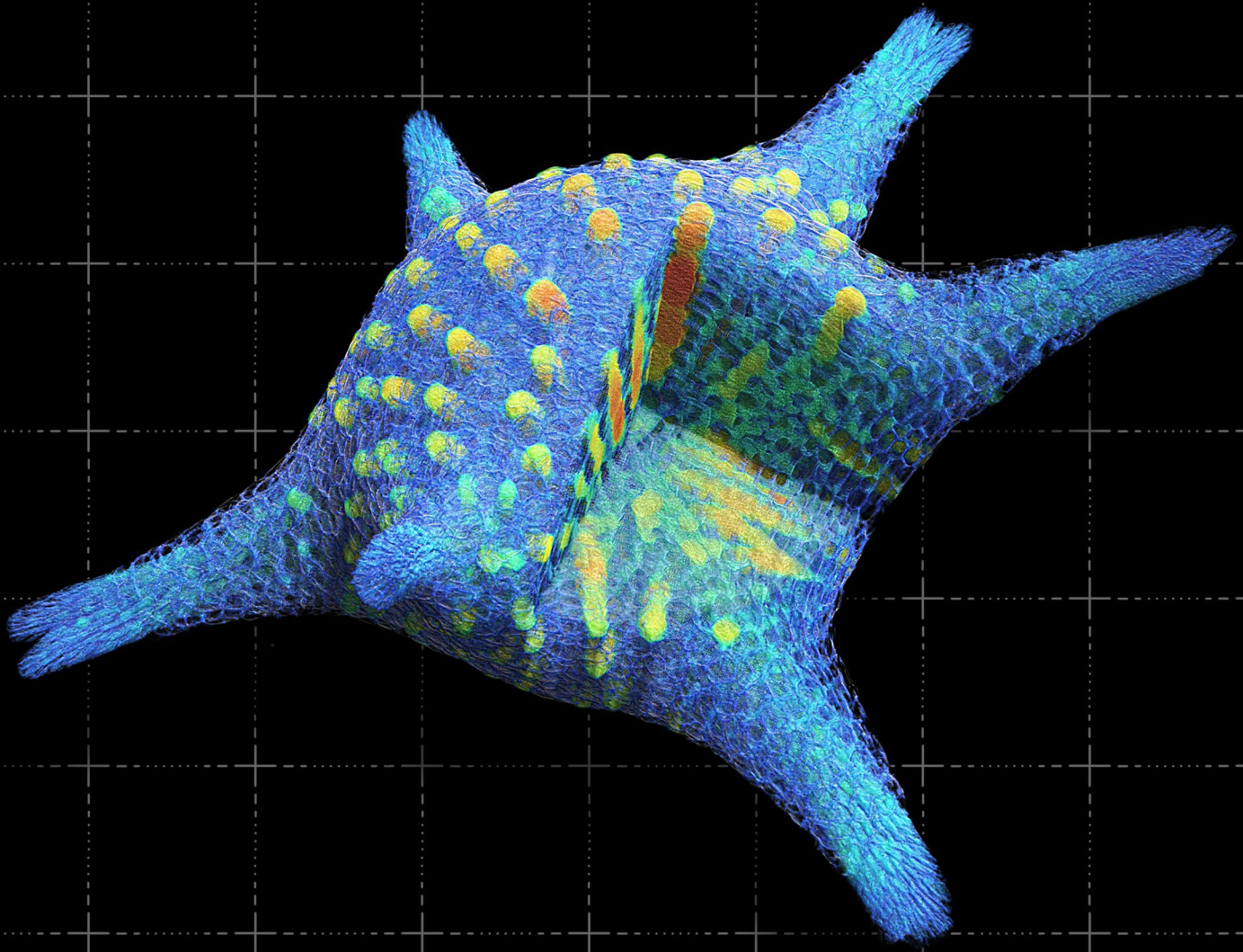
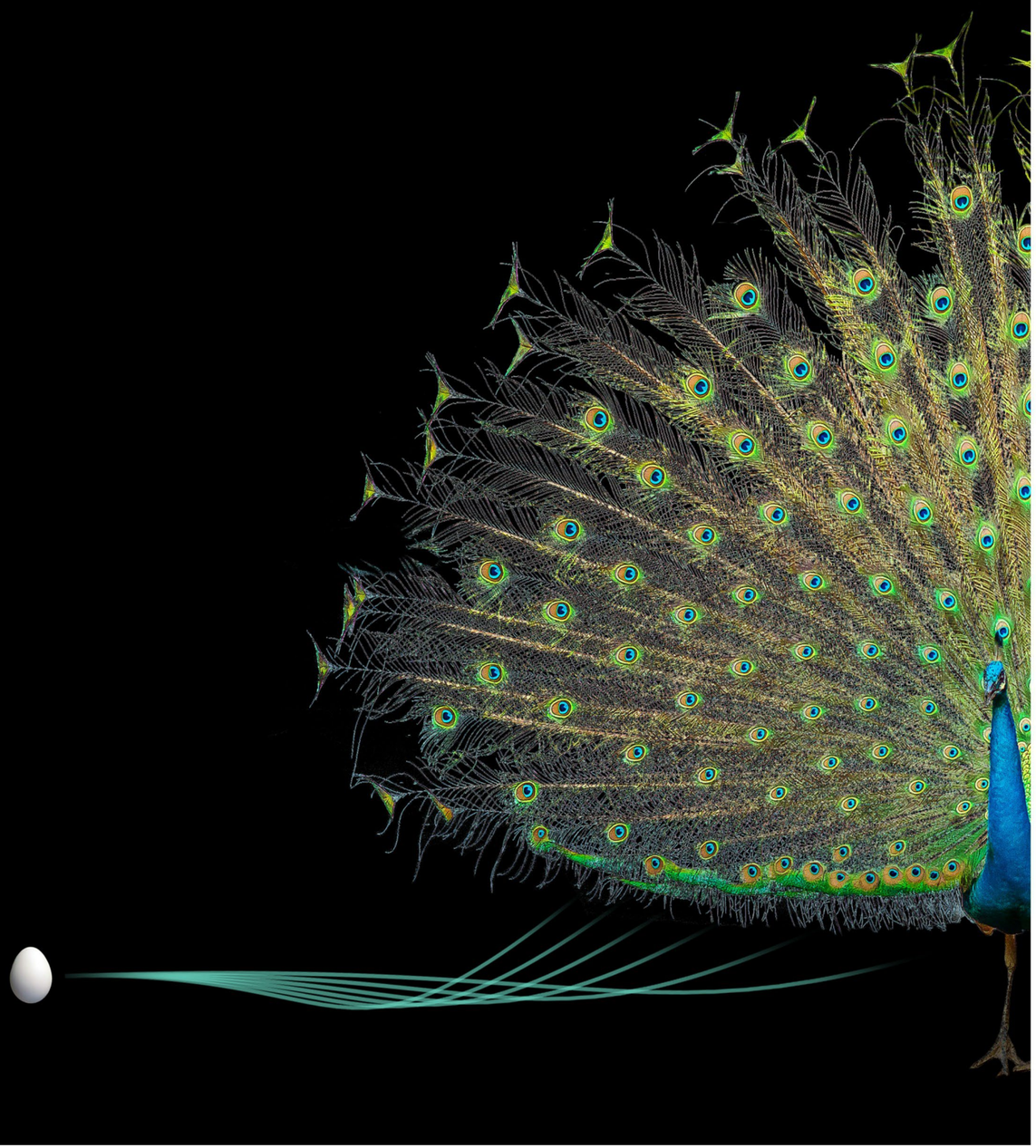
NEOSCAN

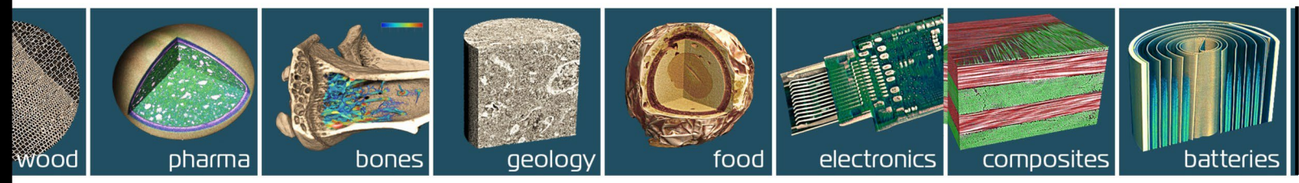


X-RAY MICROTOMOGRAPHY

MICROTOMOGRAPHY
FROM ORIGINS TO PERFECTION



X-Ray Microtomography or Micro-CT is an emerging microscopy technique for non-destructive visualization and measurement of an object's internai 30 microstructure at (sub-)micron levei without any sample preparation



1980 — Pioneering developments in microtomography started in **1980** as a part of the PhD project defended in **1983** by Alexander Sasov, current CEO and Founder of NEOSCAN

1983 — The subsequent developments in micro-CT led to a large number of scientific publications, including a 24-pages overview published in **1987** in the Journal of Microscopy.

1987 — In **1993** Dr. Sasov installed the first micro-CT at the Department of Physics at the University of Reims in France.

In **1996,** he co-founded the company SI<vScan in Belgium, tal<ing on the roles of CEO and lead designer of all SI<yScan micro-CT instruments. Thanl<s to the innovative design, SI<vScan became the leading global supplier of micro-CT systems. In **2012,** SI<vScan was acquired by Brul<er and renamed Brul<er Micro-CT.

