presented by Simon Holden*



## Customer needs

Academic and industrial scientific researchers use Renishaw Raman instruments to tackle analytical problems by a method called Raman Spectroscopy

Customers want to:

- be at the forefront of scientific research and innovation
- publish academic, peer reviewed papers
- perform research and development into next generation products
- perform quality assurance testing

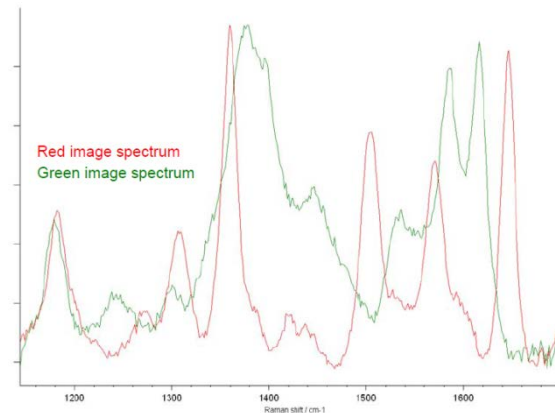


**Renishaw's Raman systems enable these customers to meet their needs**

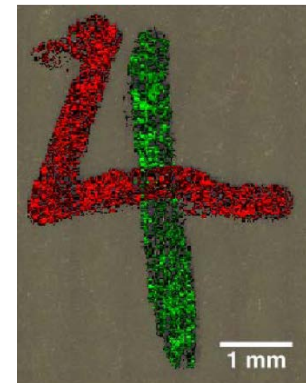
## Customer needs

Using laser light to extract chemical fingerprint information, Renishaw's Raman systems:

- enable cutting-edge chemical analysis
- produce crisp, clear chemical images
- provide robust, reliable results
- reduce time taken to collect and process high-quality data
- can interface with alternative technologies and open up new research opportunities



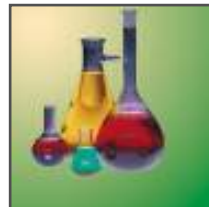
Crossed ink lines  
reveal tampered  
documents from  
chemical  
'fingerprint'



# Customer needs

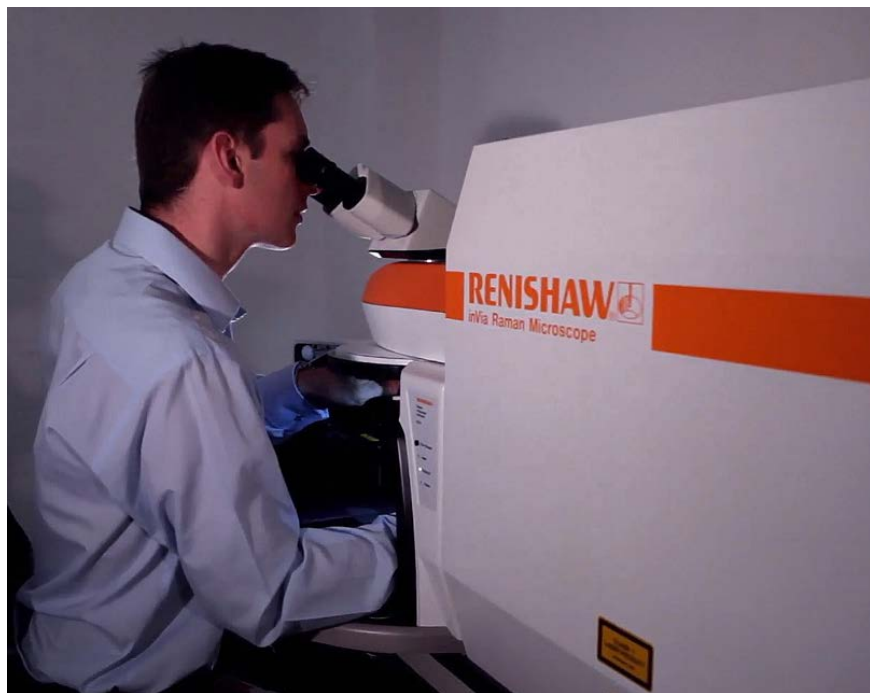
Raman systems work across many application areas:

- Chemicals
- Materials
- Pharmaceuticals
- Biology
- Semiconductors
- Forensics
- Gemmology
- Antiquities
- Solar Cells
- Medical Diagnostics



