

New GC Instruments and Accessories at the 55th Pittsburgh Conference

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In this month's "GC Connections," John Hinshaw reports on new gas chromatography instruments and accessories exhibited at the 55th Pittsburgh Conference.

For its 55th annual meeting, held 7–12 March 2004, the Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy returned to Chicago's McCormick Place for the first time since 1996. Despite the fears of some that this year's conference-goers would be treated to a repeat performance of that year's midweek blizzard, attendance was up more than 10% from last year's event in Orlando, Florida. While falling short of the more than 29 000 attendees who registered in Chicago in 1996, this year's conference had a strong finish at just more than 25 000 visitors, well beyond Orlando's 2003 level of 23 319. As has been the situation in recent years, almost exactly half of the attendees listed themselves as exhibitors. Next year the conference returns to Orlando for its earliest appearance in memory, 27 February – 4 March 2005. As it turned out, the naysayers were wrong about this year's Windy City weather: a few snow flurries caused some trepidation early in the week but departing conferees on Thursday and Friday were relieved to find only crisp, cold conditions as they rode to O'Hare International Airport.

Despite the pessimistic prognostications of some economic prestidigitators, I found signs of an incipient upturn in the fortunes of the analytical instrument business at the conference. For starters, the quantity and quality of the preconference postcards that I received improved noticeably compared

with last year's crop. Instead of summarily tossing them in the bin, I kept all 50-something in the unrealistic hope that I would be able to visit each booth to take my chances on receiving the promised rewards. Ranging from personal digital assistants to televisions and portable DVD players, the offerings were a catalogue of electronic marvels. A few exhibitors offered a chance at winning some free product, and one simply put up \$500 in cold cash for a lucky booth visitor. Time will tell whether this activity is a sign of improved business conditions or the scheming of desperate marketing executives. I did not take home anything more interesting than a Rubik's cube and a yo-yo, of course.

This annual "GC Connections" instalment reviews new gas chromatography (GC) instrumentation and accessories shown at this year's Pittcon. For a review of new chromatography columns and accessories, please see the "Column Watch" columns in the April 2004 and this issue of *LC•GC Europe*.^{1,2} The information presented here is based upon manufacturers' replies to questionnaires received up until a few weeks before the conference, as well as additional information from manufacturers' press releases, websites and product literature. During the conference, I took time to traverse the convention aisles and see some of the new products firsthand as well as discover several items that were not covered by the questionnaires. Every effort

has been made to collect accurate information, but because of the preliminary nature of some of the material, *LC•GC Europe* cannot be responsible for errors or omissions. This article cannot be considered a complete record of all new GC products shown at this year's Pittcon because not all manufacturers chose to respond to the questionnaire, nor is all of the submitted information included here because of the limited available space.

This year's new GC products are divided into five categories: GC instrument systems and add-ons; autosamplers and injection-sampling accessories; detectors and accessories; general accessories and software and accessories. This categorization does not imply that the products listed are limited strictly to the chosen category — these are simply convenient ways to classify the large amount of information for clear presentation.

GC Instrument Systems and Add-ons

In the GC world, smaller instruments continue to dominate new product introductions. From a personal digital assistant-sized GC system to a portable GC–mass spectrometry (GC–MS) system, instrument manufacturers continue to push GC dimensions to smaller and smaller sizes. Although such miniaturized instruments tend to be offered in application-specific configurations in contrast to the traditional broadly configurable benchtop laboratory

gas chromatographs, the obvious advantages of portable instruments for on-site monitoring, environmental testing, forensic and security applications turns their singlemindedness into a strong attractor. At the same time, laboratory gas chromatographs continue to become more like commodity items than the research workhorses they were in the past, so much so that one new gas chromatograph this year featured “a choice of five colours to brighten your lab.”

On the comprehensive two-dimensional (2D) GC front, two companies showed instruments that feature a single flame ionization detector with sophisticated data-reduction and interpretation software for presenting the complex and information rich 2D data stream. The technique remains a research tool, however, and has not yet made significant advances into routine GC analysis.