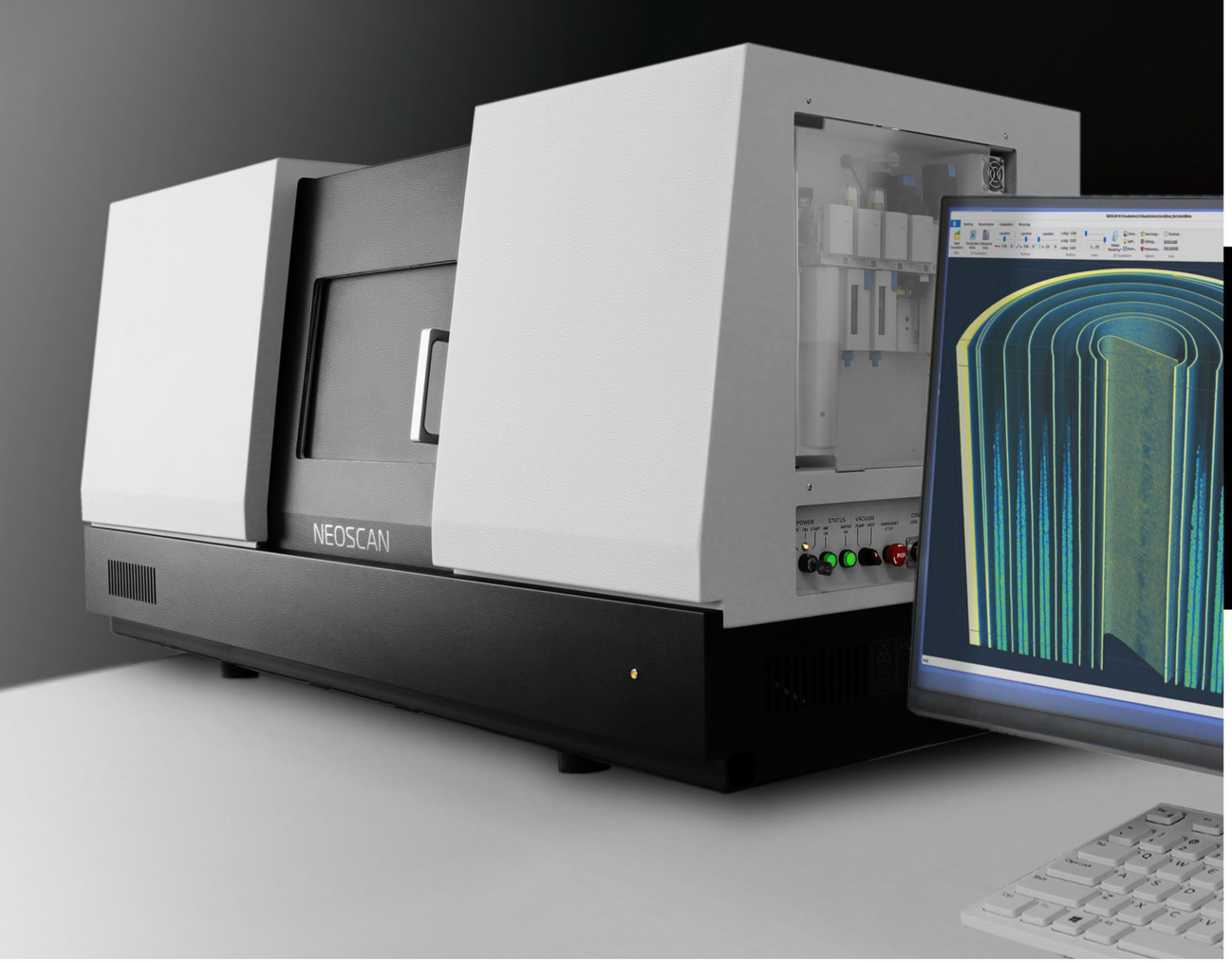
2012 — To accelerate micro-CT innovations and reduce time to marl<et Dr. Sasov left Brul<er and in **2019** founded NEOSCAN. Now, bacl<ed by a powerful, experienced, and dynamic team, four decades of micro-CT expertise have been converted into a wide range of high-end systems, serving scientists worldwide.

2019 — NEOSCAN developing accessible and highly "personal" desl<top micro-CT instruments to revolutionize 30 microscopy, much lil<e personal computers revolutionized the world 3 decades ago

PERFORMANCE	Amazing spatial resolution and image quality, fast scanning
RELIABILITY	Maintenance-free instruments, up to 10 years warranty
USABILITY	Effortless operation, license-free software, intuitive user interface
TRUST	Free software updates for life, exceptional customer support

NEOSCAN N90

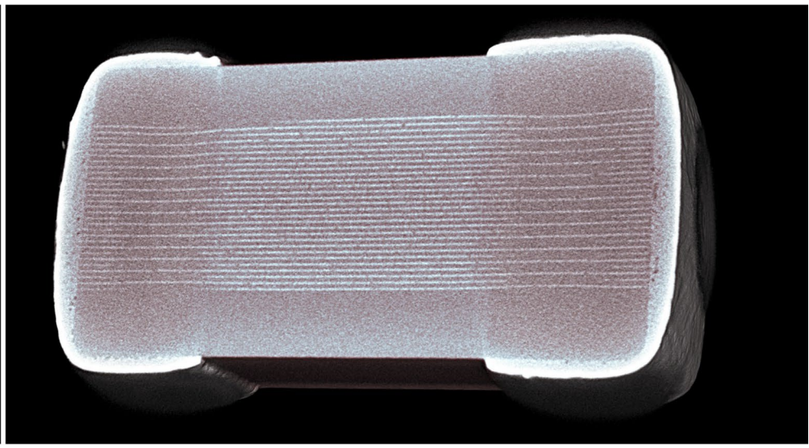
BENCHTOP NANOTOMOGRAPH



Neoscan N90 is the world's first bench-top nanotomography system.

Now researchers can get a highly personal and easy-to-use nano-CT on their desl< with capabilities equal to or better than those of large, heavy and complex systems.

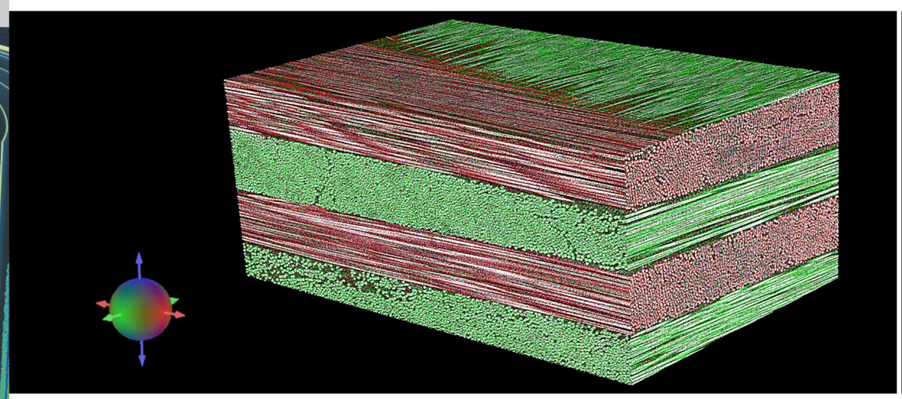
- 40 nm pixel size at highest magnification
- 300 nm resolution (JIMA resolution chart)
- 20-160 l<V / 16 W X-ray source with diamond window
- Dual detector set-up: 27 MP CMOS + 7 MP flat panei
- Integrated anti-vibration granite platform with pneumatic leveling
- Powered from a standard wall socl<et 100-240 V/ 750 W
- Small footprint of 1540 x 580 mm
- Optional integrated full-field micro-XRF for chemical mapping



▶ Multilayer ceramic capacitor (MLCC) 0.3 x 0.3 x 0.6 mm

volume rendering with virtual cut

175 nm voxel size



◀ Carbon-fiber reinforced polymer (CFRP).

220 nm voxel size.