# Engineering solutions

inVia™ - Research grade Raman microscope



Upright



Free space



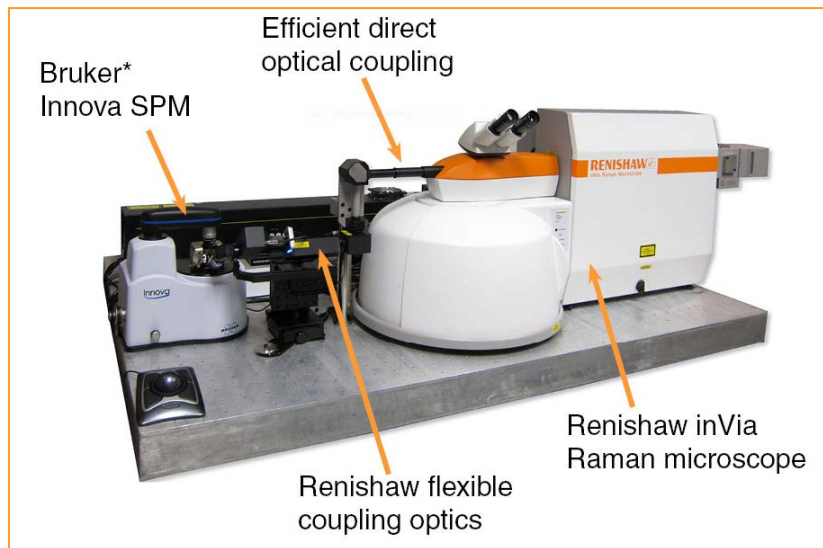
Inverted



In April 2014 inVia was awarded a Queen's Award for Enterprise: Innovation

# Engineering solutions

Simultaneous Raman spectroscopy  
and AFM/SPM enable nanoscale investigation



Couple inVia with other techniques



# Engineering solutions

RA800-series OEM bench top Raman  
for routine analysis tasks



In use at Renishaw Diagnostics

RA100-series Raman analyser with flexible  
fibre optics



Analysis of the Holy Shroud



Analysis of gemstones

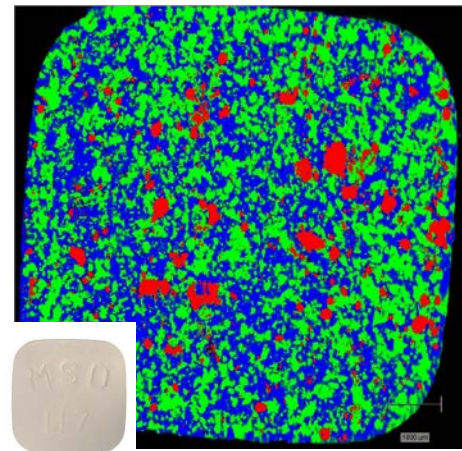
# Successful outcomes

## Use of Raman in the Pharmaceutical industry

Drug companies need methods to analyse tablet dosages to:

- verify chemical structure and purity
- check uniformity of dosage
- control drug solubility
- improve bioavailability
- enhance stability

Renishaw's Raman imaging is non-destructive and enables the physiochemical properties of APIs and excipients to be characterised within the finished pharmaceutical formulation



Pharmaceutical tablet showing chemical map of drug constituents



## Successful outcomes

### inVia used in breakthrough graphene research

- Project to address one of the major hindrances to the wider exploitation of graphene: the difficulty in growing large defect-free films.
- An international team led by Oxford University, Renishaw and researchers from Germany and Greece, used an inVia Raman microscope to examine film thickness, strain and defects in graphene films to develop methods to make commercial graphene.

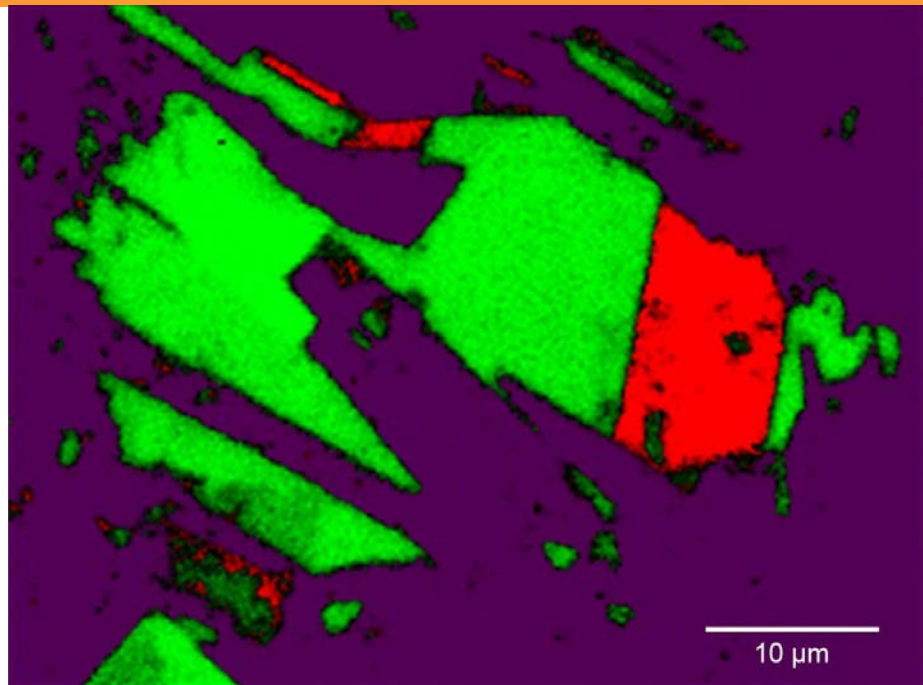


Image: StreamLineHR *Rapide* image of single-layer graphene (red) and multi-layered graphene (green) on a Si/SiO<sub>2</sub> substrate