In a Sunday afternoon “New Instrumentation” session, SLS Micro Technology GmbH (Hamburg, Germany) introduced what is arguably the world’s

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smallest commercially available GC module. At 3 × 2 × 1 in., the GCM-5000 GC module includes an inlet, a temperature-programmable column, a detector, gas-flow control and electronics. The company currently offers the module for evaluation and is looking for OEM vendors.

Varian introduced its model 4000 Ion Trap GC–MS system, which features three ionization source configurations: internal, external and hybrid. Varian also showed a new version of its model CP-4900 portable gas chromatograph, with a differential ion mobility detector that provides greatly increased sensitivities compared with the available thermal conductivity detector, as well as tunable ion selectivity. The device is factory-tuned for applications in the petrochemical, natural gas, environmental and life science areas.

From Thermo Electron (Waltham, Massachusetts, USA), the new Finnigan Focus DSQ GC system is a small-footprint version of the company’s dual-stage quadrupole mass spectrometer in combination with the single-column Focus GC system. The instrument package is targeted for routine low-cost operations. Also in the low-cost arena, the 200-Series GC system from EST Analytical (Cincinnati, Ohio, USA) is a small single-column routine laboratory instrument with an autosampler.

In the MS instrument category, the model QP-2010 MS system from Shimadzu Scientific Instruments Inc. (Columbia, Maryland, USA) offers a variety of ion sources, dual differential pumping and a direct inlet probe. The Headspace ChemSensor system from Gerstel Inc. (Baltimore, Maryland, USA) combines a

Table 1: GC instrument systems.

Product	Company	Comments
200 Series GC and Autosampler	EST Analytical	This is a compact, full-function capillary or metal-packed column GC system that features multilevel temperature programming, single-flame ionization or thermal conductivity detector, split-splitless inlet system and single keypad control. A companion 23-position autosampler is available. This unit won the UK DTI Technology Award for design.
4000 Ion Trap GC–MS	Varian	This ion trap MS system is configurable with three separate ionization configurations: internal, external and hybrid. The internal ionization configuration provides conventional ion trap electron ionization and positive chemical ionization. The external ionization option uses pulsed ionization, which reduces contamination and maintenance requirements, and adds negative chemical ionization capability as well as MS–MS detection mode. The hybrid chemical ionization mode enables the selection of a specific reagent ion for reaction with sample molecules. The detector has a mass range of 10–1000 Daltons, a pumping speed of 230 L/s, and works with the company’s CP3800 gas chromatograph.
CP-4900 with DMD	Varian	The CP-4900 Micro-GC with Differential Mobility Detector (DMD) is designed for trace-level, multicomponent analysis of gaseous samples. It has sensitivities in the 100 ppb range (e.g., for acrylates in natural gas), a dynamic range of 10 ³ and is largely independent of matrix effects. The DMD is factory tuned according to specific application requirements, and it runs in series with a μ -TCD. The μ -DMD uses nitrogen or zero-grade air as the transport gas at a typical flow-rate of 400 mL/min and a ⁶³ Ni ionization source. The instrument is intended for use in petrochemical, natural gas, environmental and life science applications. The dedicated analyser can be controlled from the company’s Galaxie, Star Workstation or CP-Maitre Elite workstation.
Finnigan Focus DSQ	Thermo Electron	The Focus Dual-Stage Quadrupole (DSQ) GC–MS system consists of a small-footprint EI-only quadrupole mass spectrometer with the company’s curved prequad optics from the Trace DSQ mass spectrometer and a single-column Focus GC system. The Trace DSQ features a mass range of 1–1050 amu, a maximum scanning rate of 10 000 amu/s and turbomolecular pump capacities of 70 or 250 L/s.
GCM 5000 Gas Chromatography Module	SLS Micro Technology GmbH	A micro-sized GC that fits into a 3 × 2 in footprint, the GCM 5000 incorporates a 1 m × 60 μ m bonded-phase capillary column on a temperature-programmed micromachined chip less than 1 in. square. Combined with a micromachined thermal conductivity detector, a valved inlet and microprocessor control, the system delivers fast chromatography down to 7 ppm of propane in helium in a package that’s the size of a PDA. The device is temperature-programmable to 200 °C in 30 s and cools down in almost the same time. The column flow-rate is around 100 μ L/min. The detector, which fits on a standard dual in-line package microchip, is made from silicon and thin-film platinum elements, has a response time of 250 μ s, and a 10 nL volume. The inlet is made from micromechanical components and injects volumes ranging from 30 to 300 nL. The onboard data system can store 2 MB of data for uploading via an RS-232 interface.