1 x 0.7 x 0.5 mm volume inside 3 x 3 x 10mm block

volume rendering with color coded 3D orientation

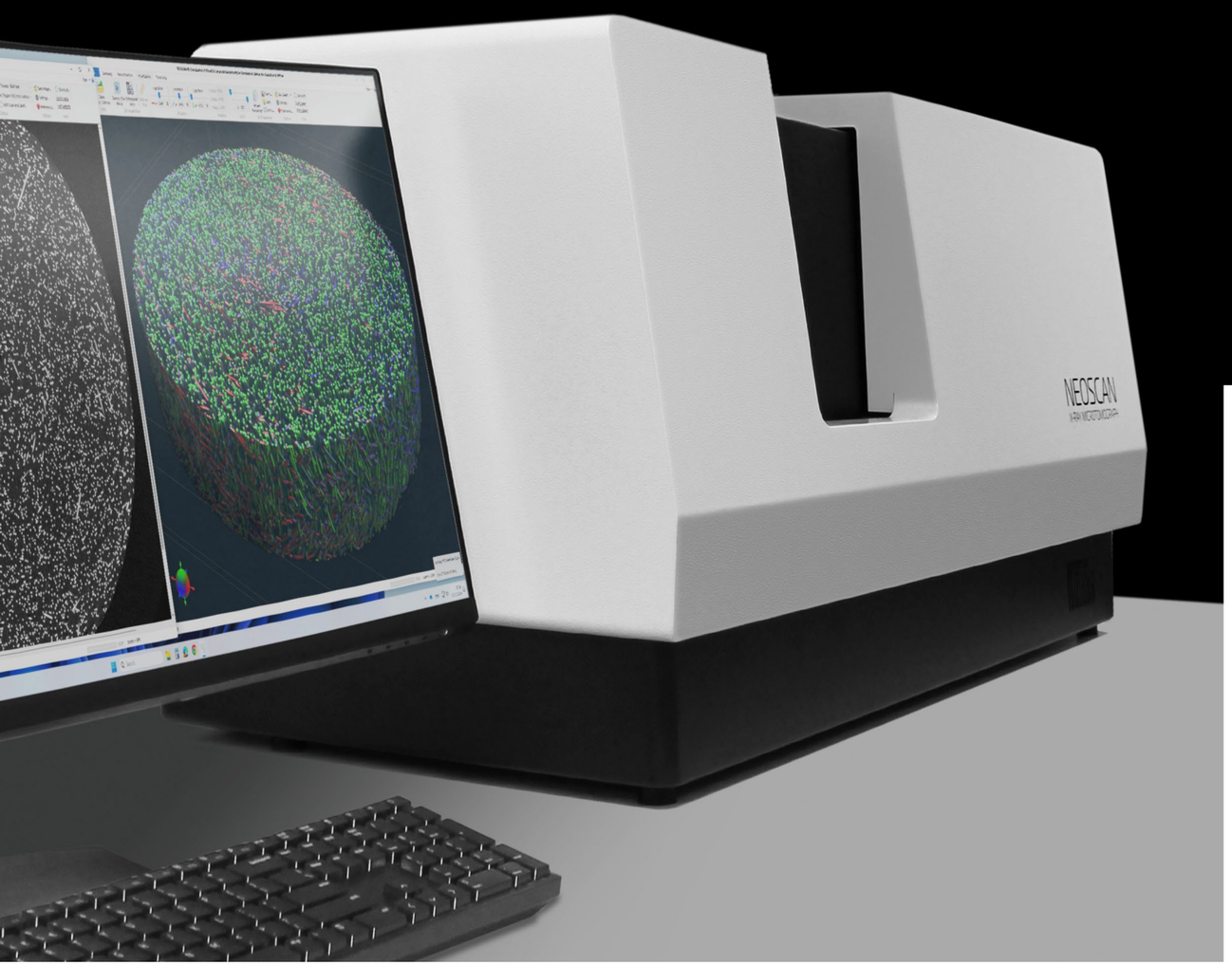
more details and examples

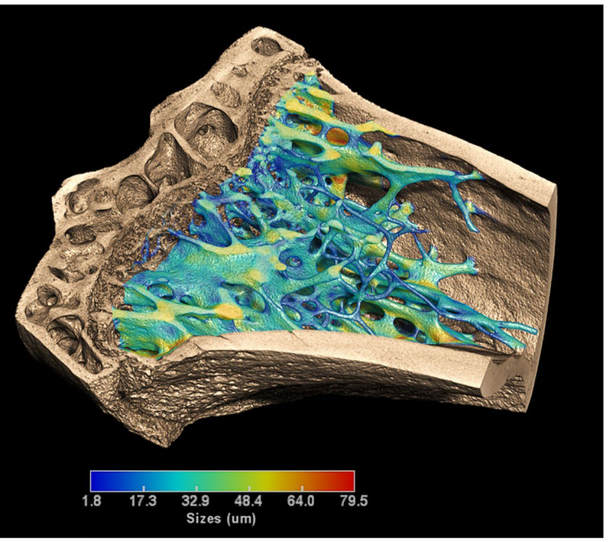
NEOSCAN N80

HIGH-RESOLUTION MICRO-CT

Neoscan NB0 is a scientific grade high-resolution microtomograph.
The NB0 houses a unique and innovative X-ray source allowing for highest-resolution scanning of large samples. The NB0 is supplied with a flat-panel detector for fast scanning or with a CMOS detector for scanning at smallest pixel size.

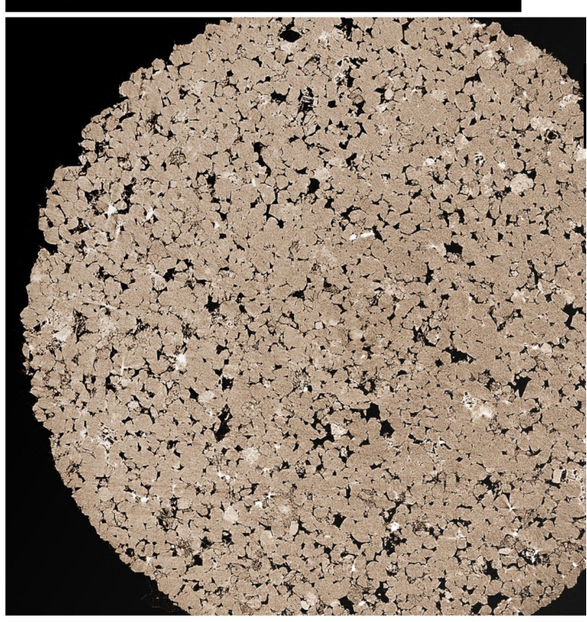
- < 0.5 µm (CMOS) / < 1.2 µm (FP) pixel size at maximum magnification
- 20-11O I<V / 16 W X-ray source, Tungsten on diamond target, 2 µm spot size
- 7 MP/ 14-bit flat-panel or 27 MP/ 16-bit CMOS radiation protected X-ray detector
- Max. scanning volume: 100 mm in diameter by 135 (CMOS) / 180 (FP) mm length
- Maximum object size 100 mm diameter x 220 mm length
- Round scan, multiple automatically connected scans, helical scans
- Active artifact elimination, phase-contrast retrieval
- Optional automatic sample changer, 24 positions
- 10 years or 10 000 h source operation (whichever comes first) standard warranty

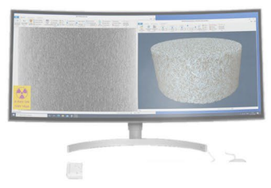


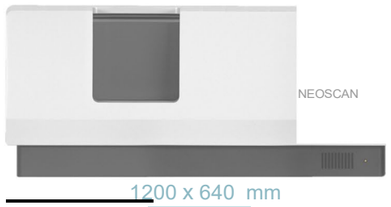


▲
Mouse bone
volume rendering with virtual cut
1.8µm voxel size
color coded local trabecular thickness

Sandstone sample 5.8 mm in diameter
virtual slice
12 496 x 12 496 pixels, 0.51 µm pixel size
▼



