HEALTH & SAFETY
WINNING WITH LOTO

ASK THE EXPERT:
TRENDS IN BIOINFORMATICS

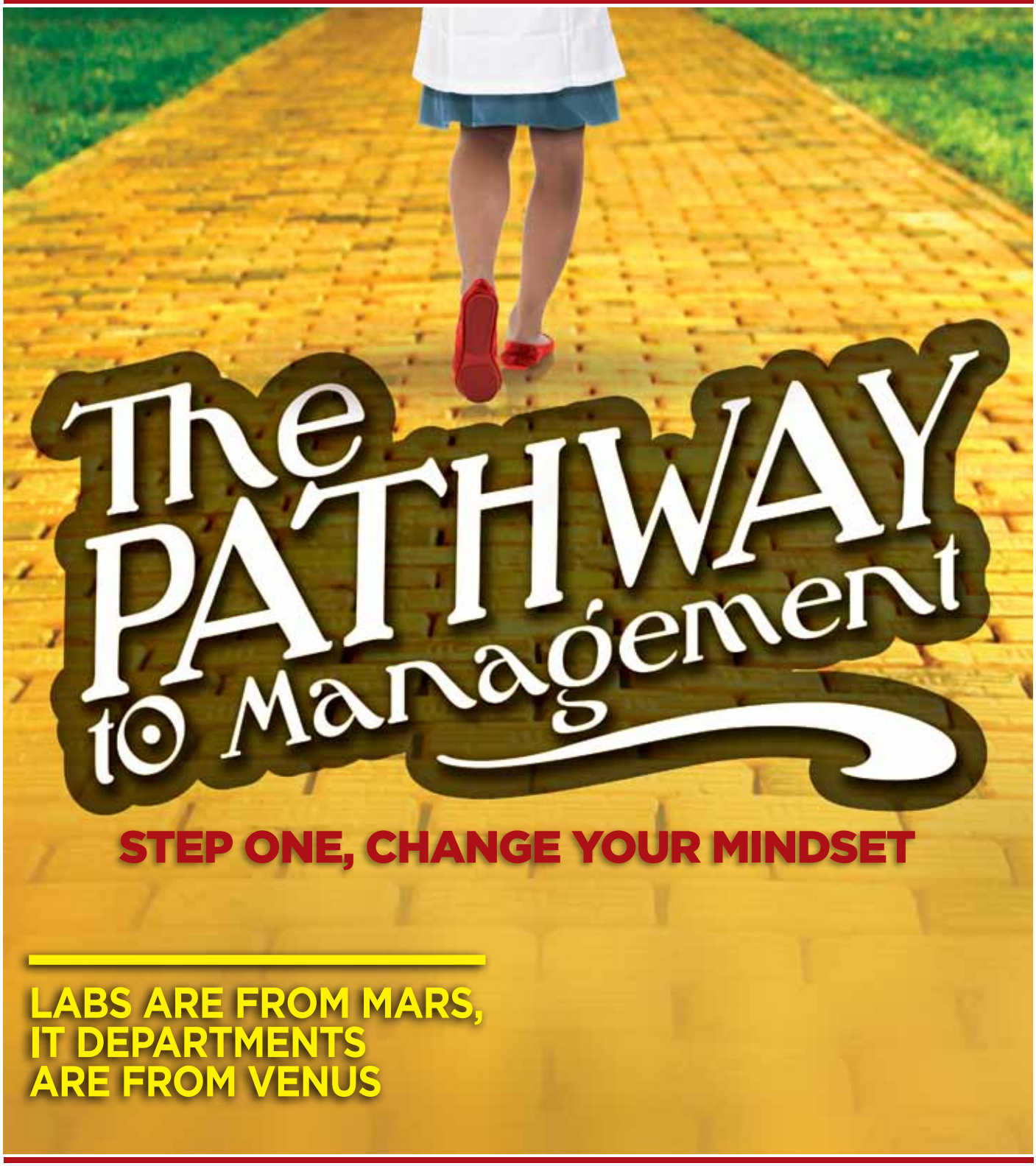
INSIGHTS
LAB TECHNOLOGY BUYER'S REPORT

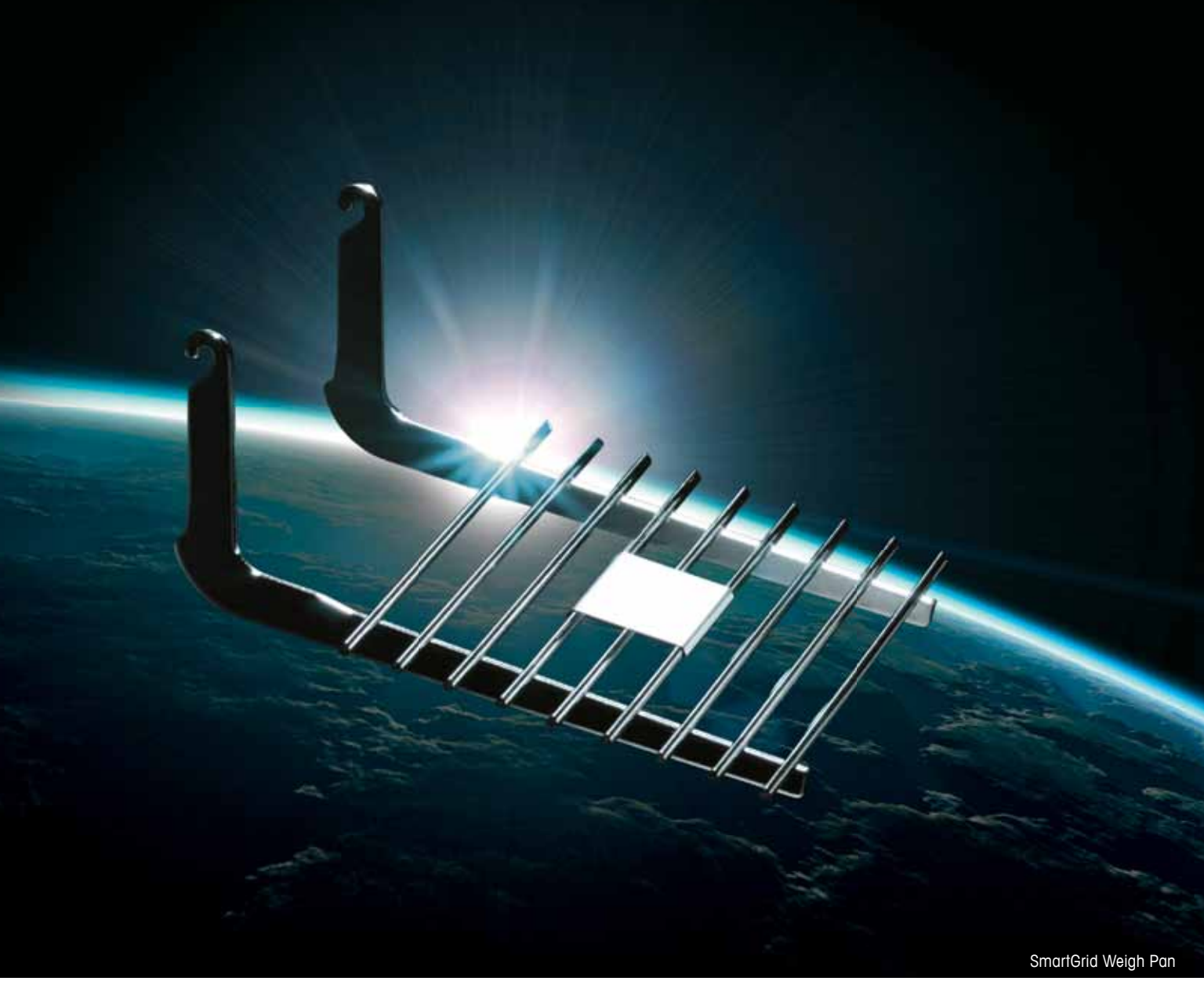
AUTOMATED SAMPLE PREP
WWW.LABMANAGER.COM
P. 65

MAGAZINE
Lab Manager®
Run Your Lab Like a Business

Available on the App Store

January / February 2013 Volume 8 • Number 1





Just Think...What's Possible

It's about the possibilities. What if your insight leads to the next great advancement? At METTLER TOLEDO we know that drive because we feel it too. Our weighing equipment helps scientists like you push the limits of discovery. You can trust your results, so the focus remains on what's most important — what lies beyond your horizon.

To see what's possible, visit **www.mt.com/justthink**.

METTLER TOLEDO

erlab®

PITTCON™ CONFERENCE & EXPO 2013 PHILADELPHIA MARCH 17-21

See us at Pittcon
Booth #924

captair®

Ductless filtering fume hoods and vented storage cabinets

Ductless Fume Hoods
captair flex

Vented storage cabinets
captair® store

PCR Workstations
captair® bio

Clean air enclosures
captair® flow

Stand alone filtration systems for fireproof cabinets
chemtrap™

PROTECTION BY FILTRATION SPECIALISTS

- ✓ Exclusive Flex® filtration technology
- ✓ No ductwork necessary
- ✓ Very low energy consumption
- ✓ No pollutants released into the atmosphere
- ✓ No advance planning required
- ✓ Mobility for instant use

captairsales@erlab.com
800-964-4434

Download the brochure today
www.captair.com

Lab Manager MAGAZINE
Run Your Lab Like a Business

CONTENTS

www.labmanager.com January / February 2013

Feelings about the Future
How confident are your fellow readers about their laboratories' financial situations as we move into the New Year? You'll find out next month when we release our Fifth Annual Investment Confidence Report and reveal how respondents felt about general business conditions in their labs at the end of 2012 and whether they expect those conditions to improve, worsen, or stay the same in 2013. Included in the report will be answers to questions concerning investments in basic and capital equipment, consumables, construction, renovation and lab setup, as well as changes to compensation, benefits and staffing levels. Also featured in next month's issue is a preview of the new technologies, services, software and basic lab equipment you'll be seeing at Pittcon 2013, March 17 - 21, in Philadelphia, PA.