headspace sampler and a mass spectrometer with an optional GC separation system for pattern-recognition applications in quality-control analysis. The Skyshield PSU-03 from OhioLumex (Twinsburg, Ohio, USA) is a handheld portable GC–ion-mobility spectrometry (GC–IMS) system for detecting chemical warfare agents, explosives, and general screening and monitoring of public areas.

In the GC × GC arena, the appearance of two thermally modulated flame ionization detector instrument offerings demonstrates the ongoing viability of this technique, which appears to be poised to move from a research device to a serious tool for complex or otherwise inseparable samples. GC × GC instruments with conventional single-channel detectors are more accessible alternatives to their high-performance mass spectrometer–equipped counterparts.

Finally, Siemens Applied Automation (Bartlesville, Oklahoma, USA) showed the MicroSAM process gas chromatograph, a football-sized GC analyser built around silicon micromachining technology that interfaces to standard process-control networks.

Autosamplers and Injection–Sampling Accessories

The autosampler and injector category is the largest group in this year's crop of new GC products. As in the past, the emphasis is on trace-level samples and sample-specific techniques, including devices designed around individual regulations.

From Entech Instruments (Simi Valley, California, USA), the model 7500 large-volume headspace sampler accommodates as many as 24 500 mL glass sample containers and features an inert sample path. The company's model 8000 volatiles–semivolatiles concentrator works with the model 7500. EST Analytical (Fairfield, Ohio, USA) showed the Centurion purge-and-trap autosampler with 100-vial capacity, optional sample dilution and vial cooling. Also from EST, the Cobra L/S GC autosampler is an alternative to less capable autoinjectors and features dual-inlet capability and programmable injection parameters.

Agilent Technologies' (Wilmington, Delaware, USA) new model G1888 Network headspace sampler works with the company's gas chromatographs as well as with other instruments and features an

extended temperature range. The EDU MicroTD sample concentrator from WMA Airsense Analysentechnik GmbH (Schwerin, Germany) works with Agilent's micro gas chromatographs as a front-end gaseous sample concentrator that extends sensitivities down to 10 ppb for toluene.

Several companies offered new autosamplers based upon programmable robotic components. Thermo Electron showed its TriPlus autosampler with three-axis motion, which can be shared by two side-by-side gas chromatographs and performs headspace as well as liquid injections. Leap Technologies (Carrboro, North Carolina, USA) showed a configuration of its Combi PAL robotic autosampler system that includes an Atlas Optic 3 programmable-temperature inlet system plus direct thermal-desorption capability, all of which combine to give a large range of sample-handling abilities in a single-sourced sampling system.

From CDS Analytical (Oxford, Pennsylvania, USA), the model 5000 Pyroprobe extends the company's pyrolysis offerings to higher temperatures and faster ramping rates than in previous products.

The TurboMatrix Trap headspace

Table 1: GC instrument systems, (continued).

