NEWS RELEASE

Contact: Allison Connelly
Organization: The Geneva Foundation
Phone: 253.682.3837
Email: aconnelly@genevaUSA.org

Contact: Casey Perkowski
Organization: nScrypt Inc.
Phone: 407-275-4755 ext.1115
Email: cperkowski@nscrypt.com

Contact: John Getz
Organization: RoosterBio, Inc
Phone: 301-200-5366
Email: jgetz@roosterbio.org

Ruggedized Bioprinter Successfully Prints Medical Products in Austere Environment

The Geneva Foundation and the Uniformed Services University (USU) 4D Bio^3 Program, in support of the U.S. Military, recently completed a pilot project involving the biofabrication of medical products in an austere military environment, with the goal of advancing future next-generation treatments for the Nation's deployed warfighters. Advances in 3D printing and biofabrication have the potential to provide unprecedented benefits for the warfighter, including perhaps the direct repair or replacement of damaged tissues. This is especially powerful when achieved in austere conditions; warfighters injured in the field could have personalized health solutions immediately fabricated onsite.

The *4-Dimensional Bioprinting, Biofabrication, and Biomanufacturing* Program (4D Bio^3) is a federally funded program that advances the development and application of advanced bioprinting, biofabrication, and biomanufacturing technologies for research pursuant to Department of Defense (DoD) priorities and, ultimately, for translation to clinical medical defense care and training solutions. 4D Bio^3 currently has several programmatic efforts in motion, one of which involves the recently accomplished advanced 3D printing activities in a forward-deployed desert environment. This initiative is part of the *4D Bio^3 Fabrication in Austere Environments* (Fab AE) Program and supports a proof-of-concept project demonstrating the feasibility of 3D printing a wide range of personalized health care products in remote geographic locations, notably austere environments.

This successful pilot project represents a multi-disciplinary collaboration which included nScrypt and RoosterBio,Inc. nScrypt's bioprinter, called the Austere BioAssembly Tool (ABAT™), is a lightweight and ruggedized bioprinter that was custom designed by nScrypt based on their 3D printer experiences with the BioFabrication Facility on the International Space Station. The ABAT™ provides 3D printing solutions with a wide range of materials, including polymers, electronic components, and biologics.

Along with the printer, basic supplies and raw materials were transported to the austere environment, including RoosterBio's Ready To Print (RTP) human mesenchymal stem/stromal cells (hMSCs); a first-of-its-kind product that was designed to radically simplify and standardize the most complex and labor intensive aspects of bioprinting. This technology enables austere printing in a resource-limited setting as these are the only cells that allow for same-day bioprinting capabilities. The forward-deployed printing project led onsite by LTC Jason Barnhill of the United States Military Academy West Point, Department of Chemistry and Life Science, resulted in the following biofabrication achievements:

- **3D printing of #3 scalpel handle and hemostat**: The scalpel can fit a standard surgical blade and can be readily used and manipulated. The hemostat, a surgical tool used to control bleeding during surgery, is capable of gripping objects and can be locked in place to hold tissue or other medical implements. Individually, each surgical tool was printed within 1.5 hours. All printed surgical tools were capable of being steam sterilized onsite, reducing the chance of infection for practical use.
- **3D printing of bioactive bandages**: These bandages were fabricated in a two-step process involving printing a hydrogel layer containing antibiotics over a flexible structural layer; all of which printed within five minutes. This design provides for slow release of antibiotics from the bandage into the wound site, resulting in prolonged bacterial suppression over several days. The bacterial suppression timeline and actual bandage design based on CT data can be tailored to fit need-based scenarios by altering antibiotic concentration and bioprinting parameters.
- **3D printing of a surgical model of T9 vertebrae:** This model is based on de-identified image obtained from medical scans. A print-ready data file was electronically provided with the ABAT™ to the undisclosed location. Though not capable of patient implantation, this printed model will aid surgeons onsite in visualizing musculoskeletal injuries and determining the best course of medical intervention.
- **3D bioprinting of a meniscus:** The bioprinted meniscus was comprised of live MSCs and a hydrogel scaffold. The RoosterBio RTP human bone marrow-derived hMSCs were taken directly from freezer to printer without the need for a dedicated cell culture environment. The file for the meniscus print was transmitted directly from a stateside facility to the remote environment, where it was printed on location. This is the first demonstration of cyber manufacturing being used whereby complex designs are transmittable to remote austere location for production.

This pilot project is a first step toward manufacturing health care products onsite potentially for treatment of battlefield injuries and medical conditions, shifting logistical needs from complete final products to material building blocks. Resulting military benefits include the potential to drastically reduce traditional supply chain and logistical challenges and costs of transporting medical supplies and related items providing both time and cost savings to the U.S. Military in resource limited settings. Perhaps equally important is the ability of 3D printing to provide personalized products to meet individualized warfighter needs.

[L to R: Joel Gaston (4D Bio3, Geneva), John Getz (RoosterBio, Inc), LTC Jason Barnhill (United States Military Academy), Vincent B. Ho, (4D Bio3 Director, USU), Ken Church (nScrypt), Kelli Blaize-Wise (4D Bio3, Geneva), Linzie Wagner (4D Bio3, Geneva)]

# # #

About The Geneva Foundation

The Geneva Foundation is a 501(c)3 non-profit organization that advances military medicine through innovative scientific research, exceptional program management, and a dedication to U.S. service members and veterans, their families, and the global community. Geneva is proud to have over 25 years of experience in delivering full spectrum scientific, technical, and program management expertise in the areas of federal grants, federal contracts, industry sponsored clinical trials, and educational services. www.genevaUSA.org

About The U.S. Military Academy

The U. S. Military Academy at West Point is a four-year, co-educational, federal, liberal arts college located 50 miles north of New York City. It was founded in 1802 as America's first college of engineering and continues today as the world's premier leader-development institution, consistently ranked among top colleges in the country. Its mission remains constant-to educate, train, and inspire the Corps of Cadets so that each graduate is a commissioned leader of character committed to the values of Duty, Honor, Country and prepared for a career of professional excellence and service to the nation as an officer in the U. S. Army. www.westpoint.edu

About nScrypt
Orlando, Florida-based nScrypt designs and manufactures award-winning, next-generation, high-precision microdispensing and Direct Digital Manufacturing equipment and solutions for industrial applications, with unmatched accuracy and flexibility. Serving the printed electronics, electronics packaging, solar cell metallization, communications, printed antenna, life science, chemical/pharmaceutical, defense, space, and 3D printing industries, our equipment and solutions are widely used by the military, academic and research institutes, government agencies and national labs, and private companies. The nScrypt BAT Series Bioprinter, which won the 2003 R&D 100 award, launched to the International Space Station in July 2019. www.nScrypt.com.

About RoosterBio, Inc
RoosterBio, Inc. is a privately held cell manufacturing platform technology company focused on accelerating the development of a sustainable regenerative medicine industry, one customer at a time. RoosterBio's products are high-volume, affordable, and well-characterized adult human mesenchymal stem/stromal cells (hMSCs) paired with highly engineered media systems. RoosterBio has simplified and standardized how stem cells are purchased, expanded, and used in development, leading to marked time and costs savings for customers. RoosterBio's innovative products are ushering in a new era of productivity and standardization into the field, accelerating the road to discovery in Regenerative Medicine. www.roosterbio.com