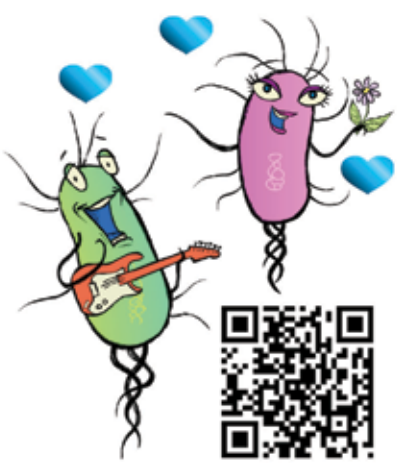
ultimate protection

The world leader in sample protection never rests. Based on feedback from customers like you all over the world, we're proud to present our newest innovation. Touch-screen control panels offer 24/7 health monitoring and a detailed event log. Our efficient cabinet design fits more samples in a smaller footprint. Reliable temperature uniformity, recovery and back-up systems assure protection. All for one reason: your samples are our obsession.

optimum capacity

• thermoscientific.com/morethanafreezer

Thermo
SCIENTIFIC



It's more than a freezer!
Watch our new video now by scanning this code with your SmartPhone.

Lab Manager MAGAZINE®
Run Your Lab Like a Business

Lab Manager Magazine® (ISSN: 1931-3810) is published 10 times per year; monthly with combined issues in February/March and July/August, by LabX, P.O. Box 216, 478 Bay Street, Midland, ON Canada L4R 1K9. USPS 024-188 Periodical Postage Paid at Fulton, MO 65251 and at an additional mailing office. A requester publication, Lab Manager, is distributed to qualified subscribers. Non-qualified subscription rates in the U.S. and Canada: $120 per year. All other countries: $180 per year, payable in U.S. funds. Back issues may be purchased at a cost of $15 each in the U.S. and $20 elsewhere. While every attempt is made to ensure the accuracy of the information contained herein, the publisher and its employees cannot accept responsibility for the correctness of information supplied, advertisements or opinions expressed. POSTMASTER: Send address changes to Lab Manager Magazine®, PO Box 2015, Skokie, Il 60076.

WDS Canadian return: P.O. Box 216, 478 Bay Street, Midland, ON Canada L4R 1K9.

BPA WORLDWIDE BUSINESS
Lab Manager Magazine® is audited by BPA

Relax with the **Microlab® 300 Series Pipettor**
A Guided Pipetting System from Hamilton.

- Programmable methods ensure a reproducible process
- Easy-to-use liquid parameters improve accuracy
- Automatic volume adjustment expedites workflows
- Fatigue-free design maximizes all-day performance

Order One Today!
1 (888) 525-2123
www.hamiltoncompany.com/microlab300

HAMILTON®
THE MEASURE OF EXCELLENCE®

More New Year's resolutions

Perhaps you've made your usual New Year's resolutions: Get to the gym more often, be a better friend, eat more fruits and vegetables, for which I commend you. However, if you're looking to make resolutions that will have a direct impact on your job performance and career development, you've come to the right place.

Resolution #1 – Expand your focus. This month's cover story outlines the necessary mindset changes required to move higher up your organization's management ladder, the most important of which is to gain a larger perspective. "Lab managers need to expand their focus from internal matters and company politics in order to develop an externally informed perspective on business opportunities and challenges," author John Borchardt tells us.

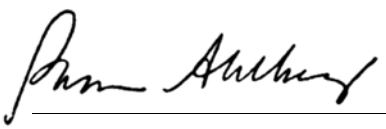
Resolution #2 – Mentor more. This month's Leadership & Staffing article looks at the lack of good mentoring programs in most labs today and argues that this is a dangerous shortcoming. "One of the points of differentiation between labs that have survived and grown and those that have disappeared or been absorbed by larger organizations was the way they treated their people. Valuing, training, and mentoring the people who work in our labs is of critical value," says Martin Mitchell, managing director, Certified Laboratories, Inc. (Plainview, NY). Driving that message home is Rebecca Pfundheller, president and CEO of Analytical Food Laboratories (Grand Prairie, TX) in this month's Perspective On article, in which she says, "One of my favorite parts is working with the employees and seeing them grow and helping them. I like to help their growth and their motivation because, in turn, they help the company and everything, so it gives back tremendously."