Product	Company	Comments
GC × GC FID	Leco	Based upon the company's Pegasus GC × GC Time-of-Flight (TOF) MS system, this GC × GC offering uses a single conventional GC detector and ChromaTOF-based software to control, detect and present GC × GC chromatograms. A liquid-nitrogen thermal modulator and second column oven act to create and control the comprehensive separation. The system is also compatible with other Agilent detectors, such as the electron capture detector.
Headspace ChemSensor system	Gerstel	This hybrid system directly couples a headspace sampler with a quadrupole mass spectrometer. By employing pattern-recognition software, the system provides rapid quality assurance information for samples through their volatile headspace gases. A gas chromatograph can be included in the system for added sample selectivity.
KT2003 GC × GC system	Zoex	This comprehensive GC × GC system uses a liquid-nitrogen-cooled modulation system with no moving parts that installs on a Agilent 6890 GC system with standard detectors. The company offers dedicated GC × GC dual column sets, connection accessories and transform software for analysis of comprehensive chromatograms.
MicroSAM Process GC	Siemens Applied Automation	This miniature process gas chromatograph uses silicon micromachining technology to perform sample stream injection, column switching, detection and flow control in a 10 in. diameter × 9 in. -high cylindrical explosion-proof package. The analyser interfaces with the company's Maxum Analyzer Network and EZChrom chromatography data-system software.
QP-2010 GC–MS system	Shimadzu Scientific Instruments Inc.	This GC–MS instrument system integrates a sensitive mass spectrometric detector with the company's GC-2010 gas chromatograph. The quadrupole mass spectrometer has a scan sensitivity of better than 200:1 for 1 pg of octafluoronaphthalene, a mass range of 1.5 to 1024 Da and a maximum scan rate of 6750 Da/s and 50 scans/s. Available ion sources include electron ionization and positive and negative chemical ionization, and it features dual rhenium coil filaments. System vacuum is provided by dual-differential turbomolecular pumps. A concurrent direct-inlet probe operates from a separate ion source.
Skyshield PSU-03	OhioLumex	A handheld portable GC–IMS system for detecting chemical warfare agents, explosives and general screening and monitoring of public areas and the environment, the device weighs less than 20 lb with battery. It uses an air-carrier gas with a high-speed 20 cm long multicapillary column with syringe injection or a sample enrichment concentrator and a tunable ion mobility spectrometer to achieve sensitivities in the order of 10 ⁻⁵ mg/m ³ .

sampling system from PerkinElmer (Shelton, Connecticut, USA) adds a trap-preconcentrator to the TurboMatrix sampler that increases the effective headspace volume and produces sensitivities improved as much as 100 times. The sample also has a dry-purge capability and internal standard addition. Teldyne Tekmar (Mason, Ohio, USA) has introduced the OPTIPlex purge-and-trap interface that monitors up to eight streams and vials at programmable intervals and

interfaces to their AQUATEk70 water autosampler.

From Supelco Sigma/Aldrich (Bellefonte, Pennsylvania, USA), the Dioxin Sample Prep system is a configurable set of dedicated glassware and hardware for dioxin sample preparation. The Discovery DSC-MCAX solid-phase microextraction cartridge (also Supelco) offers unique selectivities for basic and zwitterionic compounds.

The Prep9000 from Brechbuler AG (Spring, Texas, USA) is a GC fraction

collector that traps eluted peaks on an absorbent bed for later solvent desorption and subsequent analysis. It works in conjunction with their Sniffer 9000 olfactory port.

A unique programmable-temperature inlet offering was shown this year by Eminent & Co. (Wakayama, Japan). The LAVIStoma large-volume inlet features a stomach-shaped inlet liner that engenders total sample evaporation in the inlet. It also permits *in-situ* derivatization. The inlet is

Table 2: Autosamplers and accessories.

