25 YEARS IN FOCUS

Foto: Deutsches Optisches Museum (D.O.M.), Jena

EARLY DAYS OF MICROSCOPY

Light microscopy began with the development of single optical lenses for magnification. The first compound instrument with two lenses is credited to Hans Jansen and his son Zacharias in 1595. Galileo Galilei used his telescope as a microscope.

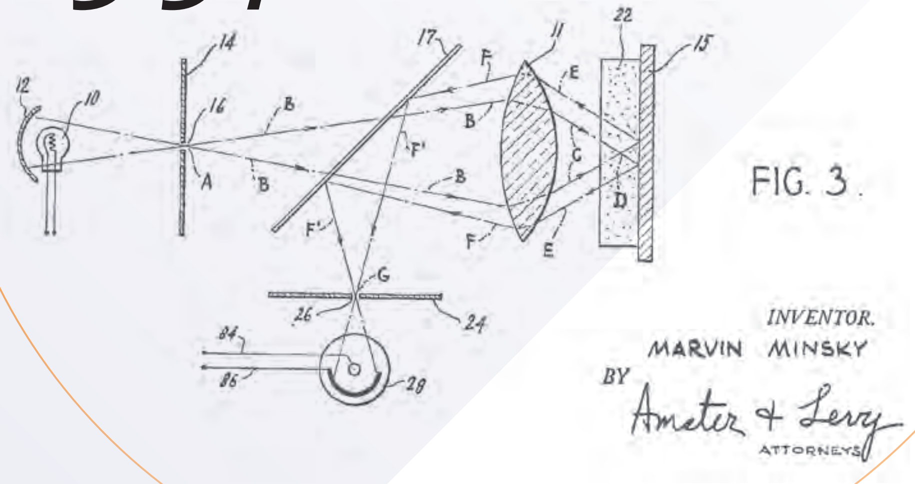
Robert Hooke constructed an instrument with several lenses and was the first to identify cells, seeing them in cork, though he didn't realize their significance. Antonie van Leeuwenhoek was a gifted lens producer: he achieved a 270x magnification with his microscope.

Ernst Abbe defined the diffraction limit for a microscope, known as the Abbe limit. Together with Carl Zeiss and Otto Schott he laid the foundation for modern optics.

$$d = \frac{\lambda}{2n \sin \alpha}$$

1595

1957



Marvin Minsky (Inventor), Ameter & Levy (Attorneys)
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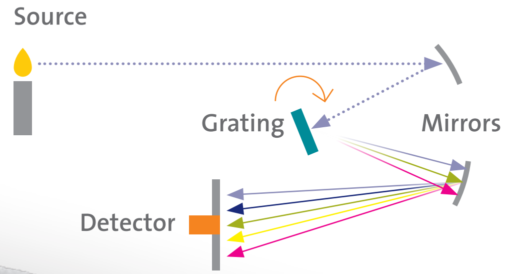
CONFOCAL MICROSCOPY

Marvin Minsky developed the basic concept of confocal microscopy, which he patented in 1957. Using a pinhole, only light from the focal plane enters the detector. Blocking the out-of-focus light provides images with higher resolution and contrast than classical wide-field microscopy. By acquiring multiple images of a transparent sample along its z-axis, this technique enables its visualization in three dimensions.

SPECTROMETRY

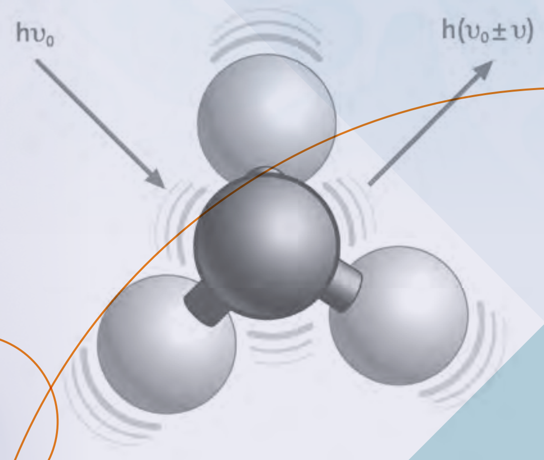
Spectrometers split light into spectral lines. The simplest spectrometer is a glass prism. In the early 19th century Joseph von Fraunhofer developed spectrometers into highly precise measuring tools using diffraction gratings, after Augustin-Jean Fresnel and Thomas Young had discovered the principles of diffraction. Diffraction gratings consist of periodic structures that disperse light into several beams at different angles dependent on wavelength. Gratings with a higher number of grooves per unit of length will show a greater dispersion, that is, a larger angle between different wavelengths following diffraction.