Resolution #3 – Create partnerships. Whether it is with your equipment vendors or your IT team, success in those relationships depends on how effectively you develop partnerships. Mark Lanfear in this month's Science Matters article says, "In the economic crunch of the current global marketplace, the potential benefits of treating a vendor like a true partner and selecting the right one can be a make-or-break scenario, as all companies are realizing that the world of work has changed and strategic partnership planning is a must." As for your IT department, author Joe Liscouski echoes the same message: "Informatics and computer-controlled systems are going to play an increasingly important role in lab work, and those tools are going to become more powerful, capable, and complex. For those tools to work properly, the underlying pieces need to function; and that, in part, is a role that IT groups provide. The smart choice is to develop an effective partnership that is mutually beneficial and synergistic. That requires planning and thought."

While the benefits of these three resolutions won't show on your scale or waistline, they just might improve your work life and advance your career in important ways.

Beginning with this issue, we are bringing our INSIGHTS supplement within the pages of the magazine. This month author Angelo DePalma tackles the very important topic of sample preparation, calling it "a tedious, time-consuming task but a necessary part of nearly every analytical workflow, regardless of industry or laboratory type." Turn to page 65 to find out everything you need to know when making your next sample prep equipment purchase.

Happy New Year!



Pamela Ahlberg
Editor-in-Chief

Lab Manager MAGAZINE
Run Your Lab Like a Business

Publisher Edward Neeb
edwardn@labmanager.com
860.350.2761

Editor-in-Chief Pamela Ahlberg
pam@labmanager.com
973.729.6538

Assistant Editor Rachel Muenz
rachelm@labmanager.com
888.781.0328 x233

Contributors John K. Borchardt, Ph.D.
Angelo DePalma, Ph.D.
Mark Lanfear
Sara Goudarzi
Tanuja Koppal, Ph.D.
F. Key Kidder
Joe Liscouski
Vince McLeod, CIH
Ronald B. Pickett
Bernard Tulsi
Mike May, Ph.D.

Account Managers Edward Neeb
Northeast
edwardn@labmanager.com
860.350.2761

June Kafato
International
junek@labmanager.com
705.812.2332

Larry Frey
Southeast, Midwest & West
larry@labmanager.com
845.735.5548

Alyssa Moore
Mid-Atlantic
amoore@labmanager.com
610.321.2599

Art Director & Production Manager Gregory A. Brewer
gregb@labmanager.com
888.781.0328 x241

Graphic Designer Danielle Gibbons
danielleg@labmanager.com
888.781.0328 x237

List Rental Jen Felling—Statlistics
203.778.8700

Custom Article Reprints The YGS Group
labmanager@theygsgroup.com
800.290.5460
717.505.9701 x100

Subscription Customer Service info@labmanager.com

Published by LabX Media Group

President Bob Kafato
bobk@labmanager.com
888.781.0328 x223

Managing Partner Mario Di Ubaldi
mariod@labmanager.com
203.227.1390

General Manager Ken Piech
kenp@labmanager.com
888.781.0328 x226

888.781.0328
P.O. Box 216, 478 Bay Street
Midland, ON, Canada L4R 1K9

PRO Scientific

Your lab equipment experts.

Homogenizing

Mixing

Shaking

Stirring

Centrifuging

www.proscientific.com 1-800-5-THE-PRO

THE PATHWAY TO MANAGEMENT

STEP ONE, CHANGE YOUR MINDSET

by John K. Borchardt

While there are specific skills one needs to develop in order to be an effective manager, there are also five mental attitudes or mindsets that aspiring managers need to develop. Specific proficiencies such as oral communication and time management skills are not enough without cultivating these mindsets. These mindsets will determine how you interpret or respond to situations likely to occur in laboratory management.

These mental attitudes are:

- Developing an external focus beyond your company to include your industry, your suppliers and your customers. This is necessary to identify business opportunities and competitive challenges.
- Adopting a commercial mindset. Lab managers need to be involved in identifying commercial opportunities and working back from these opportunities to develop and prioritize laboratory activities that deliver value. This means understanding how your employer makes money within and across its businesses.
- Delivering results by motivating people to succeed, tracking performance, and rewarding success.
- Providing speed in all of the above by making effective decisions in a timely manner, removing barriers to timely action, and managing risk.
- Striving for simplicity by eliminating activities that add unnecessary costs and do not deliver commercial value.

Let's look at each of these five skills in more detail.

> "Proficiencies such as oral communication and time management skills are not enough."

External focus

Lab managers need to expand their focus from internal matters and company politics in order to develop an externally informed perspective on business opportunities and challenges. By doing so, they develop an understanding of what the firm's customers need—both immediately and in the long term—and institute projects to meet these needs. This often means instituting external partnerships that deliver value to the firm, its external partners, and its customers.