Product	Company	Comments
7500 large-volume HS autosampler	Entech Instruments Inc.	The model 7500 autosampler accommodates as many as 24 500 mL glass sample containers for high-sensitivity headspace analysis of liquid and solid samples. As much as 300 mL of headspace can be concentrated for injection. The sample transfer line is coated with Silonite, which improves recovery of polar and thermally labile volatile chemicals. A variety of modular trays are available to accommodate other sample and canister configurations.
Centurion purge-and-trap autosampler	EST Analytical	This 100-position purge-and-trap autosampler accepts EPA standard 40 mL volatile organic analyte vials. It operates under the Windows CE operating system and includes programmable internal standard addition, dual concentrator and dual GC capabilities, sample dilution up to 250×, optional vial cooling and a hot water rinse that ensures a clean sample pathway.
Cobra L/S GC autosampler	EST Analytical	This device is an autoinjector alternative that works with most GC systems. It features dual inlet injection, variable syringe injection and fill rates, and multiple programmable solvent and wash/waste vials. It is available with either 120 or 220 vial tray options.
EDU, MicroTD	WMA Airsense Analysentechnik GmbH	The MicroTD is a fully automatic sampling and desorption device for Agilent micro GC systems that extends sensitivity down to 10 ppb toluene. The device reduces the amount of environmental water that enters the GC system, has exchangeable sampling tubes and heated transfer lines, and can be battery powered.
G1888 network headspace sampler	Agilent Technologies	The G1888 network headspace sample works with the company's GC and ChemStation, as well as with other gas chromatographs. The device features an inert sample pathway and an increased temperature range of up to 230 °C. It has a 70 sample tray with simultaneous thermostating of 12 vials, provides multiple headspace extraction (MHE) and cryofocusing concentration capabilities, and is easily switched between electronic pneumatic and manual pneumatic control. Optional screw-cap vials provide added convenience for field sampling. Both 10 and 20 mL vial sizes are supported.
LEAP Combi PAL with ATLAS Optic 3 inlet and DTD	Leap Technologies	This combination add-on autosampler, with the Atlas Optic 3 inlet direct thermal desorption, enhances an existing GC system with direct liquid injection, static headspace sampling, solid-phase microextraction (SPME) and thermal desorption capabilities. The programmable Combi PAL autosampler shuttles samples between the various injection systems, the GC inlet or the thermal desorber. The headspace sampling portion accommodates up to 96 10 mL or 20 mL vials at thermostated temperatures from 35 to 200 °C. The syringe is gas-flushed between samples and the system will also perform MHE.
Model 5000 Pyroprobe	CDS Analytical	The company's new pyrolysis inlet system has a maximum temperature of 1400 °C with rates from 0.01 °C/min to 20 000 °C/s. It can handle samples weighing from 10 to 100 mg. Other capabilities include multistep analysis, PC control, sample-trapping capability and reactant atmosphere sampling.
TriPlus autosampler	Thermo Electron	This new autosampler features three-axis (x,y,z) motion and can handle both liquid and headspace samples separately or simultaneously. Two GCs installed side-by-side can share one TriPlus Autosampler with asynchronous individual instrument start times; the sample type is easily set with interchangeable dedicated turrets for headspace and liquid samples. The autosampler system is compatible with the company's GC line and accepts up to 300 vials, syringes from 5 to 250 mL, variable needle lengths, multiple wash and waste vials, and headspace sample temperatures up to 150 °C. The device can be controlled from a dedicated Pocket PC or an external computer.
TurboMatrix Trap headspace sampling system	PerkinElmer	This GC headspace sampling system incorporates a built-in trap/concentrator that lowers detection limits by increasing the effective headspace sample volume to yield as much as 100× better sensitivities. The system is available in both 40 vial and 110 vial configurations and features dry-purge capability and internal standard addition, as well as the ability to isolate the GC column from the headspace sampler for ease of maintenance with GC-MS systems. The sampler also features MHE capability, a frequency-scanning vial shaker that requires no optimization and multiple-vial overlapping thermostating for improved sample throughput.

Table 2: Autosamplers and accessories, (continued).

