

## LASER TECHNOLOGY OFFERS BREAKTHROUGH IN DETECTING ILLEGAL IVORY

A new way of quickly distinguishing between illegal elephant ivory and legal mammoth tusk ivory could prove critical to fighting the illegal ivory trade. A laser-based approach developed by scientists at the Universities of Bristol and Lancaster could be used by customs worldwide to aid in the enforcement of illegal ivory from being traded under the guise of legal ivory.

Despite the Convention on the International Trade in Endangered Species (CITES) ban on ivory, poaching associated with its illegal trade has not prevented the suffering of elephants and is estimated to cause an 8% loss in the world's elephant population every year. The 2016 African Elephant Database survey estimated a total of 410 000 elephants remaining in Africa, a decrease of approximately 90 000 elephants from the previous 2013 report.

While trading/procuring elephant ivory is illegal, it is not illegal to sell ivory from extinct species, such as preserved mammoth tusk ivory. This legal source of ivory is now part of an increasing and lucrative "mammoth hunter" industry. It also poses a time-consuming enforcement problem for customs teams, as ivory from these two different types of tusks are broadly similar, making it difficult to

distinguish from one another, especially once specimens have become worked or carved.

In this new study, scientists from Bristol's School of Anatomy and Lancaster Medical School sought to establish whether Raman spectroscopy, which is already used in the study of bone and mineral chemistry, could be modified to accurately detect differences in the chemistry of mammoth and elephant ivory. The nondestructive technology, which involves shining a high-energy light at an ivory specimen, can detect small biochemical differences in the tusks from elephants and mammoths.

Researchers scanned samples of mammoth and elephant tusks from London's Natural History Museum using the laser-based method Raman spectroscopy. Results from the experiment found the technology provided accurate, quick, and nondestructive species identification.

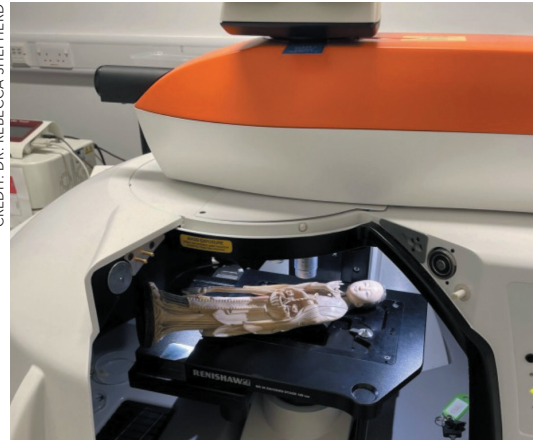
"The gold standard method of identification recommended by the United Nations Office on Drugs and Crime for assessing the legality of ivory predominantly are expensive, destructive, and time-consuming techniques," said Dr. Rebecca Shepherd, formerly of Lancaster Medical School and now at the University of Bristol's School of Anatomy. "Raman spectroscopy can provide results quickly (a single scan takes only a few minutes) and is easier to use than current methods, making it easier to determine between illegal elephant ivory and legal mammoth tusk ivory. Increased surveillance and monitoring of samples passing through customs worldwide using Raman spectroscopy could act as a deterrent to those poaching endangered and critically endangered species of elephant."

A selection of elephant and mammoth tusk samples.

CREDIT: BEN BOOTH



CREDIT: DR. REBECCA SHEPHERD



An ivory object, assumed to be of Asian elephant origin, under the microscope inside a research-grade Raman spectrometer.

## SOCIETYNOTES

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## ASNT EDUCATION'S NEW LMS

ASNT is excited to announce our new ASNT Education platform on [education.asnt.org](https://education.asnt.org). The new learning management system (LMS) provides users with a seamless enrollment process and enables them to complete various education offerings, including our webinar series, Certification Prep Courses (CPCs), and ASNT NDT Classroom eLearning courses.

This change means that ASNT's training products in different forms will now be available in one place. You can purchase and enroll in live and on-demand webinars, CPCs, Virtual Section meetings, and eLearning courses on [education.asnt.org](https://education.asnt.org).