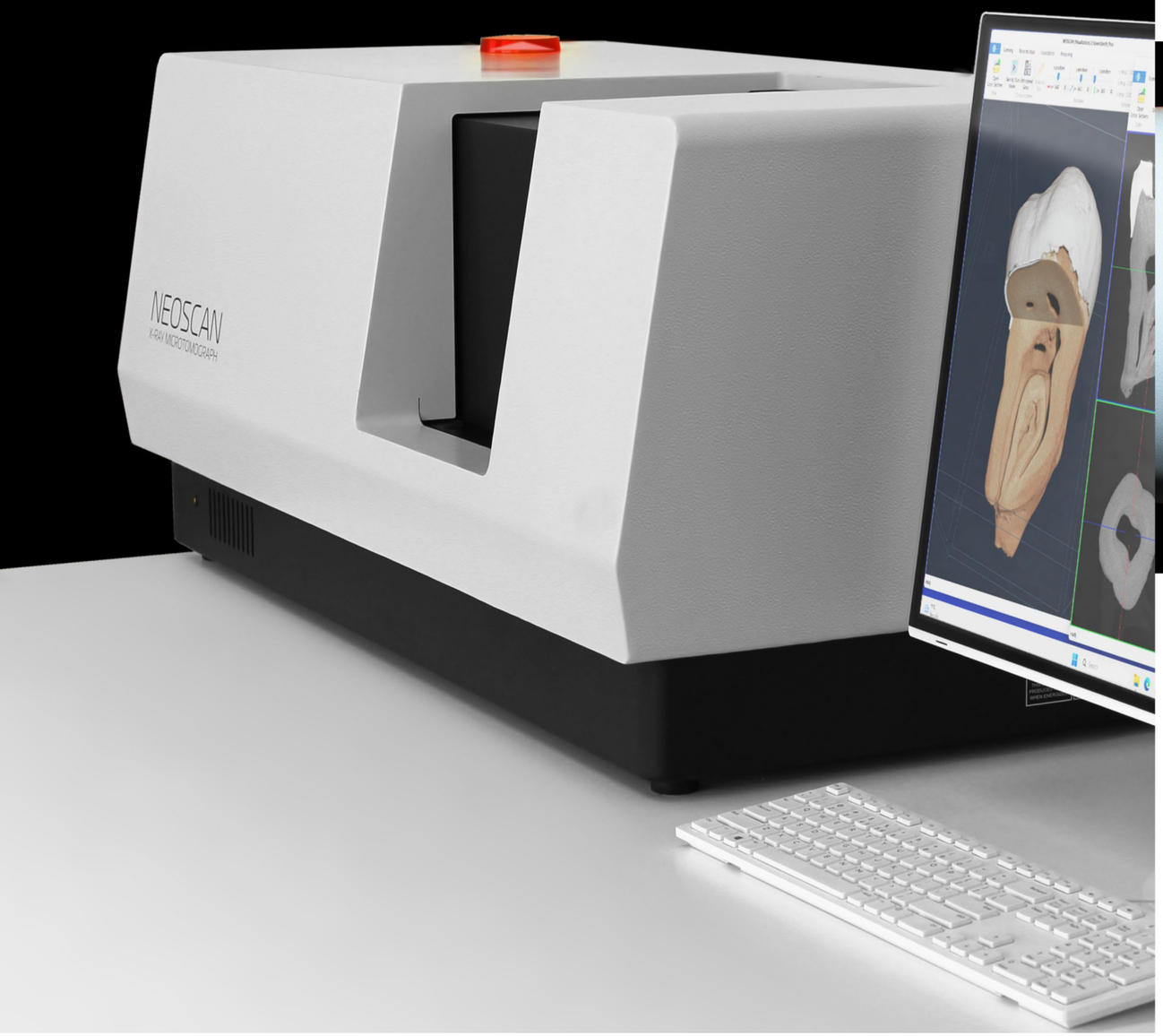




more details
and examples

NEOSCAN N70

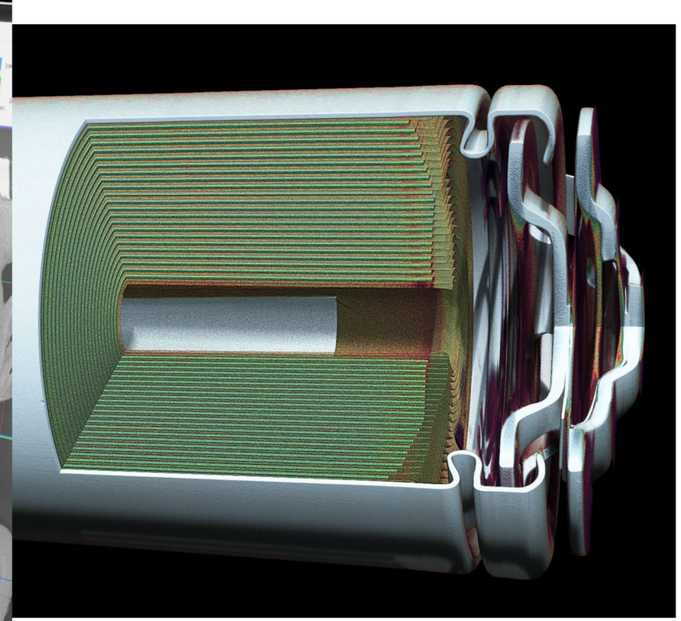
FAST AND ACCURATE MICRO-CT



Neoscan N70 is a fast, reliable and metrologically accurate microtomograph.

The combination of a powerful 100 l<V / 20 W X-ray source and an efficient flat-panel detector, sensitive to high energies, mal<es N70 the system of choice for scanning dense and large samples. High dimensional accuracy and helical scanning mal<es it suitable for metrological applications.

- < 2.S µm pixel size at maximum magnification
- 4 µm spatial resolution (JIMA resolution chart)
- 20-100 l<V / 20 W X-ray source
- Radiation protected 7 MP flat-panel X-ray detector
- Maximum scanning volume 100 mm diameter x 120 mm length
- Maximum object size 100 mm diameter x 220 mm length
- Round scan, multiple automatically connected scans, helical scans
- Optional automatic sample changer, 24 positions

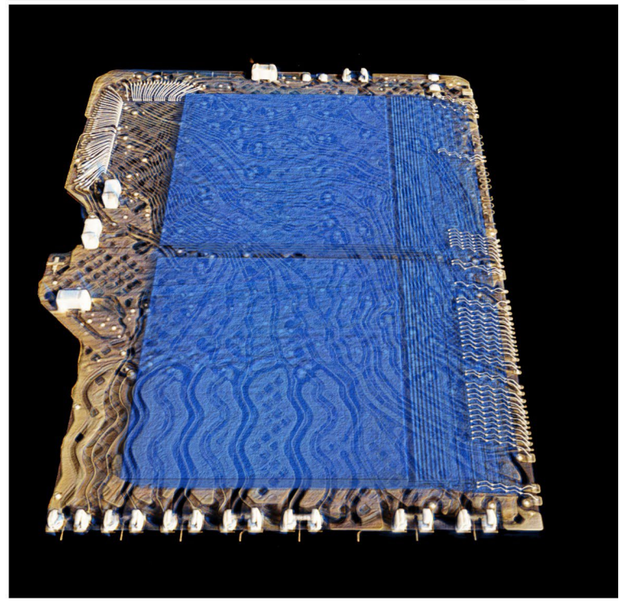


Internal structure of a 256 GB MicroSD card with multilayer 3D stacked NAND technology

volume rendering

4,5 µm voxel size

▼

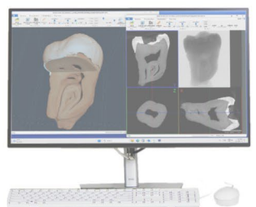


▲

Lithium-Ion battery type 18650

volume rendering,
front corner virtually removed

7.5 µm pixel size



more details
and examples

(!)

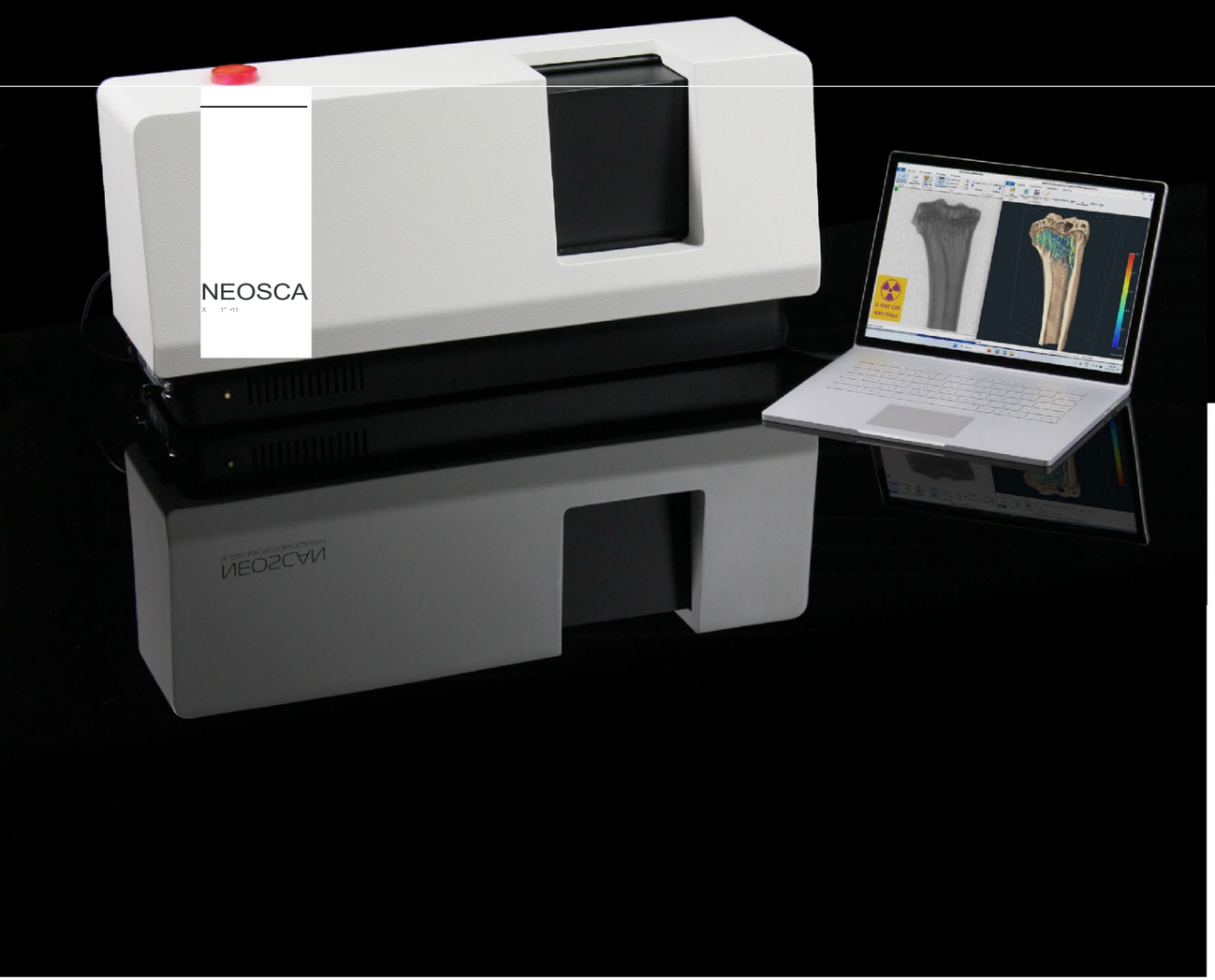
NEOSCAN N60

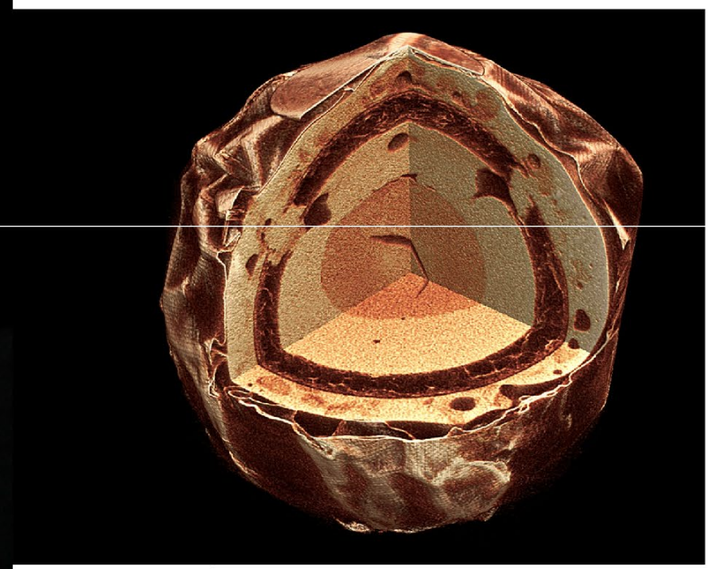
COMPACT MICROTOMOGRAPH

Neoscan N60 is an affordable compact microtomograph.

