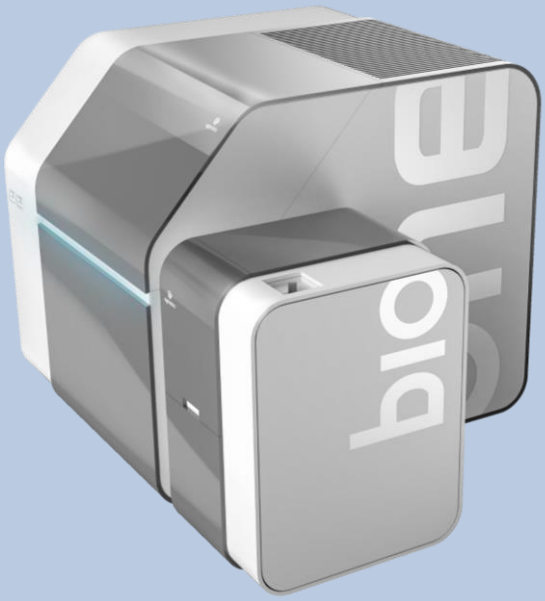
upnano

nano one bio

The new dimension in Bioprinting



The NanoOne Bio combines the possibility for biocompatible applications with the usual high precision of the NanoOne platform. Based on the technology of 2-photon polymerisation and the powerful 1W femtosecond laser enable a broad spectrum of applications, from the nano to the centimetre range.

The basis of the UpNano high-resolution printing systems is 2-photon polymerisation. A non-linear process which, due to the high absorption selectivity , only results in material polymerisation in the focal plane of the laser beam. This enables the production of high-precision structure details smaller than the laser wavelength in the sub-micrometre range directly within the material volume, without repetitive material application.

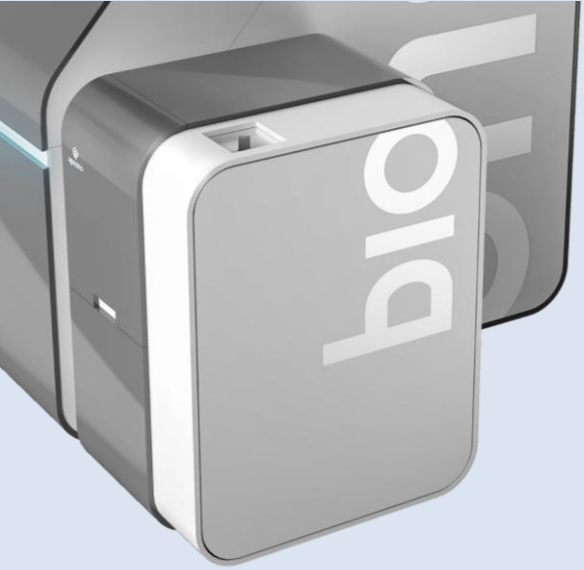
The system is designed as a dip-in free setup. The high-precision optics and the print material do not come into contact with each other. This concept brings with it a multitude of advantages. Not only does this ensure that the high focus precision of the objectives is maintained, but it also allows printing up to a height of 40 millimetres and structures within a sealed substrate.

Sterility from the first to the last process step

Manufacturing in a sterile environment, inside a cell culture plate or in a microfluidic chip is an incredible added value, especially for biological applications. Not only can sterile scaffold structures be produced, but also high-resolution bioprinting can be realised. Print preparation and post-processing can be carried out in sterile conditions. The print material, mixed with cells as required, is prepared in a cell culture workbench under sterile conditions and transferred to the desired substrate. Which is sealed, inserted into the system and printed with the desired structure.

Just a few clicks away from a novel application

The advantage of 3D printing is the high degree of flexibility in the design of the components. The THINK3D data-preparation software supports the user in a unique, intuitive way. Structures can be imported directly into the software as STL files or geometries can be built up from predefined structural elements. From individually designed microneedle arrays to generated filter elements with gyroid structures to cell-containing matrices for three-dimensional in vitro cell tests, there are almost no limits. The software can thus be used to create holistic arrays of components or to position structures directly in the individual wells of a cell culture plate. With the intuitive well-plate wizard, it is easy to assign a different geometrically shaped structure to each well and/or to vary the parameters from one well to another.



The bio unit the centerpiece of the nanoOne bio

The bio unit of the NanoOne Bio is used to provide a native, stress-free environment for the living cells during the printing process. The fully integrated stage-top incubation system can be adjusted to the preferential environmental conditions of the respective cell type and ensures these conditions during the print. Temperature is one of the key factors in cell incubation. Cells react very sensitively to excessive temperature differences.

The heating insert of the incubation system, which is clicked into the building platform of the NanoOne Bio, ensures a stable and homogeneous temperature distribution. The insert consists of a heated lid and plate which are actively tempered by a temperature controller between room temperature and a maximum of 45°C with a temperature stability of ± 0.05°C.

The gas incubation system of the Bio unit ensures a controlled gas environment in the form of humid, CO_2-rich air. Although compressed air is used, no vibrations are generated that could affect the printing result. The air is enriched with the selected amount of CO_2 and actively humidified. Via the computer interface, the CO_2 concentration can be regulated between 0-15% and the air humidity between 20-99%, each in 0.1% increments. The environmental conditions generated correspond to those in a standard cell incubator and thus to the native conditions of the cells. The environmental conditions are also stored for results tracing.