## STEP FORWARD IN UNLOCKING DRONES FLYING BEYOND VISUAL LINE OF SIGHT IN THE UK

Inspections of railways, power lines, and roads as well as critical medical deliveries could be unlocked with new proposals put forward by the UK Civil Aviation Authority (CAA) to allow further flying of drones beyond the visual line of sight.

Proposals set out in a consultation published in February by the regulator are a step forward for drone operations, which will help operators fly their drones safely beyond the line of sight of the remote pilot. While some drones have been flying beyond visual line of sight (BVLOS) in the UK for several years, these flights are primarily trials under strict restrictions.

Instead, the proposed measures could enable BVLOS operations of drones by remaining at low heights and close to buildings or infrastructure. This means drones can fly where it is anticipated there would be fewer aircraft operating.

"Allowing drones to fly beyond the sight of the remote pilot, without placing restrictions on other aircraft in the area, will be a major achievement for UK drone operations," said Kevin Woolsey, head of Remotely Piloted Aircraft Systems at the UK CAA.

Once an atypical air environment policy is adopted, the UK CAA plans to work with several operators to help implement it in a safe and scaled way.

"Safety comes first in everything we do, and so we have identified sensible mitigations on where drones can fly using this proposed concept to make sure we maintain levels of safety," said Woolsey.

This is one of many initiatives from the UK CAA designed to unlock the UK skies as part of the UK Future Flight Programme.

The UK Future Flight Programme is helping move the UK closer to a future where drones safely share more of the skies with other airspace users. The UK

Dr. Jemma Kerns of Lancaster Medical School added, "The combined approach of a nondestructive, laser-based method of Raman spectroscopy with advanced data analysis holds a lot of promise for the identification of unknown samples of ivory, which is especially important given the increase in available mammoth tusks and the need for timely identification."

Alice Roberts, professor of Public Engagement in Science from the University of Birmingham and one of the study's co-authors, acknowledged the importance of exploring this new technique for distinguishing between elephant and mammoth ivory. "The complete tusks of elephants and mammoths look very different, but if the ivory is cut into small pieces, it can be practically impossible to tell apart elephant ivory from well-preserved mammoth ivory," said Roberts. "This is great science and should help the enforcers, giving them a valuable and relatively inexpensive tool to help them spot illegal ivory."

A quick and reliable method for distinguishing elephant ivory from mammoth ivory has long been a goal, as other methods (such as radiocarbon dating and DNA analysis) are time-consuming and expensive, said Professor Adrian Lister, one of the study's co-authors from the Natural History Museum.

"Stopping the trade in elephant ivory has been compromised by illegal ivory objects being described or disguised as mammoth ivory (for which trade is legal)," said Lister. "The demonstration that the two can be separated by Raman spectroscopy is therefore a significant step forward. Also, this method (unlike the others) does not require any sampling, leaving the ivory object intact."

The study was funded by the Engineering and Physical Sciences Research Council (EPSRC) and involved researchers from the Universities of Lancaster and Birmingham and the Natural History Museum.



COURTESY UK CAA

**A drone inspecting a powerline.**

CAA is working with industry to enable these developments for drones and other new forms of aerial transportation.

The consultation is available on the UK CAA's website ([caa.co.uk](http://caa.co.uk)). They also released the 13 February 2024 podcast "BVLOS within Atypical Air Environments," which discusses how an atypical air environment could work in practice (<https://caa-drone-safety.captivate.fm/episode/bvlos-within-atypical-air-environments>).

**NMSU ENGINEERS WORKING TO DEVELOP ROBOTIC BRIDGE INSPECTION SYSTEM TO REVOLUTIONIZE INFRASTRUCTURE MAINTENANCE SYSTEM**

A team of researchers led by New Mexico State University Civil Engineering Assistant Professor Qianyun (Gloria) Zhang is working with the New Mexico Department of Transportation on two research projects to use fast-developing digital robotic technologies to create a comprehensive robotic-enabled bridge inspection system.

"We are developing a comprehensive robotic-enabled bridge inspection system from data collection to data interpretation," said Zhang, who also serves as co-director of NMSU's Bridge Inspection Program. "The ultimate objective is

to align robotic-enabled inspection with national standards, facilitating the integration of research into practical implementation to boost the bridge inspection practices in New Mexico."