Product	Company	Comments
8000 Volatiles/ Semivolatiles concentrator	Entech Instruments Inc.	The company's new oven-mounted large-volume trapping system increases the molecular weight range of recovered chemicals relative to purge-and-trap inlets and allows recovery of C ₂ –C ₂₅ compounds in a single analysis. The system is suitable for trace-level headspace analysis of high molecular weight and thermally labile compounds. The manufacturer's model 7500 autosampler interfaces to the model 8000 to provide automation capability at temperatures up to 150 °C.
Dioxin Sample Prep system	Supelco Sigma/Aldrich	This multilayer 350 mm-long × 17 mm-wide o.d. silica-gel prep column can save 1–2 days of prep time per dioxin sample. It features an integrated glassware and hardware design that enables selection of a few pieces or the entire system as desired, and can be used in manifold, syringe or single-column gravity feed modes. It is suitable for dioxin analysis under EPA Method 1613, Japanese Standards Institute Methods K0311:1999 and K0312:199, and UK Methods M23, M1613B and EN-1948.
Discovery DSC MCAX SPE cartridge	Supelco Sigma/Aldrich	Mixed-bed SPE cartridge packing uses the dual-retention mechanisms of its combination of octyl (C ₈) and benzene sulphonic acid (SCX) bonded packings to improve the selectivity and sample clean-up of basic and zwitterionic compounds.
OPTIPlex purge- and-trap interface	Teldyne - Tekmar	This automated purge-and-trap system monitors for VOC in water. Up to eight streams and vials are sampled at predetermined times and in various sequences. The unit interfaces with the company's AQUATek 70 Water autosampler, which allows standard vial analysis as well.
Prep9000	Brechtbuler AG	This GC fraction collector works with the company's Sniffer 9000 olfactory port to collect desired compounds on adsorbent material. Repetitive collection from multiple samples is assisted by a computer and the collected samples are solvent desorbed for subsequent use. The system works with Thermo GC systems.
LaviStoma inlet system	Eminet & Co. Ltd.	This new programmable temperature-vaporizing inlet system features a unique stomach-shaped inlet liner that makes it possible to perform large-volume injection of volumes as large as 200 µL, perform derivatization <i>in situ</i> , and also perform cold splitless injection. The device has a temperature range of 40–300 °C and a programme rate as high as 150 °C/min. It uses a dedicated control box and can be installed on Agilent 6890 or Shimadzu 17-A gas chromatographs.
Titan Family of GC inlets	ASAP Analytical	The Titan SL and Titan XL capillary inlet systems are designed for Agilent GC systems. The inlets are deactivated with the company's Inertium coating. The Titan SL is a conventional split/splitless inlet with a 450 °C temperature limit and extended length fused-silica liner. The Titan XL is a programmed temperature vaporizing inlet with a 720 °C/min ramp rate up to 500 °C, optional cryogenic cooling and large-volume injection capability.

Table 3: Detectors and accessories.

Product	Company	Comments
5973N-Inert MSD	Agilent Technologies	This mass selective detector features an ion source that is fabricated entirely of an inert material that permanently retains its inertness and does not require separate deactivation. The detector has 0.1 amu mass axis stability for 48 h, hyperbolic quadrupole rods and off-axis high-energy dynode detectors. Together with ChemStation software, this detector offers the capability of operating the ion source at higher temperatures.
ASD amperometric sulphur detector	PerkinElmer	This new sulphur-specific detector features sensitivities under 10 ppb with equimolar response, selectivities of 10 ⁻⁶ to 10 ⁻⁷ for carbon versus sulphur, and a 10 ⁴ linear range. A permeation tube calibration source is also available. The detector combusts sulphur-containing eluents into H ₂ S, which is then detected in an electrochemical sensor. It is available in several application-specific configurations in combination with the company's Clarus 500 GC system, including trace sulphur plus aromatics.
Intelligent Ion miniature mass spectrometer	Intelligent Ion Inc.	This miniaturized MS detector uses a non-scanning Mattauch-Herzog double focusing mass filter with a CCD detector array to achieve unit mass resolution over 2–150, 12–350 or 12–700 amu ranges. It has a 70 eV rhenium filament electron ionization (EI) source and sub-ppm sensitivities. It accommodates an optional 60 µm i.d. capillary precolumn for GC–MS operation. The unit is portable with its small size (10 × 24 × 14 in.) and weight (40 lb).
Ion Bright source for Finnigan DSQ mass spectrometers	Thermo Electron	This new ion source is available for both the Finnigan Trace DSQ and the Finnigan Focus DSQ. The source features improved lensing that yields less ion scatter into the quadrupole prefilter for a 2× improvement to 50:1 in the S/N specification for 1 µg of octafluoronaphthalene. The new source also reduces cleaning requirements and is retrofittable to existing instruments.

available for Shimadzu and Agilent GC systems. The Titan GC inlets from ASAP Analytical (Ludlow, Kentucky, USA) are a series of internally deactivated inlets, both conventional and programmed-temperature, that operate with Agilent gas chromatographs.

Detectors and Accessories

The main trend in detectors this year is also towards better sensitivity. Instrument companies employed either design improvements or enhanced detector inertness to achieve better marks.

The 5973-N Inert MSD detection system

from Agilent Technologies uses an ion source fabricated from an inert material instead of using conventional materials that are deactivated with a separate inert coating. The new ion source does not lose its deactivation upon abrasive cleaning, according to Agilent.

