Startup Contest Application
International Conference on Electron, Ion, and Photon Beam Technology and Nanofabrication

1. Venture Name. TERA-print, LLC

2. Team Leader and Primary Contact Information.
Dr. Andrey Ivankin (Co-Founder, CTO), TERA-print, LLC; *8140 McCormick Blvd, Suite #132, Skokie, IL 60076*; andreyivankin@teraprint.us

3. Additional Team Members.
Dr. Chad Mirkin (Co-Founder), Jared Magoline (Applications Scientist II), Dr. Will Hutson (Instrument Engineer), Dr. Shaowei Ding (Research Scientist), Dr. Kyle Justus (Research Scientist), Nick Kwok (Instrument Engineer), Pandora Napoli, MBA (Comptroller), and Dr. Michael Jacobsson (Sales).

4. Describe the business opportunity.
The ability to rapidly generate well-defined patterns and controllable surface chemistries, achieve sub-diffraction resolution over centimeter areas, and utilize a broad range of soft and hard materials is critical to further drive innovation in the nanofabrication industry. Over the years various micro- and nanofabrication techniques have been developed, however, each technology imposes tradeoffs between throughput, resolution, materials versatility, and cost that make them impractical for many applications. TERA-print offers a low-cost nanofabrication solution that, for the first time, uniquely combines high-resolution and throughput with the ability to work with both soft and hard materials (*Figure 1*). Academic and industrial researchers gain the ability to rapidly and inexpensively prototype and manufacture test patterns and devices using contact printing and photolithography modes. (e.g., lab-on-chip systems, microchips, affinity templates for cell studies, synthesis of hard and soft materials, and functional electronics/photonics).

5. Describe your technological solution.
TERA-print designs and manufactures desktop nanolithography tools capable of generating well defined patterns consisting of deliberately controllable chemical compositions with diffraction unlimited, sub-250 nm resolution over centimeter scale areas. Based on the Company's proprietary cantilever-free scanning probe lithography (CF-SPL) technology, the TERA-Fab™ M and E series tools bring a unique set of nanofabrication capabilities in terms of high-resolution, throughput, and broad materials compatibility. In an important departure from the cantilever-based paradigm, CF-SPL relies on a new architecture in which the cantilever is replaced with an inexpensive elastomeric film with up to millions of pyramidal tips on a rigid substrate, affording massive scaling, while preserving high resolution. These tip arrays can be used for direct molecular printing, which lies at the core of the M series tool, or for diffraction-unlimited photolithography, which powers the E series instrument. The TERA-Fab™ tools bring the specialized facility right to

the researchers' desktop and unlock new opportunities in bioengineering, soft robotics, microfluidics, sensing, and nanoelectronics.

6. Who is your competition and what are your product differentiators?

Competing technologies from companies, such as Nanoscribe, Heidlelberg, and Raith, include two-photon, nanoimprint lithography, thermal scanning probe, deep UV, electron and focused ion beam lithography, maskless photolithography, and direct laser writing. Each respective technology excels in either resolution, throughput, or materials generality; however, unlike TERA-print's technology, none of them can combine these aspects in a way feasible for a broad range of applications, especially those involving soft materials. The TERA-Fab™ tools not only deliver these nanofabrication capabilities but do so in an affordable desktop format. The user-friendly software and hardware design of the M and E series enables users to quickly start printing regardless of the application. By harnessing each of these elements into a single platform, TERA-print sets a new industry standard for nanofabrication tools and unlocks previously impossible applications.

7. Describe the Market Opportunity. [Optional Section]

By bringing a unique set of capabilities and enabling new applications, TERA-print's tools will not only capture many current nanofabrication users but will lure in researchers whose needs cannot be addressed with existing methods (*Figure 2*).

8. Describe the Team. [Optional Section]

The TERA-print team currently comprises 8 scientists and engineers, with more than half of them PhDs, who possess extensive expertise in micro-/nanofabrication, instrument design and systems integration, bioengineering, nanomaterials design, microfluidics. The Team is led by two co-founders and serial entrepreneurs Dr. Chad Mirkin and Dr. Andrey Ivankin. Dr. Mirkin is a world-renowned chemist and the founder of five nanotechnology companies (Nanosphere, AuraSense, Exicure, TERA-print, and Stoicheia), as well as a 3D printing company (Azul 3D). Dr. Mirkin has a long track record of commercializing technologies in several sectors with over 2,000 commercial products (the Nanosphere Verigene™ System, the MilliPore SmartFlare™ platform, TERA-Fab™ series) tracing back to his labs. Dr. Ivankin, who leads the engineering, science, and technology program at TERA-print, was behind the development of commercially successful TERA-Fab™ series tools, accessories, and consumables. He has served as PI and Co-PI on a number of SBIR, STTR, and other grant projects as well as contracts from NSF, Air Force, and DoD with the total funding of over $2M.

9. Describe any traction. [Optional Section]

TERA-print developed and commercialized two nanofabrication tools based on CF-SPL, including TERA-Fab™ E series, that received the 2020 Prism Award from the SPIE organization as the best new product in life sciences. Since the commercial launch in 2016, the Company has sold >30 instruments in 7 countries on 3 continents generating $4.5M in revenue, which is expected to grow at >25% annually.

Figures and Additional Information

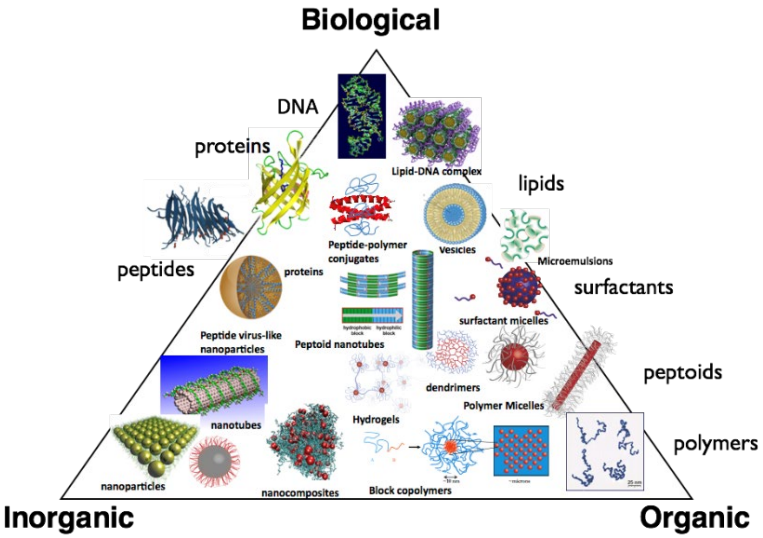

Figure 1. "Access Soft Materials" The TERA-Fab™ tools allow researchers to explore the use of both soft and hard materials unlike any other tool on the market. This enables a countless number of research applications that expand into fields are not accessible with existing tools. (Adopted from https://softmatter.no/)

Figure 2. "Market Size & Estimated Growth Target markets include biomedical, nano-optics, catalysis, pharmaceutical, and electronic devices, and the global nanopatterning market was estimated at almost $500M in 2012 and is projected to grow to $3.8B by 2022 at a CAGR of 23%. The universities and companies market consists of over 3,000 entities, and our technology also appeals to researchers working in the materials science, chemistry, and biosciences arenas we estimate that TERA-print can conservatively capture 5-10% of the global nanopatterning

2020 SPIE Prism Award Winner, Life Sciences Category
Robotics Industries Association, Industry Insights Feature
Physik Instrumente (PI) Tech Blog Product Feature
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