This can be accomplished by reading trade magazines and research journals to keep updated on relevant new developments. Developing a professional network of contacts within the company and among customer and supplier personnel as well as relevant people in academia and government can also make one aware of new developments and opportunities. Attending conferences to make new contacts and renew existing ones is very useful. Using e-mail and the telephone to develop and maintain these contacts can be quite helpful. Using social media to keep in touch may also be useful depending upon the confidentiality of the subject matter discussed.

An external focus can help industrial laboratory managers overcome limitations in laboratory staffing and other resources by establishing partnerships with university research groups to undertake projects the industrial lab could not undertake on its own. For example, through attending American Chemical Society national meetings,

it's time.

(and all about *your* time)

Gilson takes PIPETMAN® to the MAX.

Coming 2013.

See it first at booth 1601 at SLAS, January 13 – 15th.

GILSON®

www.gilson.com

I established connections with engineering professors at the University of Maine and the University of Utah, resulting in joint research projects culminating in my employer receiving several patents, developing several new commercial chemical products, and my publishing several peer-reviewed papers in research journals and trade magazines.

"Attending conferences to make new contacts and renew existing ones is very useful."

Another way to add value through an external focus is to license technology. This requires working closely with your firm's patent department (if it has one) or through an external intellectual property firm. Technology licensing is a complex process and should not be undertaken without the advice of an intellectual property attorney.

Strategic thinking is a way of analyzing situations that involves developing the best possible solutions for various scenarios and events. It is proactive, not reactive, and requires one to challenge conventional thinking. It requires understanding today's business and technology environment and extrapolating it in order to anticipate the environment of tomorrow. The goal is to develop action plans for various possible business scenarios. Then, if a critical scenario comes to pass, the company is prepared and has an action plan to implement. To do this, the team must weigh the various risks of each course of action against the rewards.

Strategic thinking is best done in teams. It requires time, and some managers even schedule a retreat to consider strategic plans. Once formulated, these plans must be articulated so everyone understands and buys into the concept.

Perhaps the most famous example of strategic business planning is Shell Oil's response to the 1973-74 Arab oil embargo that cut off Middle Eastern crude oil supplies to the United States, Europe and Japan. Shell employees had considered this possibility in a scenarios-planning session a couple of years earlier.[1] Based on their analyses, Shell modified its refineries to handle crude oil from Latin American countries and sold some of its oil tankers. (Empty, idle tankers became very cheap to charter.)

Commercial mindset

Developing and maintaining a commercial mindset is essential in maintaining your firm's current business and developing new businesses. Encouraging your staff members to do the same will help your work group outperform competitors.

Understanding how your firm provides value for customers in each business within your purview helps you do this. One can work backward from commercial opportunities to design and prioritize laboratory projects and activities that deliver value.

According to Treacy and Wiersma,[2] the three major sources of competitive advantage are operational excellence, product leadership and customer intimacy. In the case of chemical and pharmaceutical manufacturers and instrument firms, operational excellence primarily means cost-effective, environmentally acceptable manufacturing processes. Product leadership means providing customers with superior products at a reasonable price. Customer intimacy means understanding your customers' businesses and needs well enough to develop highly useful products for them.

Seldom can companies, even large ones, excel at all three of these sources of competitive advantage. This enables small and midsize labs to compete with the giants in their industry on more than just price. Managers and their staffs at these modestly-sized laboratories often focus on customer intimacy rather than the more expensive activities required for preeminence in operational excellence and product leadership.

Delivery

Project management provides a means to ensure delivery of work product on a timely basis. "Projects are the means by which organizations adapt to changing conditions," says Eric Verzuh, president of The Versatile Company, a training and consulting firm.[3] However, laboratory project managers rarely have the formal authority they need to make all the decisions required to complete a project. Therefore, project managers must consult with managers and project stakeholders to access the resources needed for the project.

To achieve project goals on a timely basis, lab managers must persuade staff members to agree on clear accountability. This commitment often must extend beyond those staff members who report to them, to sales and marketing staff members, patent attorneys and pro-

NEW!

Thermo SCIENTIFIC

performance simplified

Multiple users. A variety of processing requirements. A range of user experience. To overcome these everyday challenges of a shared laboratory setting choose the **NEW! Thermo Scientific Sorvall LYNX superspeed centrifuge**. With 100,000 x g performance and maximized capacity up to 6 liters. Plus breakthrough rotor innovations including Auto-Lock rotor exchange, Auto-ID instant rotor identification and lightweight and durable Fiberlite rotors that shorten run set-up time and increase rotor security. The result? Productivity, safety and reliability simplified.

at every turn

• thermoscientific.com/simplifynow

Sorvall LYNX Superspeed Centrifuges
Powerful technologies with breakthrough simplicity

Auto-Lock® Rotor Exchange
Push-button security and application flexibility

Auto-ID Instant Rotor Identification
Immediate rotor detection and programming

Fiberlite® Carbon Fiber Rotors
Improved ergonomics and performance

duction plant operating personnel. Lab managers must agree on clear accountability with these company employees and gain their commitment for the delivery of specific outcomes.

