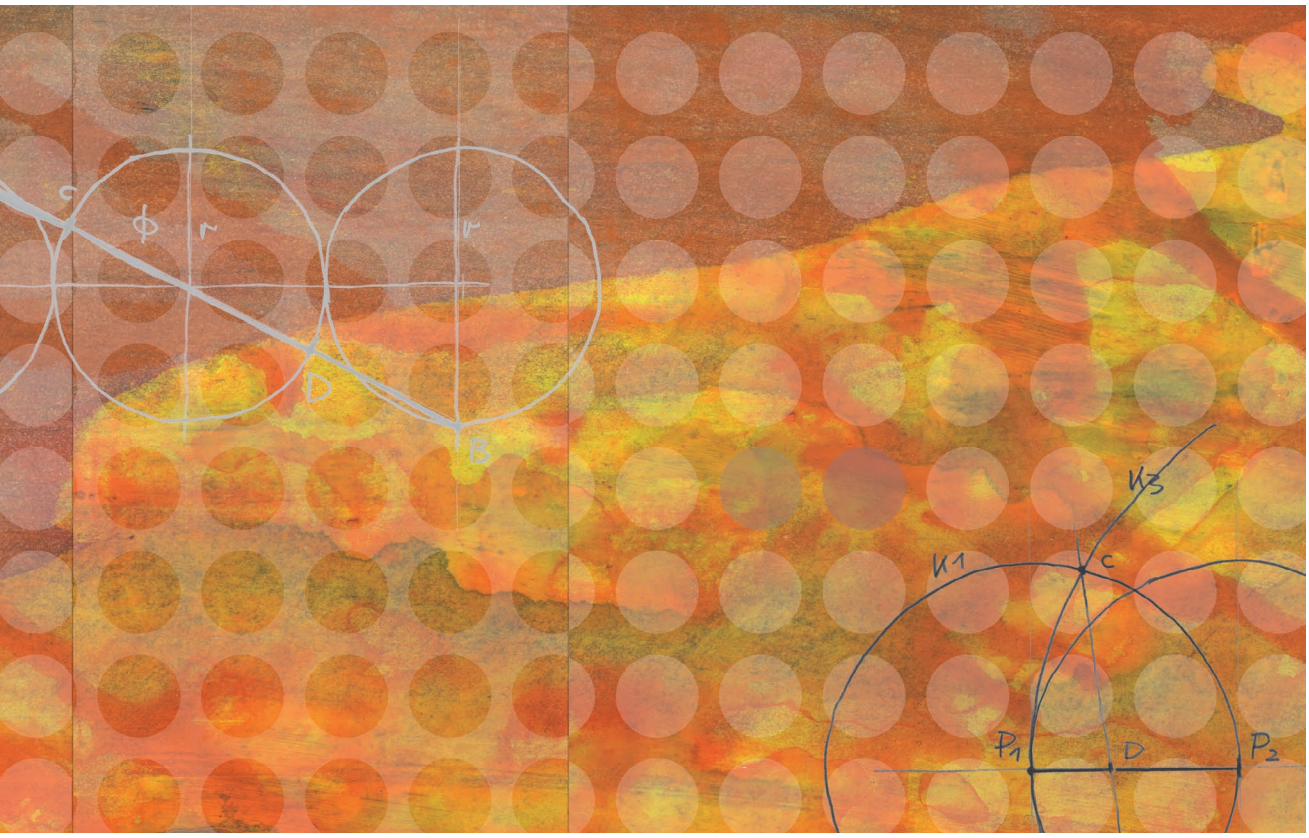
Integrating the Worlds of Micro and Macro Technology



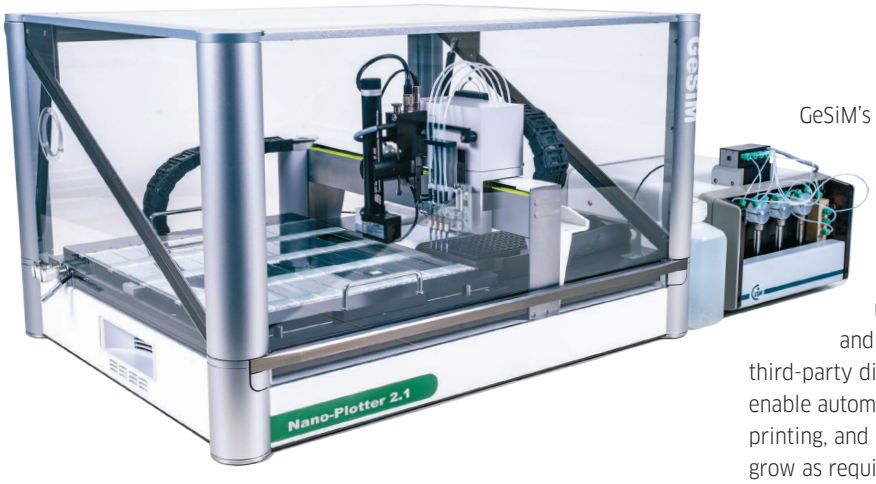
Nano-Plotter MicCell µContactPrinter BioScaffolder BioSyntheSizer