The Federal Highway Administration's 2022 national bridge inventory reported there are 4033 bridges in New Mexico, 4.9% of which are classified as structurally deficient and 38.9% in need of repairs at an estimated cost of US\$1.6 billion. Nationwide, the problem is much larger.

The efforts involved in the inspection and maintenance of bridges are challenged by a system lacking in sufficient availability of workforce, time, and funding. It can also be dangerous to perform these tasks in traffic or from heights. Addressing these challenges, the team, which comprises Zhang and two PhD students, is partnering with the University of New Mexico and New Mexico DOT District 2 for a two-phase, two-year project initiated last October.

The first phase includes a pilot program which involves the use of uncrewed aircraft systems (UAS) and advanced image analysis techniques that can recognize objects more readily than other methods. This will entail the development of an advanced UAS platform and training of pilots followed by laboratory flight and field tests to evaluate and optimize the UAS platform. The second phase, to begin in fall of 2024, will

be primarily focused on extensive data collection, database establishment, methodological exploration, and the development of implementation software.

While the National Bridge Inspection guidelines for condition rating inspection include safety data for a number of bridge components, this project will focus on the bridge deck, as this component is the most directly impacted by traffic loads. Accurate and current assessment of the bridge deck condition is critical for ensuring the safety and soundness of the entire bridge structure.

The research team hopes to show that UAS-based inspections provide a more efficient solution to field data acquisition. They hypothesize that these new automated methods will result in significantly reduced costs due to lower labor needs, shorter periods of traffic closures, and costs for hard-to-access locations that require scaffolding and cranes. They may also improve worker safety by reducing the need for inspectors to work at heights or in traffic situations. The use of automated objective data interpretation is expected to enable more frequent and timely bridge inspections.

One of the most important goals of this project involves technology transfer so that it may benefit the entire state's transportation system. This will include a site demonstration and training of the developed UAS platform software for NMDOT personnel.



**A team of researchers in New Mexico are looking to use fast-developing digital robotic technologies to create a comprehensive robotic-enabled bridge inspection system (pictured: the Rio Grande Bridge in Taos, New Mexico).**

"NMDOT is currently grappling with a shortage of skilled staff, posing a challenge. The outcomes of this project will have a significant impact on improving the operational efficiency of bridge inspection. The technology transfer workshop will provide the opportunity to NMDOT personnel to undergo training in advanced technologies, facilitating their implementation across various districts," Zhang said.

"Integrating drones into infrastructure inspection processes will catalyze rapid advancements in the inspection practices of the state of New Mexico. This initiative aims to address various concerns such as cost, efficiency and safety. In a long-term collaboration with Dr. Zhang, we are dedicated to crafting comprehensive UAV inspection systems that will significantly elevate the standards of bridge inspection practices," said Jonathan Boyle, NMDOT District 2 Bridge supervisor.

Another yearlong project addresses the challenges involved in underwater inspection. The study, which began last November, proposes to use underwater robots for substructure inspection.

To ensure public safety and protect overwater bridges, underwater structures must be inspected for structural integrity. In shallow water, such structures can be inspected from above. In relatively deep water, however, diving or other techniques are required. Underwater inspections require highly skilled inspectors as well as specialized equipment and documentation techniques.

"Even though we don't have that much water, the demand for underwater inspection persists. Moreover, the shortage of proficient divers poses a challenge for conducting underwater inspections. The implementation of an advanced robot system provides a promising solution to perform low-cost and efficient underwater inspections," Boyle said.

The team will compare remote-operated robotic systems and various high-resolution sensors and conduct prototype field demonstrations to assess performance. Advanced computer vision algorithms will be developed to perform

automated data processing and interpretation that will be programmed into web-based software. The proposed system is expected to deliver rapid data collection, high-quality data, objective data interpretation, cost efficiency, lower safety concerns, lower labor cost and easy repeatability. The same system could also be applied to other underwater inspection applications, like dam inspections.

