

Review of Scientific Instruments New Products

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AFFILIATIONS

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In order to supplement manufacturers' information, this department will welcome the submission by our readers of brief communications reporting measurements on the physical properties of materials which supersede earlier data or suggest new research applications.

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NEW INSTRUMENTS AND COMPONENTS

Camera for high-energy physics

Andor Technology, an Oxford Instruments company, now offers its Marana-X camera for ultrafast soft-x-ray and extreme-ultraviolet (EUV) tomography and high-harmonic-generation applications. According to the company, the camera's scientific complementary metal-oxide-semiconductor (sCMOS) technology makes it significantly more advanced than slow-scan charge-coupled device (CCD) cameras. With its fast frame rates, high sensitivity, and high dynamic range (up to 16 bits), the Marana-X overcomes the limitations of CCD technology in the range in which it operates. The Marana-X features what the company claims is the first uncoated 4.2-MP sCMOS sensor with >90% quantum efficiency in the 80 eV–1 keV range at up to 74 fps full frame, a unique combination that lets users better sample dynamic phenomena. It also increases the output of high-quality results while minimizing experimental time, for example, in the acquisition of large tomographic datasets. The shutterless sCMOS technology addresses the inconvenience associated with traditional mechanical shutters' lifetime and limited repetition rates. The Marana-X is deep cooled to -45°C and offers a convenient universal serial bus (USB) 3 plug-and-play interface

and a CoaXPress interface more suited to challenging high-energy physics environments. *Andor Technology Ltd., 7 Millennium Way, Springvale Business Park, Belfast BT12 7AL, United Kingdom. (+44 28 9023 7126)* <https://andor.oxinst.com>



All-in-one single-frequency laser

Hübner Photonics has introduced its Cobolt 05-iE (integrated electronics) series of single-frequency lasers that cover the 457–1064-nm wavelength range. Because all the control electronics are contained in the laser head, the Cobolt 05-iE lasers do not need an external controller. With less complexity and fewer parts, the laser has a significantly reduced system footprint and is simpler to integrate into researcher and other user systems. The company's Cobolt Rogue 640-nm 1-W laser is also available with integrated electronics as the Cobolt Rogue iE. All Cobolt lasers are manufactured using proprietary HTCure technology. According to the company, the resulting hermetically sealed package protects the lasers from varying environmental conditions and ensures that

they perform reliably in both laboratory and industrial settings. *Hübner Photonics, Inc., 2635 North 1st Street, Suite 202, San Jose, CA 95124, USA. (408-708-4351)* <https://www.hubner-photonics.com>



Cryostat with fast cool-down times

The DRY ICE 1.5 K 100 mm closed-loop cryostat from ICE Oxford is suitable for users carrying out experiments in the 1.3–325 K temperature range. It ensures tight tolerance on temperature stability ($\pm 10 \text{ mK}$ below 10 K), fast cool-down times (<30 min to 1.4 K), and minimal vibration in the sample space (as little as $\pm 100 \text{ nm}$). The option exists to add ${}^3\text{He}$ and dilution-fridge inserts to achieve even lower temperatures—300 and 15 mK, respectively. According to the company, the large

100-mm-diameter sample space and the cryostat's high cooling power of >30 mW at 1.75 K are the best available for a variable-temperature-insert cryostat. (Variants are

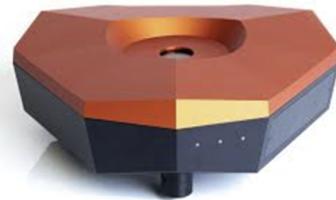


offered with 30-, 50-, or 70-mm-diameter sample spaces.) The fast cool-down cycle is especially useful for scientists' allocated time on the beamlines of big-science facilities such as the ISIS Neutron and Muon Source. The versatile system can use two types of cryocooler: a Gifford-McMahon (GM) setup, which relies on a mobile piston for compression and expansion of the helium fluid in the cold head, or pulse-tube refrigerator (PTR) technology. With no moving parts in the low-temperature region, PTR cooling produces vibration approaching an order of magnitude lower than GM. Further damping comes with the use of "ICE sock" technology, in which a container called a sock is built to surround the cryocooler and hold it away from any mechanical parts on a bellows. ICEoxford's patented Dual-Cool technology enables the DRY ICE 1.5 K 100 mm system to switch between static and dynamic exchange-gas mode for sample cooling. High-field superconducting magnets are designed to be an integral part of the DRY ICE 1.5 K 100 mm system; the company offers a range of solenoid, split-pair, and vector-rotate magnets up to 18 T field strength. For scientists who want to carry out simultaneous optical investigations of their materials, the sample can be loaded into the bore of a split-pair magnet. The system can be designed with optical windows to allow, for example, laser spectroscopy experiments in transmission or reflection mode. Using LabVIEW-based software, the cryostat can be highly automated to reduce system setup and turnaround time. *ICE Oxford, Avenue Four, Station Lane, Witney, Oxford OX28 4BN, United Kingdom. (+44 (0) 1993 706 444) <https://www.iceoxford.com>*