To obtain this commitment, managers have to motivate people to succeed and achieve their goals and to do so in a timely manner. They must require success. This means lab managers must track staff members' performance and intervene when necessary to ensure that work product is completed and delivered on schedule.

Speed

This brings us up to speed in accomplishing goals. To meet deadlines, managers must work with staff members to make informed decisions and manage risks. They must work with the appropriate people to remove barriers to timely decision making and overcome obstructions to quick action. Sometimes this requires removing people from a project and replacing them with other individuals.

The reason for greater speed is the need to decrease time from product conception to commercial production. Advantages of decreasing time to market include earlier revenue, which improves company cash flow and decreases time to profit. Early revenue can be particularly important to startup companies. Delays in achieving substantial revenue from new products can cause investors to pull out and result in budgets being slashed, employee layoffs and even bankruptcy.

To introduce new products and services to market more quickly, companies are finding it rewarding but challenging to incorporate customer suggestions into the products they develop. This may mean including customers on product development teams. Alternatively, technical service personnel could poll customers on what they need.

"Lab managers must track staff members' performance and intervene when necessary."

Greater speed may or may not increase overall development costs. Managers must balance the cost of devoting greater resources to a project in order to more rapidly achieve goals against spending a longer time (while using fewer resources) to achieve project goals at a later date. Should the manager opt for speed, it may mean using more employees or contractors on a project or outsourcing some of the work to another firm. While outsourcing can enable goals to be achieved on a timelier basis or reduce costs, it may come at the cost of project simplicity, making projects more difficult to manage.

Simplicity

Over time, work processes can become bogged down by activities that do not deliver any commercial value. Often these activities are complex (such as intricate approval processes) and increase costs. Lab managers must relentlessly search out these non-value-adding activities and eliminate them.

A good time to do this is immediately after a staff reduction or reorganization. Given that fewer people are available to do the same amount of work, laboratory managers and staff members will be more open to eliminating nonproductive activities that do not contribute to the employer's profitability.

Building skills, developing attitudes

Senior-level laboratory managers need to create ways for staff members to develop management skills. They also need to provide a clear path to management assignments. Ways to do so include training programs and assignments as team leaders or project managers.

However, doing this has become more difficult. For example, since 2008 and the beginning of the Great Recession, the middle-management level at large companies has been gutted, according to a study by the Corporate Executive Board (CEB). As a result, the remaining managers now have 50 percent more direct reports and 20 percent less time to spend with these reports, according to Brian Kropp, CEB managing director. So managers have less time to serve as mentors and to coach aspiring managers.

Managers need to encourage staff members to take charge of their own career planning and spend their own money if necessary to take short courses or evening classes. Some professional societies such as the American Chemical Society offer webinars, often free, to their members. Other organizations such as Toastmasters International can help your staff members develop specific skills at a reasonable cost.

Active participation in professional societies can help you expand your skill base as well. For example, I learned a lot about managing, first by observing the professional society teams and committees on which I served and then by managing these groups myself. The same was true early in my career for oral presentation skills.

Assignments as team leader also provide opportunities to learn and practice management and leadership skills. "The greatest challenges exist not in implementing new techniques, business practices or technology, but in overcoming the organizational barriers and the resistance to changing the way things are done," according to management consultant Kenneth A. Crow, president of FRM Associates.

References

1. Pierre Wack, "Scenarios: Uncharted Waters Ahead," Harvard Business Review 63(5), 72-89 (1985).
2. Michael Treacy and Fred Wiersma, "The Discipline of Market Leaders: Choose Your Customers, Narrow Your Focus, Dominate Your Market," Basic Books (June 10, 1997).
3. Eric Verzuh, "The Fast Forward MBA in Project Management," John Wiley & Sons (1999).

Dr. John K. Borchardt *is a consultant and technical writer. He is the author of* Career Management for Scientists and Engineers *and often writes on career-related subjects. He can be reached at jkborchardt@hotmail.com.*

WHAT'S THE RISK?

STRATEGIES FOR REDUCING RISK AND GROWING YOUR BUSINESS

by John K. Borchardt

"Risk can neither be avoided nor eliminated completely. Indeed, without taking risk, no business can grow," says Peter Drucker, management consultant and author of 36 books on management. Drucker identified four types of business risks[1]:

1. Risk that is built into the very nature of the business and which cannot be avoided
2. Risk one can afford to take
3. Risk one cannot afford to take
4. Risk one cannot afford not to take

These risks are most definitely the concern of laboratory managers. Developing and commercializing a new product or process certainly involves risk. How can you reduce these risks?