1815

THE RAMAN PRINCIPLE

Some photons in light scattered by a material exhibit a shift in wavelength that depends on the incident wavelength and the material's properties. This phenomenon was named the Raman effect after its discoverer, Sir Chandrasekhara Venkata Raman. As this reaction is a result of inelastic scattering by the molecular bonds of the exposed material, each molecule and chemical compound produces a unique Raman spectrum from which it can be identified. Furthermore, a Raman spectrum contains information on the quantity of a specific compound, the degree of crystallinity, crystal symmetry and orientation and the presence of stress.



1928

25 YEARS
IN FOCUS

25 YEARS OF EVOLUTION IN RAMAN IMAGING AT WITEC

We were three physicists who met by chance at the University of Ulm and decided to become entrepreneurs. 1997 was the year: we founded WITec. "We" means Dr. Olaf Hollricher, Dr. Joachim Koenen and Dr. Klaus Weishaupt. Our first products were a Scanning Near-field Optical Microscope (SNOM) and Pulsed Force Mode (PFM) control electronics. SNOM enables optical microscopy with spatial resolution beyond the diffraction limit. PFM is a non-resonant intermittent contact method that is used for Atomic Force Microscopy (AFM).

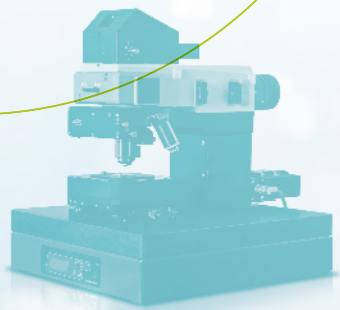
Thus already our first instrument enabled high-resolution correlative microscopy as it combined SNOM and AFM in a new, innovative manner in a single instrument. It is still being used by its launch customer at the University of Illinois Urbana-Champaign.

We chose "Focus Innovations" for the company's maxim because that's what we aspired to achieve as a company developing new scientific instruments. It turned out to be a good decision: since then, the company has stayed true to this ethos and become the primary technology leader in Raman microscopy and a world-renowned manufacturer of confocal and correlative Raman imaging systems.

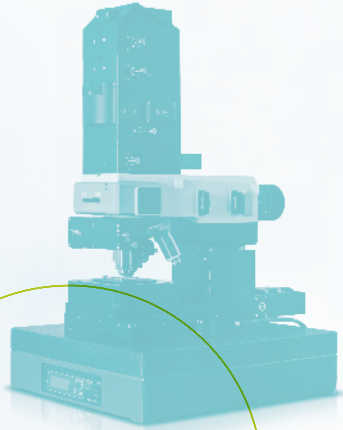
1997

1999

1999 – We pioneer Raman imaging and introduced our *alpha300 R*. It was the first Raman imaging microscope to be confocal and was substantially faster than any conventional system.



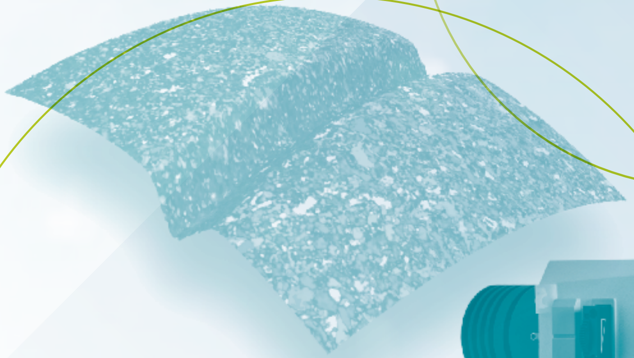
2003 – We initiate correlative Raman imaging/Atomic Force Microscopy (AFM) imaging by integrating two microscopes within one instrument. The result was our *alpha300 RA*, the first instrument worldwide capable of applying both techniques on a sample without transferring it.