Tip-scanning atomic force microscope

Nanosurf designed its DriveAFM to allow researchers in materials science, life sciences, and nanotechnology to capture high-resolution images of large samples. It offers an imaging envelope of $100 \times 100 \times 20 \mu\text{m}^3$, with an optional 150- μm z-axis extension. The DriveAFM comprises a low-noise, high-bandwidth controller; a low-noise, super-luminescent diode for feedback; and a direct-drive scanner. It features innovative CleanDrive technology, a photothermal method to actuate the cantilever. Photothermal excitation provides high

stability and a high excitation bandwidth in both air and liquids, benefits that allow for high-speed measurements at multiple frequencies. Laser and detector alignment, tip approach, and sample movement are all managed with the software. Such full-system motorization enhances ease of use and opens up new possibilities to fully automate the system. *Nanosurf AG, Gräubernstrasse 12, 4410 Liestal, Switzerland. (+41 61927 47 47) <https://www.nanosurf.com>*



Compact, quiet vacuum pumps

Leybold has expanded its Ecdry Plus product family of dry multistage Roots vacuum pumps for laboratory, research and development, and analytical applications. The compact Ecdry 25 Plus and 35 Plus, which achieve high pumping speeds with relatively little footprint, complete the company's range of low-maintenance, economical fore-vacuum pumps. They are also particularly quiet, with a noise level of 52 dB(A). The Ecdry 25 Plus and 35 Plus emit neither oil vapor nor particles, which is important in research institutes and laboratories where a clean working environment is essential. The pumps are equipped with an integrated pump controller and are suitable for all voltage ranges. Users can also connect a pressure gauge directly to the vacuum pump and adapt the pump's performance to specific requirements. That can potentially make it more energy efficient and reduce ambient heat. The Ecdry is equipped with new intuitive LeyAssist software and with connections such as USB and RS485 for easy integration into external control systems and for reading all data from other systems. The oil-free multistage Ecdry 25 Plus and 35 Plus pumps have a maintenance interval of five years, during which time they run without any servicing. *Leybold GmbH, Bonner Strasse 498 (Bayenthal),*

50968 Cologne, Germany. (+49221 347 0)
<https://www.leybold.com>



Maskless lithography system with UV light

Microlight3D, a manufacturer of high-resolution microscale two-dimensional (2D) and 3D printing systems for scientific and industrial applications, has unveiled its Smart Print-UV (SP-UV), a maskless lithography system equipped with a UV light source. The new capability, a 385-nm light-emitting diode (LED) source, means SP-UV is compatible with the most commonly used photoresists. Those include SU-8, which is indispensable for microfluidics applications. According to the company, it will allow developers to choose from a broader variety of photoresist materials for semiconductor processing. SP-UV's optical projection technology gives users access to four writing resolutions and combines writing precision with speed. With Microlight3D's "quick release" objective system, resolution can be changed within 2 s. The company says that lab-on-chip researchers and those in other fields—optoelectronics, micro-electromechanical systems, and spintronics—can more easily fabricate structures on large surfaces ($120 \times 120 \text{ mm}^2$) at micrometric resolution. SP-UV's objective lens range has been selected to allow for a long working distance (up to 3 cm). Therefore, SP-UV can operate with nonstandard substrates, including those that are curved—such as an optical lens—flexible, or thick. SP-UV's 385-nm UV light source is coupled with a feedback camera for easy focusing, inspection, and alignment. Alignment accuracy and stitching-error are improved through the system's offer of a higher-grade motorized stage. Housed in a compact

user-UV-protective packaging that can be safely employed in any indoor environment, SP-UV has one of the fastest writing speeds available: up to $1000 \text{ mm}^2/\text{min}$. *Microlight3D, 5, avenue du Grand Sablon, 38700 La Tronche (Grenoble), France. (+33 4.76.54.95.16)* <http://www.microlight.fr>