With N60, modem scientists can get a compact but very powerful toai for fast, non-destructive 30 imaging of a wide range of objects made from different materiais.

- 3.8 µm smallest pixel size for any object size
- 8 µm spatial resolution (JIMA resolution chart)
- 20-65 l<V / 50 W X-ray source
- Radiation protected 15 MP cooled CMOS X-ray detector
- Maximum scanning object diameter is 35 mm
- Up to 91< x 91< pixeis in reconstructed virtual slices
- Very compact size, footprint only 80 x 31 cm, weight 45 l<g
- Using single USB3 connection, it can worl< with both desl<top PCs and notebool<s





▲
Round biscuit with a whole hazelnut inside covered with chocolate and hazelnut crumble.

volume rendering,
front top corner virtually removed

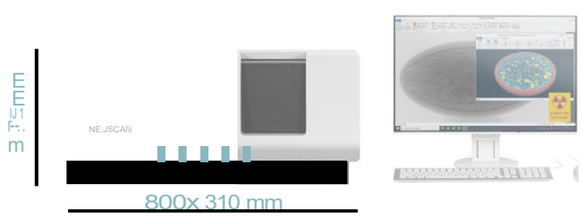
15 µm pixel size

Human tooth

volume rendering with virtual cut

7.5 µm pixel size

▼



more details ...._.,,
and examples

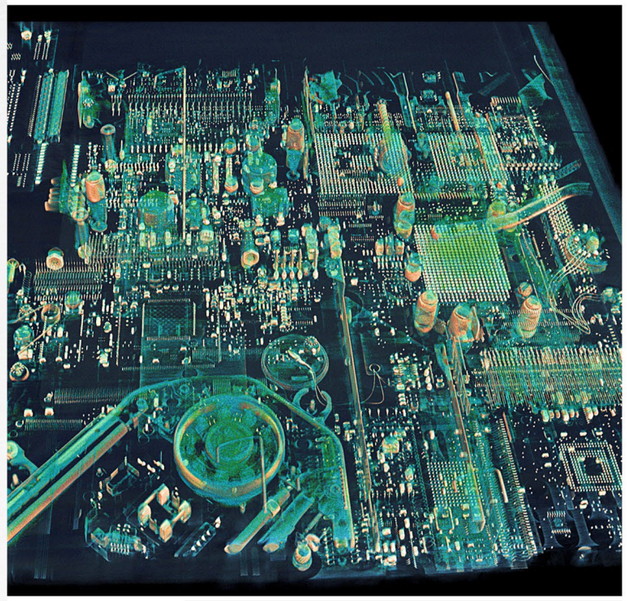
NEOSCAN NXL

MICRO-CT FOR LARGE AND DENSE OBJECTS

Neoscan NXL is a unique bench-top scanner with high penetration power.

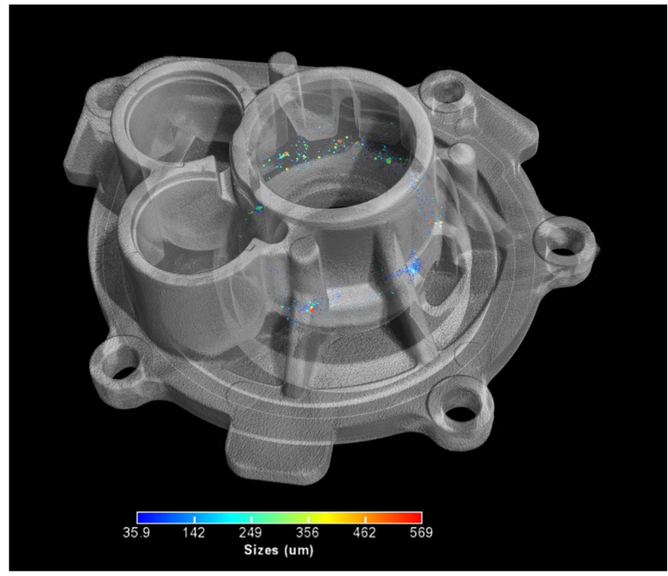
Dueto the very powerful 150 l<V / 75 W microfocus X-ray source and the large flat-panel detector, NXL can scan objects several hundreds mm in size, as well as objects with high X-ray absorption.

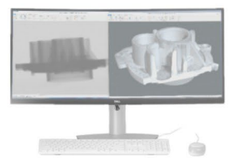
- O 40 ... 150 l<V / 75 W microfocus X-ray source
- O 2.5 µm smallest pixel size at maximum magnification
- O 5 µm spatial resolution (JIMA resolution chart)
- O Radiation-protected 13.5 MP/ 14 bit active pixel flat-panel X-ray detector
- O Maximum scanned object size is 310 mm in diameter and 330 mm in length
- O Maximum physical object size is 320mm in diameter and 540 mm in length
- O Round scan, multiple automatically connected scans, helical scans



▲
15-inch notebook computer
semi-transparent volume rendering,
35 µm pixel size

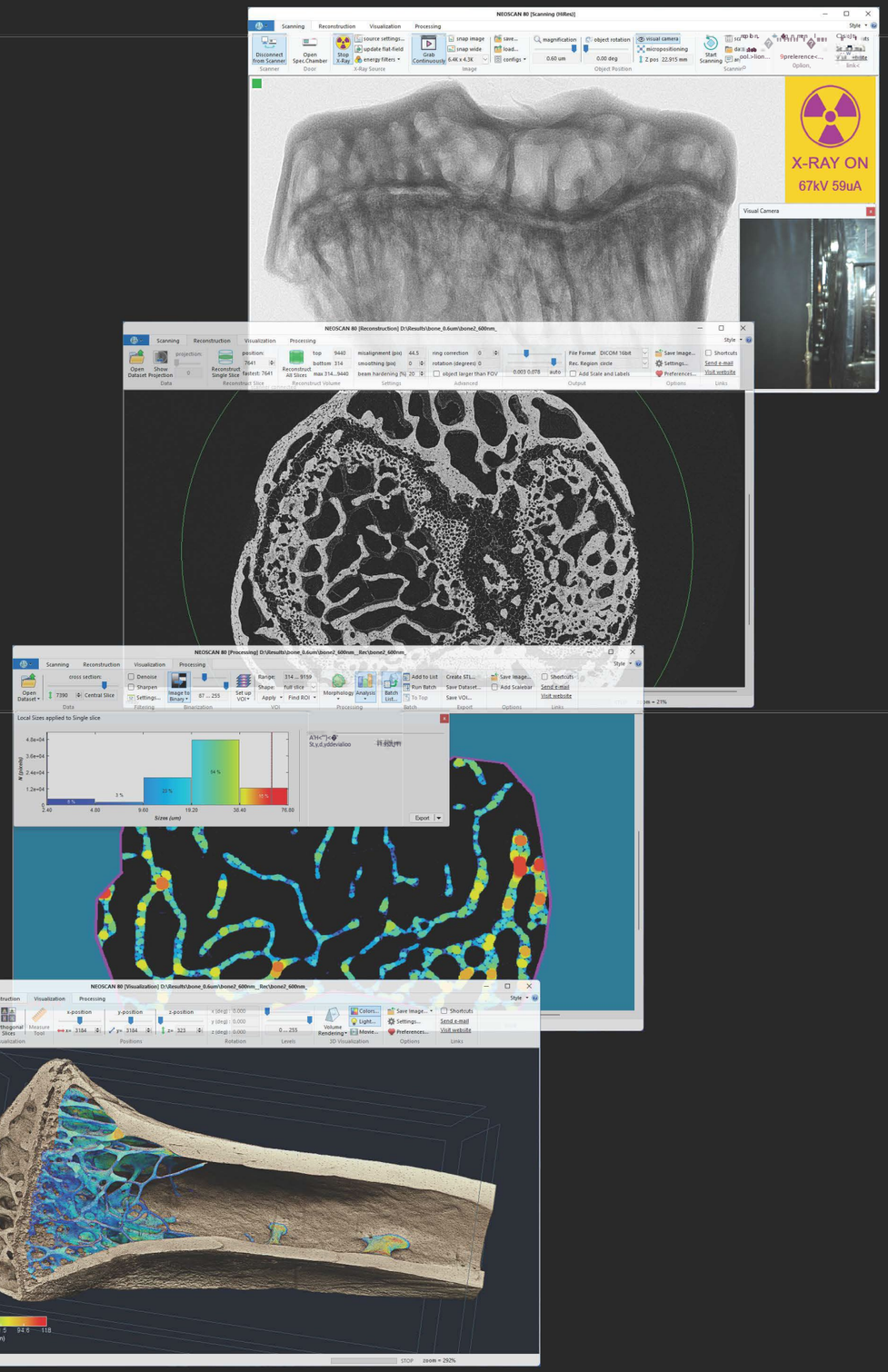
Car's cast aluminum water pump housing
semi-transparent volume rendering,
color coded sizes of internal voids
35.9 µm pixel size
▼