Integrating the Worlds of Micro and Macro Technology

About the GeSiM mbH

Our privately owned company, founded in 1995 at the renowned HZDR research centre in Dresden, set out to become a key player in the field of microsystems technology and a provider for made-to-order micro-components of silicon, glass, and plastic. Meanwhile GeSiM has evolved into a highly innovative bioinstrumentation company offering five instrument platforms for microfluidics, sub-nanolitre liquid dispensing, 3D printing, microcontact printing, chemical synthesis and many other facets of lab automation.

First and foremost, GeSiM stands for the development of novel and individual technical solutions and applications. For both end customers and OEMs, our engineers are keen to design components or full systems from scratch or customize our existing standard instruments. Researchers and entrepreneurs in the life sciences and other fields around the globe already rely on our technology. Being a small enterprise, GeSiM is committed to quick decision making and maintaining close contact to our customers and distributors, and has helped customers on their way to prospering businesses. As a high-tech supplier, we have also frequently taken part in research projects.

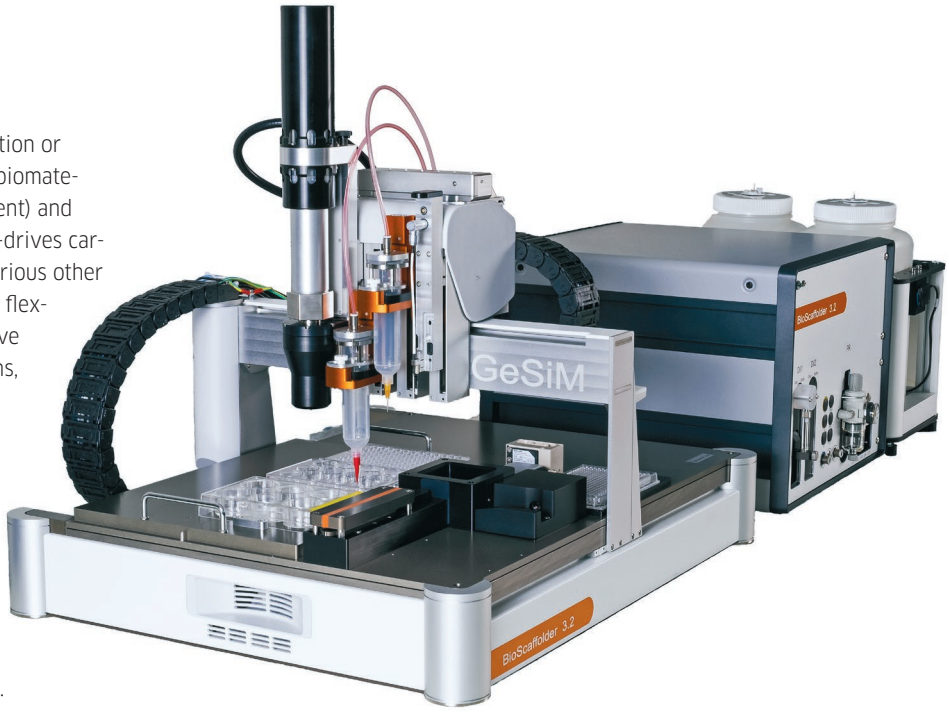


Microdispensing and Microarraying

GeSiM's piezoelectric picolitre pipetting tips produced by silicon-glass micromachining are the heart of the GeSiM **Nano-Plotter**, a platform with up to 16 of these non-contact dispensers for spotting microarrays and biochips 'on the fly'. The instrument comes in two sizes and with many extras, such as droplet volume measurement, double wash station, cooled microplate and substrate holders, humidifier, a variety of GeSiM and third-party dispensers (including solenoid valves), a microscope to enable automatic spotting onto tiny objects, live spot analysis during printing, and many more. The Nano-Plotter is modular and can thus grow as required, in research labs and in the diagnostics industry.