NEW DETECTORS, MEASUREMENTS, AND MATERIALS

Extra-long-scan noncontact thickness gauges

Bristol Instruments has added two models to its line of noncontact optical thickness gauges. The 157XLS (extra-long-scan) and 137XLS systems extend the maximum measurement limit to 80 mm. The longer-scan measurement capability was added primarily to accommodate thicker, multielement optical components and assemblies and large-diameter medical devices. The new gauges maintain what is, according to the company, industry-leading accuracy: as high as $\pm 0.1 \mu\text{m}$ for the 157XLS models and long-term repeatability of up to $\pm 0.02 \mu\text{m}$. For less exacting requirements, the 137XLS measures accuracy as high as $\pm 1.0 \mu\text{m}$ and has a long-term repeatability of $\pm 0.05 \mu\text{m}$. The instruments use the properties of light to measure material thickness without damage or deformation. Up to 31 individual layers, as well as total thickness, can be measured simultaneously. *Bristol Instruments Inc., 770 Canning Parkway, Victor, NY 14564, USA. (585-924-2620)* <https://www.bristol-inst.com>



Mass flow meters with large flow capacity

Aalborg has made available its XFM57, XFM67, and XFM77 digital flow meters with extended flow rates up to 1000 l/min . Calibrations for up to ten different gases and internal conversion factors for up to 32 gases are offered. Flow rates are displayed in 23 volumetric or mass flow engineering units, among them user defined. The XFM's support various functions, including programmable flow totalizer, high and low flow alarms, automatic zero adjustment, two relay outputs, jumper-selectable $0-5 \text{ V}_\text{dc}$ or $4-20 \text{ mA}$ analog outputs, and status LED diagnostics. The meters exhibit leak insulation $<1 \times 10^{-9} \text{ cc/s}$ of helium to the outside environment. An optional local liquid-crystal display (LCD) with 2×16 characters and adjustable backlight provides flow, total, and diagnostic readings simultaneously. The meters can be programmed remotely via the RS-232/RS-485 or optional Profibus DP interface such that the relays can be made to switch when a specified event occurs. Examples are when a low or high flow alarm limit is exceeded or when the totalizer reaches a specified value. Users can also control them directly. *Aalborg Instruments, 20 Corporate Drive, Orangeburg, NY 10962, USA. (800-866-3837 or 845-770-3000)* <https://www.aalborg.com>



Plastic-analysis system

Shimadzu has launched a Fourier-transform IR (FTIR) spectrophotometer for

plastic degradation analysis. The system features the company's IRSpirit FTIR spectrophotometer, QATR-S single-reflection attenuated total reflectance attachment, and plastic analyzer method package. The method package includes FTIR spectral libraries for plastics degraded by UV rays and heat. The proprietary libraries facilitate highly accurate qualification and determine the state of deterioration when analyzing foreign substances, contaminants, and microplastics. They can help investigators accurately analyze unknown samples that are difficult to identify with standard libraries. The UV-damaged-plastics library includes more than 200 spectra from the UV degradation of 14 types of plastic, unirradiated and UV-irradiated for 1–550 h. UV irradiation for 550 h with an ultra-accelerated weathering tester is equivalent to exposure to UV light for about 10 years. The thermal-damaged-plastics library includes more than 100 spectra from the degradation of 13 types of plastic heated to between 200 and 400 °C. The system also includes plastic measurement parameters and IR Pilot, a special program for the IRSpirit that simplifies spectral measurements and the creation of reports. According to the company, it enables analysts—even users unfamiliar with FTIR analysis—to easily perform everything from the measurement of target samples to data analysis. *Shimadzu Scientific Instruments, Inc., 7102 Riverwood Drive, Columbia, MD 21046, USA. (410-381-1227) <https://www.shimadzu.com>*



Low-spatter flux-cored wire for soldering

To meet the demanding requirements of robotic and laser soldering applications, Indium has developed CW-232, a highly activated rosin flux-cored wire. According

to the company, the specialty wire combines superior wetting speed and spread with minimal spatter. It also works well in hand soldering applications. CW-232 eliminates flux spattering that can burn users' hands, impair the vision system of robotic soldering machines, and make finished products less aesthetically appealing. Its residue is light-colored. CW-232 is capable of soldering to heavily tarnished surfaces. It is compatible with lead-free and tin-lead alloys and with such surface finishes as hot air solder leveling, immersion silver plating, electroless nickel immersion gold plating, and organic solderability preservative. *Indium Corporation, 34 Robinson Road, Clinton, NY 13323, USA. (315-853-4900) <https://www.indium.com>*