Table 4: General accessories.

Product	Company	Comments
Dual Vespel ring inlet seal	Restek Corp.	These replacement inlet seals for Agilent split/splitless inlets feature a soft Vespel seal on both their top and bottom surfaces that eliminates the need for a separate washer seal. The seals greatly reduce injection port leakage with thermal cycling and require much less torque at installation. They are available in stainless steel, gold-plated and Siltek treated.
GC Racer temperature programmer	Horizon Technology	The GC Racer GC add-on provides rapid temperature programming for higher GC sample throughput. The device works with the GC microprocessor to maintain heating rates up to 70 °C/min at oven temperatures as high as 350 °C. It is compatible with any inlet-detector combination on Agilent 5890 or 6890 GC systems.
SeCure "Y" connector	Restek Corp.	The device is a glass Y connector constrained in a metal bracket that prevents undesired tubing disconnection during operation up to 40 °C. The bracket mounts onto the company's standard capillary column cage. The connector is available in sizes to fit standard fused-silica columns from 0.25 to 0.53 mm i.d.
Stop-Flow GC kit	Restek Corp.	This accessory for dual capillary column systems helps resolve coeluting analytes while reducing analysis time by momentarily interrupting flow through the first column to enhance separation of target compounds. Compounds that otherwise would be coeluted from the second column are further separated by the stopped flow action. Multiple stop-flow operations can be programmed to optimize separation of multiple peak pairs. The device is available as an add-on kit and includes hardware to interface with the Agilent 6890 GC system.

Table 5: Software and accessories.

Product	Company	Comments
Device Development Kit for Atlas CDS	Thermo Electron	The Device Development Kit provides tools to control new instruments with Thermo's Atlas chromatography data system to incorporate new LC and GC technology into the automated laboratory environment more quickly. It offers a common user interface that minimizes training requirements.
Mass Spectra of Designer Drugs	John Wiley & Sons	Compiled by the mass spectral experts at the Regional Departments of Criminal Investigation in Kiel, Hamburg and Weisbaden, Germany, this database includes 1400 chemical compounds and 1700 mass spectra, 100 chemical warfare agents, added because of recent interest in homeland security, and data taken from both legal and underground literature, providing a comprehensive picture of these compounds.
MSD Deconvolution reporting software	Agilent Technologies	This software-reporting package for target compound analysis in the environmental, food safety, and homeland security industries provides consolidated MS data processing and reporting using the company's GC-MS ChemStation, the National Institute for Standards and Technology (NIST) Automated Mass Spectral Deconvolution and Identification Software (AMDIS), and the 143 000 compound NIST 2002 Mass Spectral Search program (NIST02). It reduces the time required for compound identification by as much as 2 h compared with manual data manipulation and increases results confidence by applying three independent verification techniques.
MSD Security ChemStation	Agilent Technologies	Data-system software for the company's 5973 series GC-MS detector addresses the requirements for data security, integrity and traceability of FDA 21 CFR Part 11. It enforces secure user identification, traceable and auditable activity records, and electronic sign-off of records for a closed system. It uses standard Windows® user administration. Electronic records are stored together with all associated raw data, metadata and results versions by the automatic audit trail capability. The system is compatible with the company's 6890 series GC systems and 5973 series mass-selective detectors.
SoftLINK	PerkinElmer	Controls as many as four Clarus 500 GC systems from a single workstation without intermediary box or interface cards. GCs can be connected to the computer via RS 232 or USB computer ports. The system runs under the company's TotalChrom 6.2.1 Workstation environment.
TurboMass V. 5.0 reporting software	PerkinElmer	New version 5.0 reporting software for Clarus 500 and TurboMass GC-MS systems adds multiple-ion ratio reporting, improved report summary and page-formatting options to meet the specific needs of users conducting forensic, clinical or toxicological diagnostics, as well as general chemical analysis. The software is based on the Communiqué report creator that is available on multiple PerkinElmer products.

Taking the improved design approach, Thermo Electron introduced the Ion Bright source for its DSQ line of benchtop GC mass spectrometers. The new source features improved ion lensing that gains sensitivity by reducing ion scatter while at the same time reducing maintenance cleaning requirements.