Any new product or process must meet performance, cost, and quality criteria. There is always a risk that a newly developed product or process won't meet these criteria. Laboratory managers should work with their staff members, their firm's business development managers, and their salespeople to develop these criteria. Working as a team, these individuals need to determine:

- Users' needs and requirements. This often requires working with customers.
- The size of the market. Is it sufficient to justify the expense of the R&D and developing manufacturing capabilities?
- Whether their laboratory has access to the skills needed to develop the product. Outsourcing or technology licensing may be required to gain access to these skills.
- Whether their firm has the capabilities and financial resources to manufacture the product.
- Whether development and commercialization costs are such that their firm can earn a reasonable profit margin.

A final question that determines overall risk is whether your firm can accomplish all the above in a reasonable time frame so competitors haven't divided up the market by the time your firm commercializes its own product.

It is also important to address the risks associated with various strategies available for protecting your firm's intellectual property.

Determine users' needs and requirements

This often requires working with customers to determine product performance needs and delivery requirements. One can do this through meetings with individual customers. It may be necessary to carry out these discussions under a secrecy agreement. Attending industry conferences and reading trade magazines and research journals may provide you with the information you need.

The importance of determining customers' needs may seem obvious, but many new product introductions fail because customer needs—in particular, new product performance and price requirements—are not accurately defined prior to beginning work on a product development project.

Innovative Solutions that Drive Efficiency, Accuracy and Throughput in Your Lab.

See Us at PITTCON Philadelphia, PA Booth 1249!

The AutoBlock™ Plus Automates Sample Prep for Metals Digestions

This latest generation of AutoBlocks is the smartest one yet and costs less. The System:

- Allows you to operate any batch size up to 54 samples so doesn't waste reagents
- Includes user-friendly software with pre-programmed EPA methods plus the option to create your own
- Adds deionized water to your digestates to achieve the final volume you choose.
- Offers an optional fume hood and has a smaller footprint.

The SPE-Express™ Automates EPA Method 1664 for Oil and Grease Analysis

SPE-Express is the ONLY system that:

- Both extracts your sample and evaporates the n-Hexane eliminating the transfer step
- Uses a fluid sensor to verify that the sample vessel is empty improving accuracy
- Runs multiple samples simultaneously on up to 6 stations improving analyst efficiency

Contact our Technical Sales Department to find out how you can test a sample FREE.

Getting consistent results and freeing up analyst time has never been easier!

ENVIRONMENTAL EXPRESS

Call 800.343.5319 or 843.881.6560 • www.environmentalexpress.com

Determine the size of the market

The size of the market must be sufficient to justify the expense of the R&D and developing manufacturing capabilities. If the potential market for a new product is large, it may be beyond the capabilities of your firm to secure a substantial part of the market. To avoid becoming a marginal player, your firm may need to form a joint venture with another firm or obtain substantial finances to cover development costs and the construction of manufacturing capabilities.

Determine whether the laboratory has access to needed skills

Co-development, outsourcing, or technology licensing may be required to gain access to the skills required to develop and manufacture a new product. This access can reduce project risks. Outsourcing part of a project can reduce the workload placed on the project team.

However, outsourcing can increase project risks, because project managers often have less control over team members employed by other organizations than over those employed by their own firm. In addition, communication often suffers when members of more than one organization work on a project. The flow of information can be delayed, resulting in loss of time and perhaps the performance of unnecessary work. Another concern involves the flow of proprietary knowledge to another organization. This can eventually result in the outsourcing partner ultimately becoming a competitor.

Another approach to outsourcing is to shift project costs and work to suppliers or customers who will benefit substantially from project success and commercialization.

Determine if your firm has the needed capabilities and financial resources

It takes both technical capabilities and financial resources to develop and commercialize a major new product. This is particularly a concern for smaller firms with limited financial resources. One can either accept the risks and press ahead with a major project, or reduce the risks by taking on a joint venture partner. While this results in sharing the risks, it also reduces the profits associated with commercializing a new technology.

In the case of start-up companies, overly rapid consumption of funds may result in having to raise additional funds through a second round of financing. This "burn rate" is a negative cash flow that determines how fast a start-up company will use up its shareholder's capital. An excessively rapid burn rate resulting in the need for additional financing will reduce the ownership level of the original investors in the start-up firm. What's more, an excessive burn rate can force managers to terminate some of the laboratory's projects and conduct a staff reduction to preserve cash for the company's most promising R&D projects. However, abandoning some projects may adversely affect the longer-term growth prospects of the firm.