BIOINSTRUMENTATION AND BIOTECHNOLOGIES

LED illuminator

Excelitas has added the X-Cite NOVEM to its fluorescence illumination product line. The LED illuminator is suitable for complicated imaging applications that require high excitation power and individual wavelength control. Those applications include slide scanning, live-cell imaging, fluorescence *in situ* hybridization, ratiometric imaging, and general fluorescence microscopy. The light-guide-coupled, nine-channel, wavelength-switching X-Cite NOVEM illuminator offers spectral ranges for applications from 340 to 785 nm. Preinstalled filters simplify system setup, and the device's high power reduces scan time for multiplex imaging. To accommodate the spectral requirements of specific imaging applications, the new X-Cite product is available in four standard wavelength combinations. Excelitas's patented LaserLED Hybrid Drive technology provides increased excitation in

the 500–600-nm band range where X-Cite NOVEM's four-position motorized filter changer will automatically isolate specific spectral bands. The X-Cite NOVEM features efficient cooling and quiet operation, even when running at full capacity. *Excelitas Technologies Corp., 200 West Street, 4th Floor East, Waltham, MA 02451, USA. (781-522-5914) <https://www.excelitas.com>*



NEW FACILITIES AND HARDWARE

Helium recovery and liquid-nitrogen generation

Cryomech and AFCryo, a division of Fabrum Solutions, have collaborated to design and supply a helium recovery system and a liquid-nitrogen (LN₂) generation system at the NMR laboratory at the Victoria University of Wellington in New Zealand. The facility, housed in the chemistry and physics departments, has five NMR spectrometers with magnets operating between 400 and 600 MHz. The two 500- and one 600-MHz instruments are used primarily for postgraduate research in chemistry. The other two systems, both operating at 400 MHz, are primarily used to study physical processes such as rheometry and diffusion. The already high expense of obtaining liquid helium to cool the magnets was exacerbated by the added shipping costs to New Zealand, so the university saved money by installing the recovery system and the additional liquefaction and reliquefaction system for LN₂. The air-to-liquid system is fully automatic, including the on/off cycle. It fills a bulk storage Dewar in the plant room and a mobile Dewar at the laboratory. The laboratory uses the LN₂—some of it in the recovery system to purify the helium—and distributes it to other users on campus. With the global shutdown caused by the COVID-19 pandemic, Wellington

has become a central location for New Zealand's specialist NMR testing due to its self-sufficiency in helium and liquid-nitrogen needs. *Cryomech Inc.*, 6682 Moore Road, Syracuse, NY 13211, USA. (315-455-2555) <https://www.cryomech.com>



NEW LITERATURE AND SOFTWARE

3D mapping and contouring software

Golden Software has enhanced its Surfer gridding, contouring, and 3D surface mapping package. Featuring fast, powerful contouring algorithms, Surfer software enables users in many disciplines to visualize and interpret complex datasets, apply advanced analytics tools, and graphically share the results. The new release provides additional visualization tools and

display options that make it easier to communicate the information extracted from user data. A new layer type—Peaks and Depressions—automatically identifies and outlines closed high and low areas, in a grid file. A statistics report is generated for the areas, including information such as length, width, depth, volume, and orientation. Peak and depression detection is useful for geologists mapping geohazards and hydrologists interpreting drainage patterns in karst topographies, but it is applicable to any data type including LiDAR. The feature allows the high and low areas to be colorized, annotated, and displayed on their own. 3D Views has four new capabilities: Color scale bars can be added to explain the elevation, concentration, or other data values depicted by colors; virtual reality modeling language file format exporting lets users export their 3D Surfer model into another 3D software package or to a 3D printer; anti-aliasing makes axes and grid lines inside the 3D model appear smoother; and improved 3D PDF exporting has reduced the PDF file size and speeded up the file exporting process. Several existing capabilities have been added to the automation function so users can write scripts to automate certain workflows. Automated features now include Base from Data layer type, Vector Base Map Symbolology, and new Scale Bar, Legend, and Grid

Data options. A Renaming Objects in Base Maps feature lets users identify objects in vector base maps, such as polygons, polylines, or points, by automatically renaming them based on any attribute. The ability to list and view objects with names based on an attribute helps users when importing a SHP (Shapefile) or other vector base map file, with tens or hundreds of objects. With the Enhanced Grid Statistic Calculation, users can select multiple polygons and choose to calculate their statistics, areas, or volumes either as a single combined polygon or as individual polygons. *Golden Software LLC*, 809 14th Street, Golden, CO 80401, USA. (303-279-1021) <https://www.goldensoftware.com>