## FLIGHT SAFETY FOUNDATION ANNUAL REPORT HIGHLIGHTS THREAT TO AVIATION SAFETY FROM ERODING SAFETY CULTURE

The international commercial airline industry did not suffer any fatal jet airliner accidents in 2023, according to the Flight Safety Foundation's *2023 Safety Report*, but a series of close calls last year and

two accidents so far in 2024 are clear signals that the industry must guard against complacency and the potential for an erosion of safety culture to weaken its safety margin.

"Despite last year being among the safest in aviation history in terms of accidents and fatalities, it's crucial to acknowledge and address the warning signs that were present in events that narrowly avoided disastrous outcomes," said Foundation President and CEO Dr. Hassan Shahidi. "Complacency is a stealthy threat that can erode safety and quality unless it is actively countered with a robust safety culture. Complacency can lead to shortcuts, degradation of quality, neglect of procedures, poor communication, and a delayed response to escalating risks. Failing to rigorously reinforce a strong safety culture can become the weakest link in the safety chain."

The report, issued mid March, is based on an analysis of data drawn from the



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Aviation Safety Network (ASN) database. It showed there were 94 accidents across all types of airliner operations last year. While there were no jet airliner fatal accidents, there were seven fatal accidents involving turboprop and piston engine-powered airliners. In addition, corporate jets used in a variety of operational roles were involved in 32 accidents last year, seven of which were fatal. The 2023 Safety Report is available on the foundation's website, [flightsafety.org](https://flightsafety.org).

The release of the report is accompanied by an interactive dashboard that features accident data and information from the past six years that is searchable by a range of parameters, such as type of operation, region of the world, phase of flight, and accident type or end state, such as turbulence-related, runway excursion or excursion, and loss of control. The report and the dashboard present information that covers all types of airliners capable of carrying at least 14 passengers and a wide range of corporate jets. The dashboard can be accessed on the foundation's website.

## TAP CLIENT PRECISION AEROSPACE GROUP EXPANDS PORTFOLIO WITH ACQUISITION OF AEROFAB NDT

Precision Aerospace Group (PAG), a leading provider of products and value-added services to the aerospace, defense, and space industries headquartered in Atlanta, Georgia, has acquired Aerofab NDT, a Kent, Washington-based company that engineers bespoke nondestructive (NDT) tools to safeguard the integrity of aerospace components.

Precision collaborated with TAP Financial Partners to complete the acquisition process. The merchant bank identified Aerofab as an ideal addition to its client's portfolio, given PAG's strategic objectives and current industry offerings.

Aerofab NDT brings PAG more than 50 years of expertise and a global customer base with its comprehensive catalog of reference standards,

eddy current probes, and ultrasonic transducers.

The acquisition marks a significant step forward in Precision's ongoing expansion efforts, positioning the company as a key player in the high-demand NDT industry.

## GE AEROSPACE LAUNCHES AS INDEPENDENT PUBLIC COMPANY FOLLOWING COMPLETION OF GE VERNOVA SPIN-OFF

In April, GE Aerospace (Cincinnati, OH) announced its official launch as an independent public company defining the future of flight, following the completion of the GE Vernova spin-off, the company's renewable energy business.

The launch of GE Aerospace represents the completion of GE's multi-year financial and operational transformation. Over the last several years GE has taken steps to significantly strengthen the business, including more than US\$100 billion in debt reduction since 2018. This stronger foundation enabled the successful creation of three independent companies—GE HealthCare, GE Vernova, and GE Aerospace.

"With the successful launch of three independent public companies now complete, today marks a historic final step in the multiyear transformation of GE," said GE Aerospace Chairman and CEO H. Lawrence Culp Jr.

With an installed base of approximately 44 000 commercial engines and approximately 26 000 military and defense engines around the world, GE Aerospace launches as an established global leader in propulsion, services, and systems. The company generated approximately US\$32 billion in adjusted revenue in 2023, with 70% generated by services and the strong economics of the engine aftermarket.

At the company's Investor Day in March, GE Aerospace reaffirmed its 2024 guidance and presented a longer-term financial outlook, including expecting to achieve ~US\$10 billion of operating profit in 2028. Additionally, GE Aerospace

shared a capital allocation framework to invest in growth and innovation, while also returning approximately 70-75% of available funds to shareholders.