The sole entry in a classic non-spectrometric detector comes from PerkinElmer/Arnel. The ASD amperometric sulphur detector delivers equimolar sulphur response with <10 ppb sensitivities and six to seven orders of magnitude of selectivity against carbon. The detector is available in several application-specific configurations of the PerkinElmer Clarus 500 GC system.

Finally, the Intelligent Ion miniature mass spectrometer from Intelligent Ion Inc. (Seattle, Washington, USA) uses a non-scanning double-focusing mass filter and a charge-coupled diode array in a portable format. The unit is also able to accommodate a capillary precolumn.

General Accessories

Only a few general accessories came to my attention this year. Items fall into this category if they do not obviously fit elsewhere.

The Dual Vespel ring inlet seals from Restek (Bellefonte, Pennsylvania, USA) are for Agilent split-splitless inlets. The devices improve sealing and require less torque for installation than other inlet seals of this type. Also from Restek, SeCure Y-shaped connectors are a variation on press-fit fused-silica column connectors. They constrain the connector in a metal bracket that hangs inside the capillary column cage and prevents undesired tubing disconnection.

Two accessories addressed specific capillary column performance issues. First, the Stop-Flow GC kit from Restek is a dual-capillary column accessory that helps resolve coeluted analytes while reducing analysis time by momentarily changing the column flows to control peak passage through the columns' midpoint connection. Second, the GC Racer accessory from Horizon Technology (Atkinson, New Hampshire, USA) is a high-ramp temperature-programming add-on for Agilent gas chromatographs that boosts programme rates at higher temperatures, well beyond the factory instrument heater's capabilities.

Software and Accessories

This year, there were many software offerings at Pittcon, especially in the

laboratory information management systems (LIMS) area. In particular, these booths were organized into a Laboratory Informatics neighborhood which, as I walked through, had a little of the flavour of a carnival midway with competing vendors located across the aisles from each other. I could almost imagine them barking out their sales pitches to all passers-by. Because of the large number of LIMS products, and for reasons of conserving space in this review, I limited this column to mention only those software vendors that offered new items directly related to GC instrumentation.

From Thermo Electron, the Device Development kit for the Atlas chromatography data system is a developer's toolkit that allows rapid deployment of new LC and GC instrument technology and a common user interface to minimize training requirements.

John Wiley & Sons (Hoboken, New Jersey, USA) has published a collection of mass spectra of designer drugs that includes 1400 compounds and 1700 mass spectra plus 100 chemical warfare agent compounds. The library is compatible with search and data-reduction software that uses the company's other current mass-spectral libraries.

Agilent Technologies introduced a new mass-selective detector deconvolution reporting software package that performs target compound analysis with three independent verification techniques. Reportedly, it can reduce the time required for compound identification by as much as 2 h. Agilent also deployed a new version of their ChemStation software for the 5973 series GC-MS detector that addresses the requirements for data security, integrity and traceability of FDA 21 CFR Part 11. The software enforces secure-user identification, traceable and auditable activity records, and electronic sign-off of records for a closed system.

New GC software offerings from PerkinElmer include SoftLINK instrument-control software that operates as many as four of the company's Clarus 500 GC systems from a single TotalChrom 6.2.1 Workstation using either RS-232 or universal serial bus (USB) ports without additional intermediary control boxes or interface cards. The company also announced its TurboMass V.5.0 reporting software for its TurboMass GC-MS system, which adds multiple-ion ratio reporting, improved report summary, and page-formatting options based upon the company's Communiqué report creator.

Conclusion

Yet again, in 2004 Pittcon proved itself the flagship annual conference in analytical chemistry. In the GC arena, instrument, software and accessory manufacturers continued to enhance their products with new technologies and to improve existing equipment with new ideas. This year, the largest number of new or improved products was in the automation category, followed by instrument systems and add-ons. Perhaps the showing of so many relatively expensive offerings signals an upturn in the instrument business. Next year's conference might reveal whether such a trend is truly under way.

References

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For an on-going discussion of GC issues with John Hinshaw and other chromatographers, visit the Chromatography Forum discussion group at <http://www.chromforum.com>