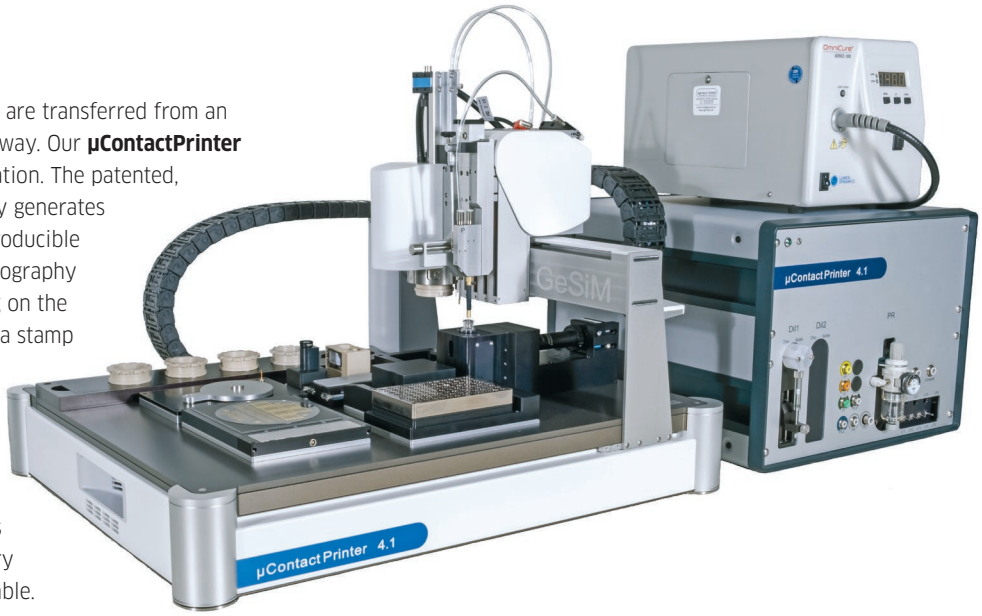
3D Bioprinting

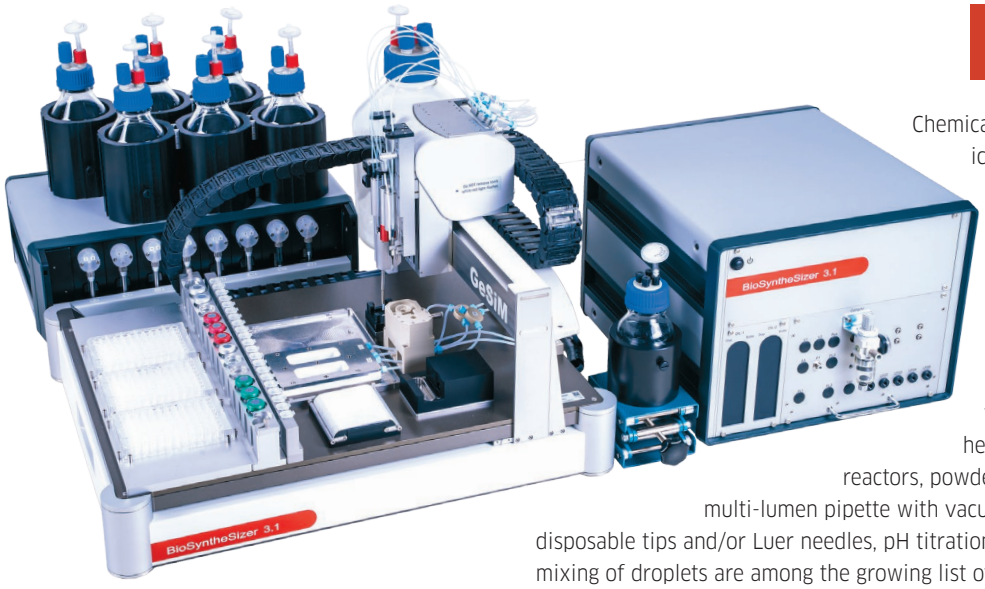
The GeSiM **BioScaffolder** uses air pressure actuation or piston extrusion to build scaffolds from various biomaterials/hydrogels (e.g. alginate, collagen, bone cement) and high-melting polymers using four independent Z-drives carrying heatable/coolable cartridge holders and various other tools. What sets this system apart, aside from its flexibility, is the integration of piezo or solenoid-valve based ink-jet dispensers, allowing to spot proteins, cells and other biomaterials on top or between scaffold layers, all with an easy to use graphical user interface and comfortable CAD data import. With options such as UV, mixing, gradient or core-shell printing, melt electrowriting, plasma coating and many more, and together with its open architecture, the system is ideally suited for 3D cell culture and tissue engineering. In addition, we offer high-throughput platforms with linear motors and more functions.