2003

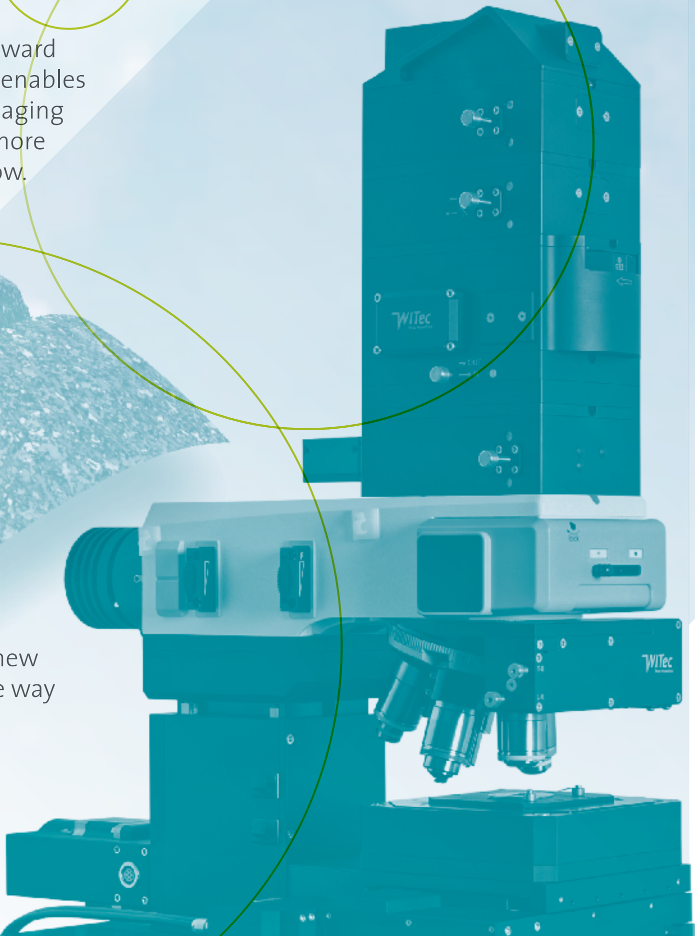
2008

2008 – We receive the R&D 100 Award for our *alpha500 RA* system, that enables automated, correlative Raman imaging and AFM. Through 2022, twelve more awards for our products will follow.

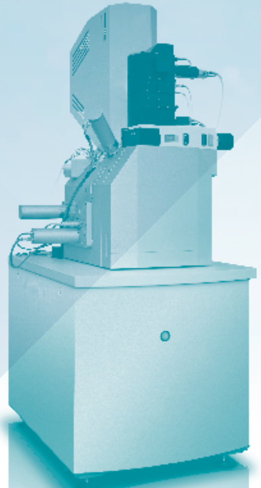


2010 – We market *TrueSurface*, a new optical profilometer, and pave the way for topographic Raman imaging.

2010

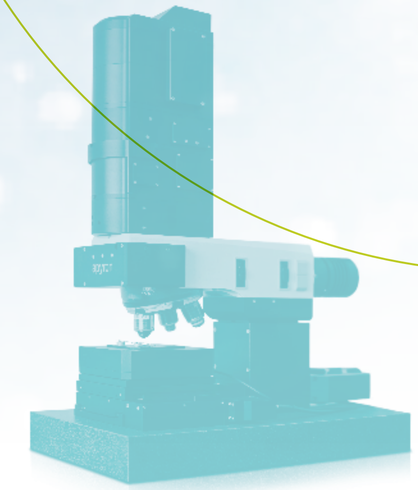


2014



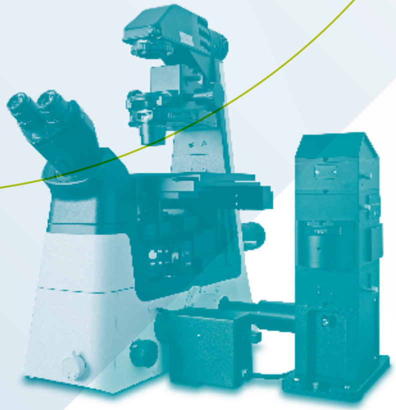
2014 – We do it again: we merge two microscopes. This time we combine Raman imaging with Scanning Electron Microscopy. Through the new *RISE (Raman Imaging and Scanning Electron)* microscope, ultra-structural surface properties can be linked to molecular compound information.

2015



2015 – With our new *alpha300 apyron*, we redefine what is expected of a "fully automated" Raman microscope.

2018



2018 – In this year, we turned everything upside down. The result was the *alpha300 Ri* inverted confocal Raman microscope.

2019

2019 – On the trail of microparticles: With *ParticleScout* we use Raman spectroscopy to find, classify and identify particles on the micro- and nanoscale.

2021

2021 – Ice cold: WITec and attocube systems AG launch a hot device – *cryoRaman* for Raman imaging at very low temperatures.

2022

2022 – We celebrate our 25th anniversary. The company, now with 85 wonderfully smart and committed employees, has step by step become recognized as the home of innovation in Raman imaging and correlative microscopy.

In 2021 we became part of the Oxford Instruments Group. Joining this revered UK-based technology company enhanced our reach and resources while preserving our technological agility and close connection to the research community. Our customers can look forward to new, exciting products as WITec continues to chart the course ahead for Raman microscopy.