Holders of GE common stock were entitled to receive one share of GE Vernova common stock for every four shares of GE common stock held. GE Aerospace will trade under the ticker "GE" on the New York Stock Exchange (NYSE).

## AMPP SECURES US\$2M BOOST FOR DOD CORROSION FIGHT, ENHANCING DEFENSE AND SAFETY

The advocacy efforts of the Association for Materials Protection and Performance (AMPP) have led to a substantial increase in funding for the US Department of Defense (DoD) Corrosion Policy and Oversight (CPO) office.

Initially expected to receive US\$3.185 million for fiscal year 2023-24, the CPO office was ultimately allocated \$5.185 million due to the passed legislation, reflecting an increase of \$2 million.

In March, President Biden signed the US\$1.2 trillion appropriations package into law to avoid a partial government shutdown, following months of negotiations. This comprehensive package includes the final passage of the Defense Appropriations bills, which funds the DoD.

The purpose of the CPO office is to reduce the total lifecycle costs of corrosion, increase availability, and improve safety within the DoD. It serves as a platform for stakeholder communication, bringing together managers, logistics supporters, engineers, scientists, and maintainers to address corrosion threats effectively. 

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## NEW DISPERMAT DISSOLVER CV3EVO HAS IMPROVED ADAPTABILITY



BYK-Gardner USA announced the new CV3evo Dispermat<sup>®</sup> Dissolver, a redesign that is smaller and more compact with higher functionality. It features a closed worktop, unique lifting column, integrated control panel, large color display with light-up buttons, and optional modular components for better system adaptability. Manufactured by VMA Getzmann, the improved CV3evo dissolver has the same price point as the old model.

BYK develops innovative high-tech instruments, software, and services for testing color, appearance, and physical properties. BYK also specializes in supplying additives that improve product properties such as scratch resistance or surface gloss.

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## HEBI ROBOTICS RELEASES NEW H-SERIES ACTUATORS



HEBI Robotics, a Pittsburgh-based robotics company and spin-off of Carnegie Mellon University's renowned Biorobotics Lab, has expanded its offerings with the new H-Series platform of smart robotic actuators. HEBI's H-Series introduces versatility, precision, and torque to create custom robots for

challenging environments. The H-Series is a fully featured robotic component with onboard IMU, current sensing, and over-temperature protection. This allows it to be used in everything from wheeled robots to collaborative robot arms.

The H-Series was built to provide more torque and versatility while still withstanding rugged conditions. HEBI's H-Series actuators run on anything from 24V-48V DC and communicate using standard 100 Mbps fiber-optic ethernet, allowing for easy, flexible integration with less downtime.

HEBI ROBOTICS  
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## FAST FOCUS SCANNING SYSTEMS FOR MICROSCOPY AND METROLOGY APPLICATIONS



PI, a global leader in nanopositioning instrumentation, has extended its PIFOC series of microscopy products by two new economical nano-focus scanner packages for applications including surface metrology, super-resolution microscopy, light sheet microscopy, and digital slide scanning.

Two scanning ranges are currently available: the P-725.1CDE1S offers 100  $\mu\text{m}$ , and the P-725.4CDE1S offers 400  $\mu\text{m}$ . The fast scanners are based on a closed-loop piezo flexure design with capacitive position feedback for high linearity, stability, and repeatability. A compact digital controller with software is included.

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**Show us your products!** Newly released equipment, instruments, software, and other products designed for use in NDT work can be submitted to [press@asnt.org](mailto:press@asnt.org). Submissions should include a writeup and high-res image.

## SHOWCASE

### LET OUR FRUSTRATION MAKE YOUR LIFE EASIER



Over 30 years, UTEX has designed and delivered many automated and semiautomated inspection systems. We have encountered system components and controls that were cumbersome, lacked precision, or were not designed with NDE in mind. So, we designed our own system components that are engineered for NDE professionals. They are robust,

precise, and intuitive to use. For example, our pendant offers two modes to control large, rapid movements or to make small, precise adjustments. Switching between modes is effortless, with tactile feedback, so that you can focus on the work, and not on the controller. To learn more, check out our videos.

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UTEX.COM/WEBAPPS/UTEXHOMEV2.NSF/~/.3.3