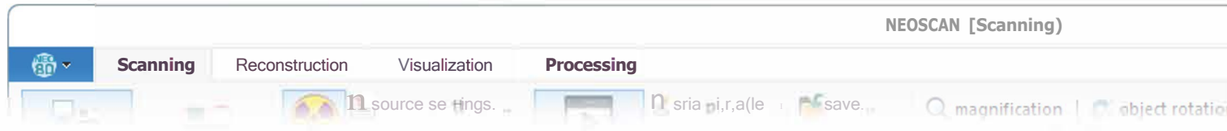
more details
and examples

NEOSCAN SOFTWARE



AII NEOSCAN systems come equipped with a comprehensive integrated Software Pacl<age offering an intuitive ribbon-style user interface.

- All-in-one software pacl<age contains all functions for acquisition contrai, 30 reconstruction, realistic visualization, and 20/30 image processing
- Multiple software instances can run simultaneously to perform tasl<s in parallel
- The license-free software pacl<age can be installed to multiple computers
- The software is covered by free, time-unlimited upgrades and updates



ACQUISITION

- System contrai, camera and source settings
- Interactive object positioning
- Scanning with round or helical trajectories
- Active artifact elimination

RECONSTRUCTION

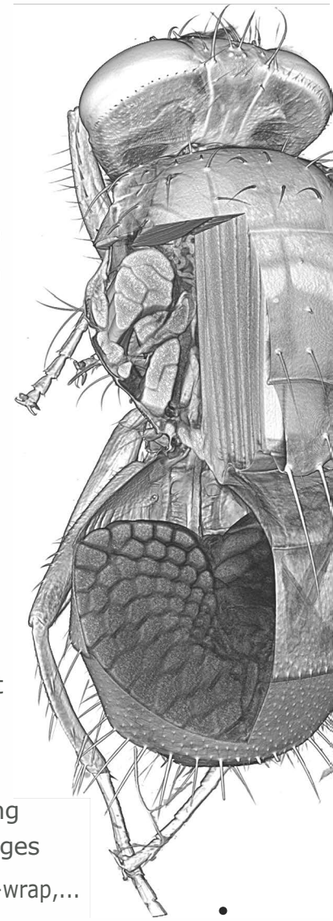
- GPU-accelerated reconstruction for round or helical scans
- Automatic stitching of several partial scans to a single volume
- Automatic misalignment correction, as well as drift compensation
- Beam-hardening and ring artifact correction
- Interior reconstruction from truncated data
- Reconstruction with phase contrast retrieval
- Saving results as TIFF, BMP, JPG, PNG or DICOM

VISUALIZATION

- Show results slice-by-slice or as three orthogonal sections
- Measuring distances in 30
- Virtual rotation of the reconstructed volume around any axis
- Realistic 30 volume rendering with colors/opacity selection
- Lighting, shadows, defining the object's surface properties
- Easy movie creation allowing to orbit and virtually clip the object

ANALYSIS

- Sharpening, smoothing, denoising, binarization
- GPU-accelerated 20/30 analysis of volumes, sizes and shapes
- Oefining volume-of-interest by standard shapes or free-drawing
- Local fiber orientation analysis based on half-tone or binary images
- Morphological operations: erosion, dilation, despecl<ling, shrinl<-wrap,...
- Numerical analysis outputs and color-coded 30 maps
- Surface rendering with export in STL format for 30 printers
- Creating batch lists to be applied to multiple datasets



more details

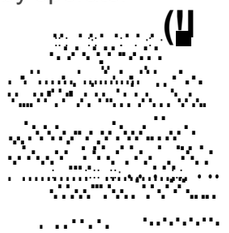
ESSENTIAL ACCESSORIES

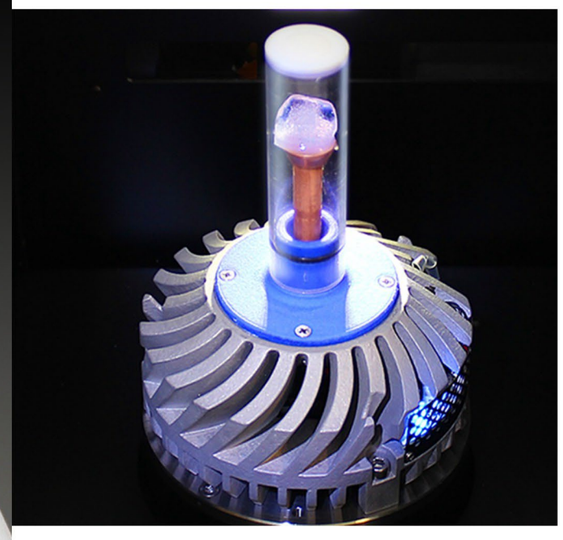
Automatic Sample Changer for N70 and N80 micro-CT systems

- 24 positions with indication of sample status by illuminated calor bars,
- Being outside the shielded area, scanned samples can be replaced anytime
- Scanning protocol for every sample can be defined individually, either by operator or selected automaticall

- Optimal magnification based on object dimensions
- X-ray source settings optimized according to object's absorption

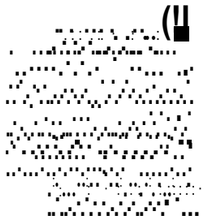
more details





Cooling-Heating Stage for N70, N80, N90, NXL

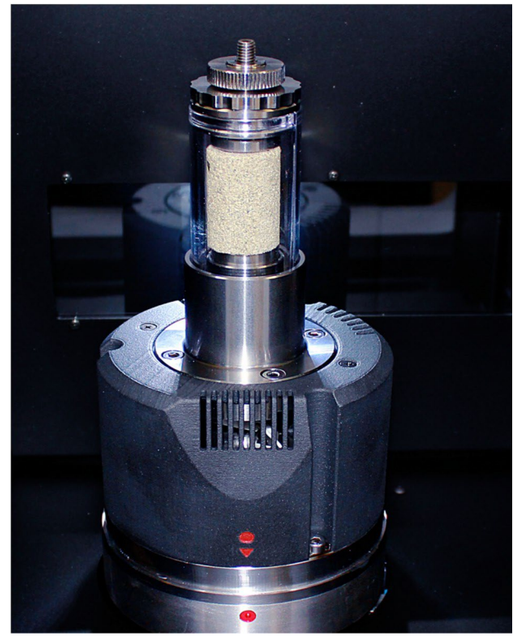
- Provides both cooling and heating capabilities
- Maintains object's temperature during scanning
- Minimum temperature: 40ºC under ambient
- Maximum temperature: +120ºC



more details and examples

Com ression-Tensile Sta e for N70, NB0, N90, NXL

- *In-situ* scanning under pressure or tension
- Adjustable loading speed 0.3.... 3.3 mm/min
- +1000 N maximum compression force
- - 1000 N maximum tensile force
- >10 mm displacement travei



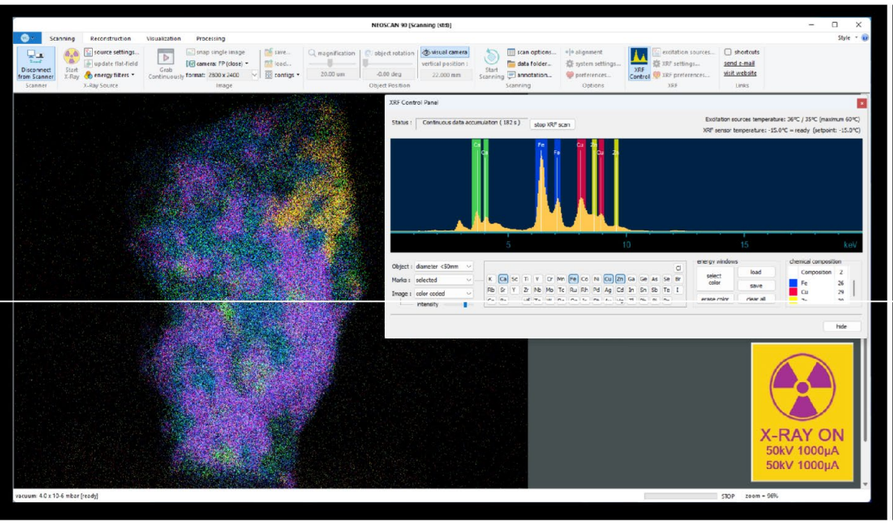
more details and examples

UNIQUE OPTIONS:

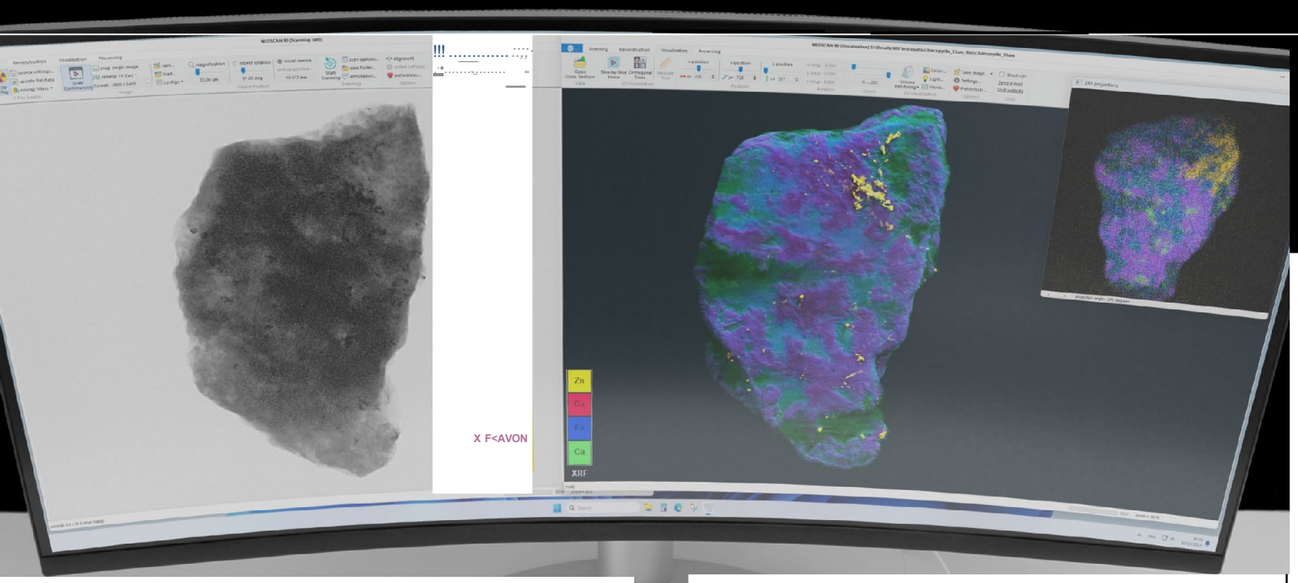
- INTEGRATED MICRO-XRF
- 3D NEOSPACE STATION

Inte rated full-field micro-XRF subs stem for chemical ma in in N90 nano-CT opens unique possibilities for detecting elemental distribution on the sample surface, which can then be correlated with CT-results to obtain a 30 elemental map.

- O The Micro-XRF module is fully integrated inside the N90 body and software
- O XRF excitation is provided by two 50 I<V / 50 W X-ray sources
- O Pinhole optics in the XRF detector allows mapping objects of any shape
- O A 4Mp detector measures the energy of every incoming X-ray photon, emitted by the object with a characteristic energy defined by the local chemical composition

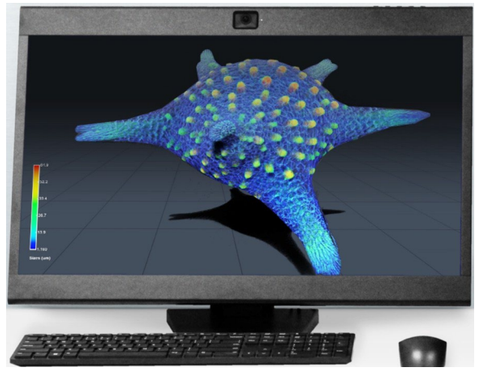


more details and examples



30 NeoS ace Station provides real-time 30 viewing, without the need for glasses, for the most immersive experience.

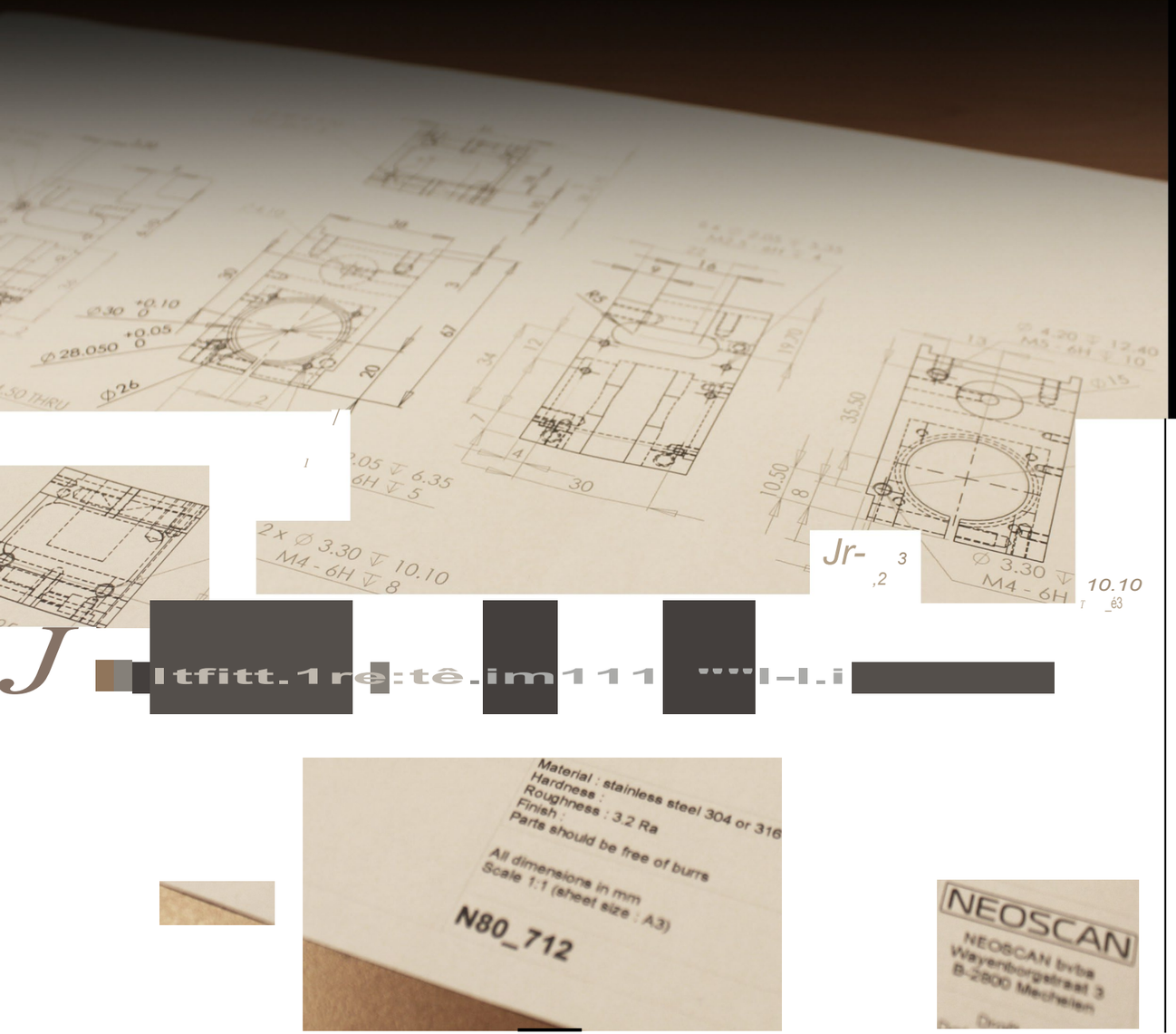
- O A 30 Oisplay delivers spatial reality with unlimited spatial depth due to real time eye-tracl<ing technology
- O The NeoSpace software allows interactive 30 spatial rendering of an object's internai microstructure from various angles, with the possibility for object manipulations, virtual clipping, and creation of 30 movies
- O A powerful computer runs the sophisticated software pacl<age to visualize 30 objects anywhere in the space above and behind the screen without any glasses or headset



more details

NEOSCAN

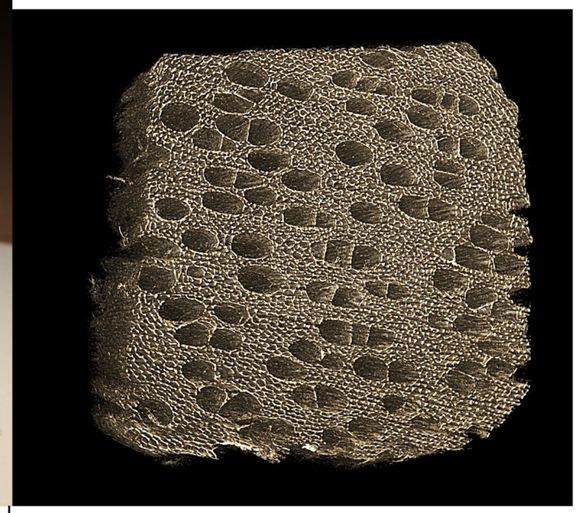
CUSTOM BUILT SYSTEMS AND ACCESSORIES



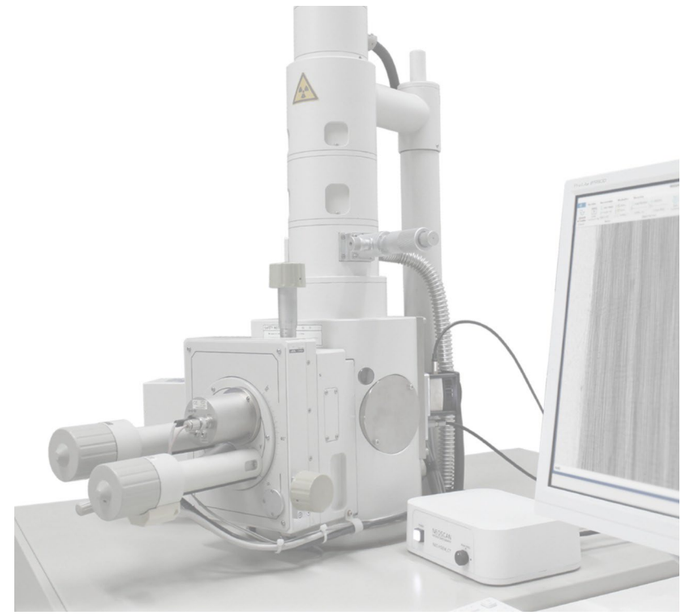
Using decades-long expertise, Neoscan is open to create custom-built systems and accessories tailored to the wishes and dreams of scientists. A few examples:

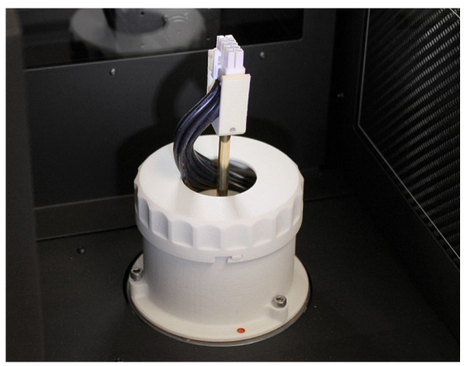
inSEM-CT is a microtomography set-up integrated in a Scanning Electron Microscope (SEM) allowing imaging through the objects and performing 30 reconstruction of object's internai micro structure without compromising any SEM imaging capabilities.

- inSEM-CTuses the SEM's electron beam to generate X-rays
- Vacuum compatible micro scanner performs object rotation and magnification contrai
- Direct detection X-ray camera on the side flange of SEM produces X-ray images
- Compact bench-top controller provides communication with software
- The system includes software for acquisition, reconstruction, visualization and analysis
- SOO nm smallest voxel size, 4 mm maximum object's scanning diameter
- Non-conductive objects can be visualized and scanned without any coating



Wood volume renderlng 1.3 µm voxel slze





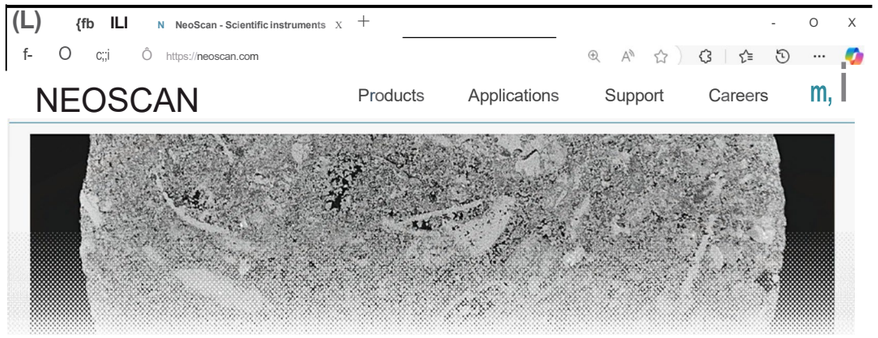
On customer's requests, Neoscan can design and produce special scanning accessories such as application-specific sample mounts

This example shows a special holder for inspection of automotive connectors. The connector holder is attached to the micro positioning stage for optimizing scanning position, while the long wires are wrapped into 30-printed container outside the scanning area.

NEOSCAN MICRO-CT

CREATED IN THE HEART OF EUROPE
FOR SCIENTISTS AROUND THE WORLD

neoscan.com serves as the primary gateway for technical and application-related l<nowledge



- specifications for all Neoscan systems and accessories
- application examples from different areas
- location and contact information
- career opportunities

rapidly expanding NEOSCAN's distribution network

NEOSCAN designs, redefines and manufactures personal high-performance benchtop microtomography instruments, offering an enjoyable operating experience and long-lasting lifetime.

We bring cutting-edge micro-CT technology at your fingertips, enabling you to discover and analyze the captivating 30 microworld.

Have inquiries or interest in a demo? Contact us to discover how our systems can solve your specific application needs.

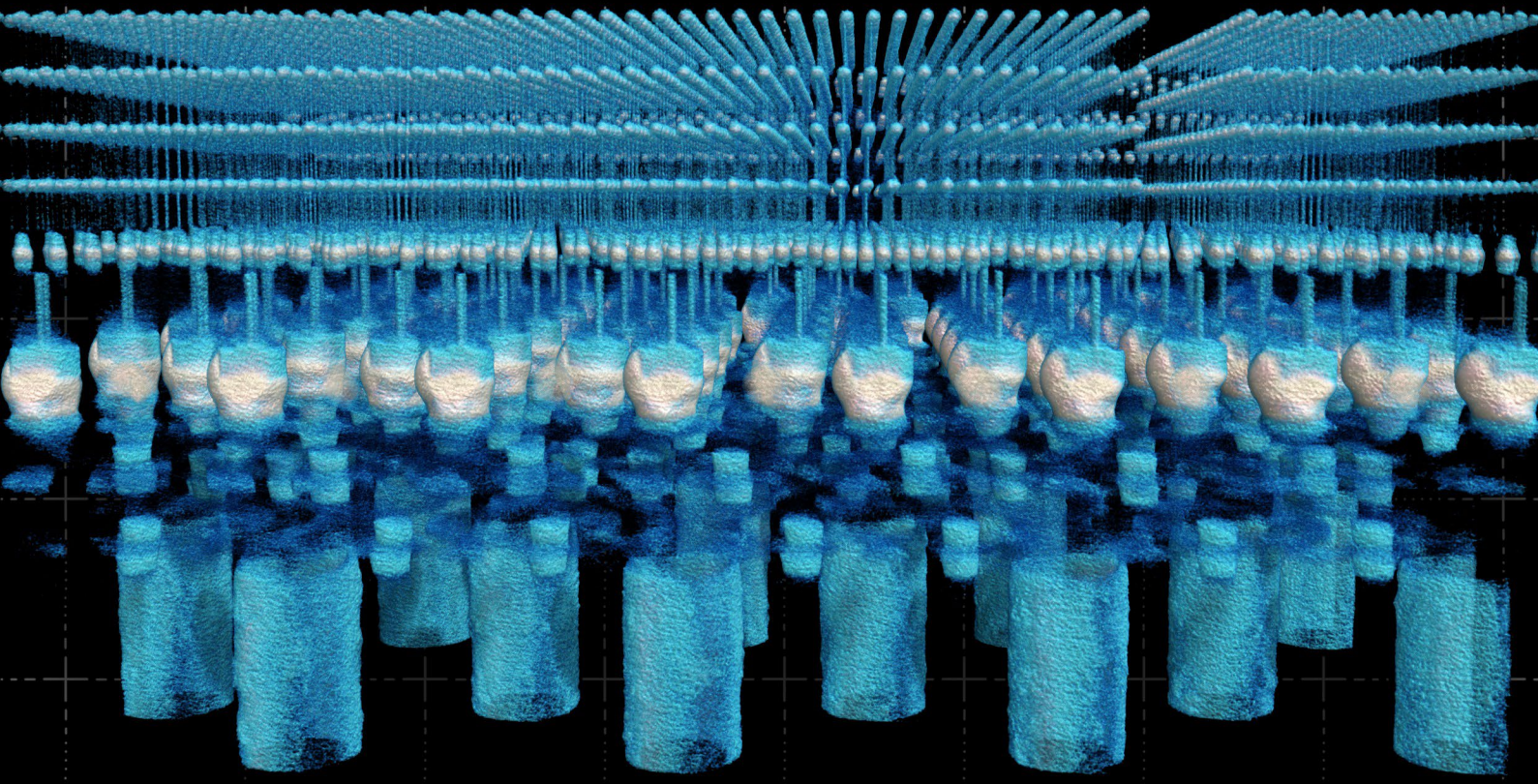
(@ **neoscan.com**

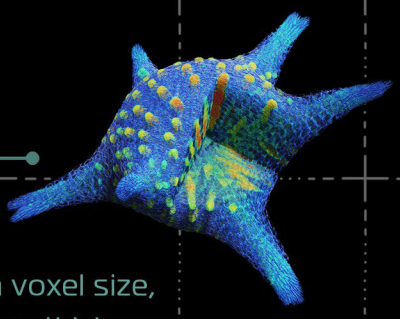
info@neoscan.com

(8) **Wayenborgstraat 3, Mechelen, 2800 Belgium**

inside advanced GPU with 3D-stacked memory:

stacked layers of High Bandwidth Memory (HBM)
interconnected by vertical Through-Silicon Vias (TSV)
NEOSCAN N90, 500nm voxel size in 30x40mm GPU





on the front cover

grain of Star Sand
from Okinawa, Japan.
NEOSCAN N90, 550nm voxel size,
color-coded local structure thickness,
front right corner virtually removed