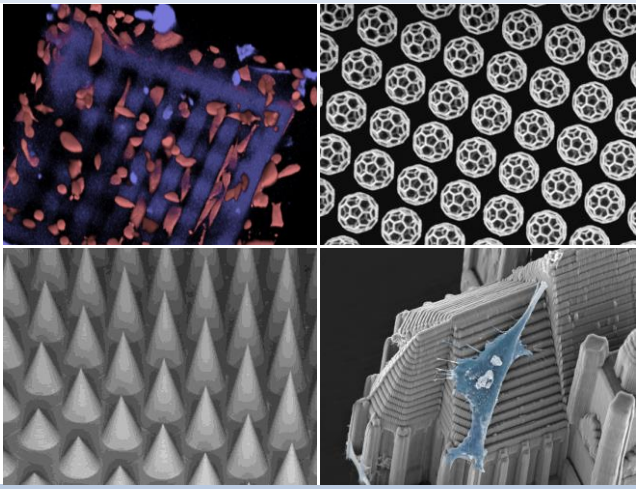
DATA LOGGING

HEATING SYSTEM

GAS INCUBATOR

An excerpt of the unlimited possibilities of sterile production with a nanoOne bio

- **Cell-containing samples** for three-dimensional in-vitro cell tests
- **Filter elements** with defined pore sizes and gyroid structures
- **Barrier models** with defined semi-permeability within microfluidic chips
- **Scaffold structures** positioned in each individual well of a cell culture plate
- **Cell models** mimicking natural tissue topography and microenvironment
- **Medical devices** such as implants or micro needle arrays



Technical Specifications

System Type	Multiphoton laser lithography
Printing process	Layer-by-layer 2-photon polymerization
Smallest feature size	≤170nm
Maximum object height	40mm
Maximum print volume	<1000mm³
Scanning speed	up to 1500mm/s
Femtosecond laser	1W at 780nm

Compatible substrate formats

- **Standard glass-bottom well plates**
  in any configuration
- **Glass-bottom µ slides and µ dishes**
  in different format
- **Micro fluidic chips**
  commercially available or custom-made chips
- **Glass-bottom petri dishes**
  Ø20 – 74mm
- **UpNano glass substrates**
  10 x 10mm, 20 x 20mm and 1” wafer

Perfect Materials for demanding applications

UpNano's high performance 2-photon materials are engineered and optimized to utilize the full potential of the ultrafast high-resolution printing system NanoOne. Bioprinting in the presence of living cells is not only a challenge for hardware and software, but also for materials. In addition to the standard material portfolio of the UpNano, biocompatible materials are needed. Together with Xpect INX, a gelatin-based material was developed exclusively for the NanoOne Bio, which has already been tested on a wide range of cell types.

XHYDROBIO INX® U200

provides all the biological benefits of conventional gelatin-based materials in combination with 2-photon polymerization processability enhanced by a high reactivity and fast curing speed. The material can be processed in the presence of cells at fast writing speeds resulting in a high cell viability. It is based on gelatin type B derived from natural collagen, which is modified with photo processable functional groups. After processing, it mimics the natural extra cellular matrix of the cells to a large extent resulting in a high cell viability. Additionally, as the formed hydrogel is biodegradable, it allows cells to remodel the environment and substitute it with newly formed ECM over time.

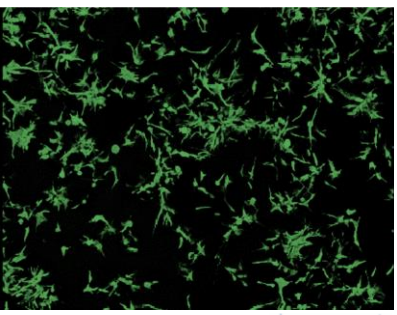
Biocompatibility
supports cell encapsulation, adhesion and proliferation

Reproducibility
production under strict quality control

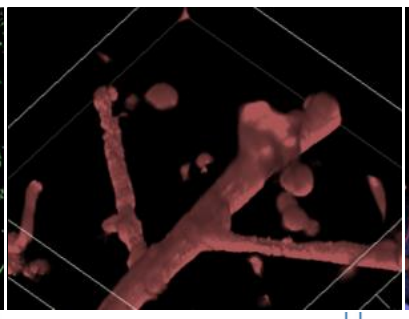
Biodegradability
enables cellular remodeling of the printed matrix

Manageability
delivered in a ready-to-use kit it is ready for printing in 10min

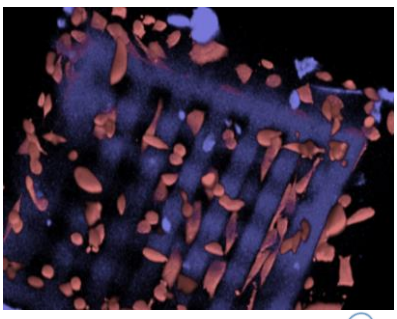
Established for the following cell research areas



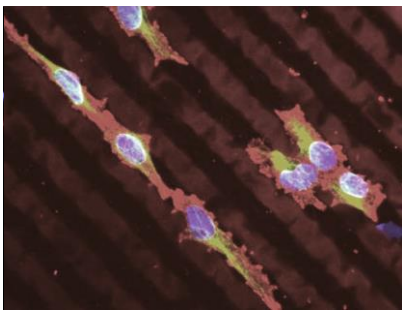
Adipose tissue
adipose derived cells



Blood vessels
human umbilical vein endothelial cells



Bone tissue
osteoblasts



Cornea
corneal endothelial cells

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