

Technology Overview: Digital NanoGenetics™, LLC (DNG) is an early stage start-up developing an automated, portable single biomolecule sequencing technology, called exonuclease time-of-flight (or X-TOF™). X-TOF employs a sequencing by subtraction strategy unique to the commercial sequencing industry while providing superior read-length and base call accuracy at a very high speed. X-TOF is comprised of simple hardware, minimum reagents, and a mixed-scale plastic fluidic chip consumable with multiple nanosensors, which accepts native DNA or RNA molecules and deduces each sequence by rapidly digesting a single DNA or RNA molecule into its individual nucleotides (or nucleosides) preserving all epigenetic modifications. Because each nucleotide has a unique biochemical structure of specific molecular weight, a flight time can be digitally detected as a peak in real time for a single molecule electrokinetically driven through a nanotube that is flanked by two mechanically formed nanopores strategically positioned at a fixed distance apart. Raw sequence data of every nucleotide call is recorded until the sequencing process is complete. Downstream data processing can then be accomplished using bioinformatics software algorithms capable of handling large amounts of data to accurately reassemble each sequence to confirm identity.

X-TOF Competitive Benefits: The X-TOF instrument prototype is designed to be a small high-speed sequencer capable of sequencing a genome within one working day by generating very long read lengths up to 50,000 nucleotides with a call accuracy of 99.5%. An automation component ensures no end user intervention during the entire sequencing process eliminating hands on time normally required in the art for time consuming quality control verification steps prior to onboard sequencing. X-TOF uses a sequencing by subtraction approach unique to the sequencing market where any native DNA or RNA molecule can be sequenced using a nucleic acid specific exonuclease. Because there are no polymerization steps required using this approach, all original DNA or RNA content is preserved including all epigenetic modifications. Additionally, this approach eliminates tedious and time-consuming ligation-mediated sequencing library preparations and PCR-biased library enrichment strategies that require complex and expensive fluorescent chemistry labelling kits for subsequent optical detection on expensive instrumentation.

Management: DNG was co-founded by a diverse and experienced team coming from both academic and industry. Dr. Steven Soper, KU Foundation and Distinguished Professor, currently serves as DNG's Founder and Chief Scientific Officer. Through strong and long-standing academic collaborations, Dr. Soper has brought in 2 diverse expert faculty members, Collin McKinney, and Sunggook Park, who have been instrumental in X-TOF's academic research and development (>\$5 million). The company is led by CEO Tony Barnes PhD, MBA, GC Jim Wilcox, JD, and Max Fiore, PE. Together they have marketed \$5 billion products, 6 instrument systems and supported 5 IPO's.

Target Market: Commercial next-generation sequencing (NGS) market projections estimate the global sequencing market to reach up to \$12+ billion by 2022 with continued high growth and demand potential by 2025. Key application areas with highest growth potential are projected to be in clinical investigations and diagnostics with a strong emphasis in oncology.

Competitors: The competitive landscape is complex and dynamic but currently dominated by two-well established NGS companies, Illumina, Inc., and ThermoFisher Scientific, Inc., who collectively possess an >80% global market share. Emerging commercial single molecule technologies such as Oxford Nanopore and Pacific Biosciences have entered the market and are gaining some traction due to single base pair resolution capabilities and reducing sequencing library preparation workflows.

Product/Consumables: DNG will offer a highly competitive solution to the NGS market by offering X-TOF as a cost-effective commercial sequencer bundled with one-use fluidic chip consumable packs and quality control kit versions to verify operational performance during the sequencing process.

Opportunity/Financial Need: DNG has already identified two strategic commercial partnerships with established manufacturing and production infrastructures and expertise to help accelerate the X-TOF prototype and mixed-scale chip consumable research and development process. DNG will need initial financing of \$3M based on 5 subprogram objectives:

1. Disposable Reaction Chip and Kit Development, Manufacturing, and Packaging
2. Reaction Chip Interface and Processing Module with Control and Readout Interface
3. Enzyme and Fluidics Development, Packaging Design, and Production
4. Automation and Software Design with Protocol Standardization
5. Calibration, Control, and Quality Assurance Across System with Regulatory Consideration

Please contact Tony Barnes at tony.barnes@digitalngx.com or (404) 488-5560 for more information.