Microcontact Printing

In microcontact printing (µCP), (bio)molecules are transferred from an elastomer stamp to a flat surface in a simple way. Our **µContactPrinter** takes the risk out of this, often manual, operation. The patented, pneumatically controlled stamping technology generates 2D patterns by µCP, but also enables the reproducible transfer of 3D structures via nanoimprint lithography (NIL), both down to the nanoscale. Depending on the configuration, the automatic systems include a stamp casting station, various stamps, manual or automatic substrate adjustment/heating, picolitre and powder dispensing, spin coating, UV, and much more. PTFE-coated silicon masters for easy stamp fabrication are manufactured by GeSiM. Larger platforms with a lot more tools (e.g. a collimator for very accurate UV-NIL) and linear motors are available.



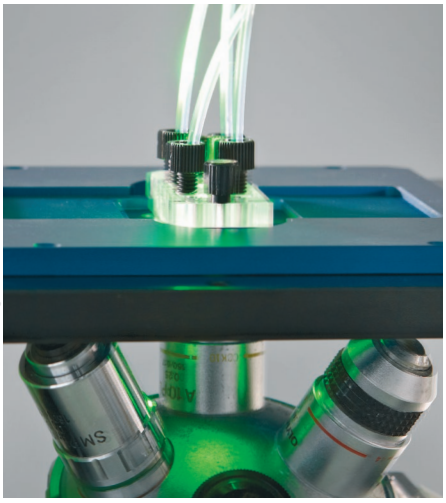


Microscale Chemical Synthesis

Chemical synthesis, e.g. of hydrogels or radiochemicals, always poses the risk of contamination when done manually. For this we developed the **BSyS** (BioSyntheSizer), a pipetting system for unsupervised operation, especially for chemical synthesis. Aside from safety and flexibility, this system saves chemicals and processes different protocols in parallel, again with a multi-Z tool head. As always, a clear user interface helps to define sequences of events. Heatable reactors, powder dispensers even for single (!) particles, multi-lumen pipette with vacuum gripper, flip cap opener, handling of disposable tips and/or Luer needles, pH titration pipette and a twin dispenser for in-flight mixing of droplets are among the growing list of tools; so the picture shows only one of the countless possibilities. High-throughput system with linear motors and more functions exist.

Microfluidics

Miniaturization has become central in bioanalytics and chemistry, as it speeds up experiments and saves money. From its earliest beginnings, GeSiM has devoted itself to the development of tailor-made miniaturized components and flow-through systems from various materials using methods of microchip manufacturing, in our own clean room. In addition to made-to-order chips, we also offer packaging, precision mechanics and software development. This work has led to the development of off-the-shelf systems such as flow sensors and microvalves and to the **MicCell**, a microperfusion system for microscopes with channels from PDMS and other materials. Its specialty is a standardized chip-to-world interface, easy handling (allowing to reuse most parts) and modularity. A casting station, different fluidic system sizes, a complete macrofluidic environment (**FluidProcessor** with syringe pumps, valves, mixers and intuitive software), and accessories such as silicon masters, microvalves and microelectrodes complete this versatile system. We also offer customized multi-layer **foil-based** microfluidic chips, including highly defined micropore filters.



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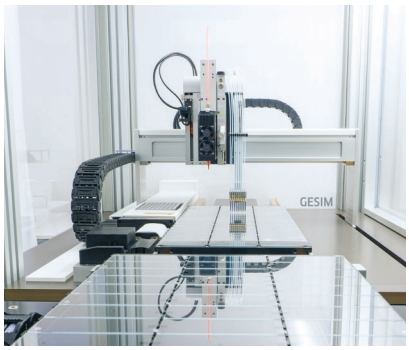
Instruments for High Throughput

It is only logical that GeSiM has streamlined instruments for high throughput. For this, standalone modules were invented that feature a safe enclosure with illumination and HEPA filter. For an even higher degree of automation, these modules can be daisy-chained and connected with a conveyor belt.

Each of these modules can host a robotics unit (e.g. piezo spotter, 3D printer, based on the single instruments). One or two magazines (stackers) for substrates, e.g. new and printed slides, can be added on either side.

The modules need not be pure printers. In fact you can choose from a variety of functionalities, e.g. cameras, UV and IR lamps, grippers, or one of the many extruders for 3D printing (using compressed air, pistons, screws or FDM, also mixers), not to mention the many different substrate holders.

Examples encompass microarray spotting ('Nano-Plotter NP7') and the 3D printing of polymers, but any of the systems mentioned above can be automated this way.



Gesellschaft
für Silizium-Mikrosysteme mbH
Bautzner Landstraße 45
01454 Radeberg, Germany
Tel. +49-351-2695 322
Fax +49-351-2695 320
contact@gesim.de
www.gesim.de

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