Determine an adequate profit margin

What determines a reasonable profit margin depends on the type of industry your company is in and the scale of manufacturing. Customarily, a very large scale of production generates a large cash flow. Companies in businesses with large production volumes, such as crude oil refining and commodity chemicals, can tolerate lower profit margins than companies in businesses with small production volumes, such as laboratory instruments, high-purity analytical reagents, and pharmaceuticals.

The estimated profit margin for a potential new product or process should be at least as high as that of the products with which your firm's new product will compete. Otherwise, your firm's competitors may have the flexibility to reduce their prices to maintain or grow their market shares while your company does not.

Bring the product to market in a reasonable time frame

One must constantly monitor the project schedule to ensure that work is done on time and the project stays on schedule. However, falling behind schedule is another problem that often occurs during the course of a project. To get projects back on schedule, one can take advantage of "project float." Project float is the amount of time a project task can be delayed without causing a delay to subsequent tasks or to overall project completion. Changing team members' task assignments to take advantage of project float is one way to help get projects back on schedule.

Taking advantage of project float involves moving team members to critical path assignments and away from tasks not on the critical project path. The objective is to shorten the duration of the critical path. (The critical path is the longest sequence of activities in a project plan—it is those which must be completed on time for the entire project to be completed on time.) Should the project fall behind schedule despite the effort to take advantage of project float, it will be easier to get additional funding for noncritical path tasks after achieving major critical path milestones.

Intellectual property risks

Laboratory managers often participate in defining the company's intellectual property associated with the development of a new product or process. Other participants in this process are members of the firm's intellectual property department and business managers. One has to balance the costs of obtaining a patent against the risks of maintaining key features of a new product or process as a trade secret. However, even obtaining patents carries risks. The freedom to operate has come under increasing threat from the growing number of lawsuits between companies.

Patent strategies by other companies can result in their obtaining patents that prevent a competitor's newly obtained patent from being used because the newer patent relies on technology covered by the older one. This older patent is referred to as a blocking patent. Conversely, the newer patent may include improvements to the technology covered in the older patent. The frequently used solution to this problem is that the two firms cross-license their patents so that both companies are legally free to practice the technology covered by the pair of patents. This strategy may go one step further and also involve more than one other company.

"Risk can neither be avoided nor eliminated completely."

The alternative to cross-licensing is to file a lawsuit challenging the legality of an existing patent. Such lawsuits can be expensive to pursue. In addition, should Company A be found to be infringing the patent of Company B, the court may assess a financial penalty on Company A. Multimillion-dollar judgments are common, and occasional judgments of a billion dollars are not unknown. Depending on the size of Company A's financial resources, these financial judgments can impose a greater or lesser risk to the company.

Risks facing patent holders have shifted recently as a result of the increase of "patent trolls." The "nonpracticing entities" do not commercialize technology—they instead obtain patents to limit technology improvements to previously existing patents. NPE companies acquire patents, identify possible infringers of these patents, and bring legal action to force a financial settlement. Companies with patents are forced to license these patents or engage in costly litigation, which they may not win. Because they do not commercialize products or processes, it is difficult to sue NPEs.

NPEs are largely a problem in the computer and communications technology industries. However, the practice could spread to other industries.

With the increasing job mobility of people who know an employer's trade secrets, disclosure of these secrets to third parties is an increasing risk. The pages of *Chemical & Engineering News* increasingly contain notices of individuals who stole intellectual property from their employers or former employers.

Disruptive technologies

A disruptive technology is an innovation that reorganizes an existing market. Disruptive technologies improve a product or process in unexpected ways. Currently, computer and communications technologies are doing this in many ways in many industries including the chemical, biotechnology and nanotechnology industries.

Wrap-up

Peter Drucker notes, "All economic activity is by definition 'high risk.' And defending yesterday—that is, not innovating—is far more risky than making tomorrow." This is what laboratory managers and firms conducting R&D do—make tomorrow. Thus risk is inherent in doing research.[2]

Harvard Business School professor Clayton Christensen suggests that by placing an excessive emphasis on satisfying customers' current needs, companies can fail to develop or adapt new technology that will meet their future needs.[3] Companies that do this will eventually fall behind. Instead, companies—often start-up firms—displace them in the marketplace by using disruptive new technologies.

References

1. Peter F. Drucker, "Managing for Results," HarperBusiness; reissue edition (October 3, 2006).
2. Peter F. Drucker, "Innovations and Entrepreneurship," HarperBusiness; reissue edition (2006).
3. Clayton M. Christensen, "The Innovator's Dilemma," HarperBusiness (2011).

Dr. John K. Borchardt *is a consultant and technical writer. He is the author of* Career Management for Scientists and Engineers *and often writes on career-related subjects. He can be reached at jkborchardt@hotmail.com.*

MENTORING MATTERS

AN OFTEN OVERLOOKED PRACTICE CRITICAL TO PASSING ON KEY ASPECTS OF SCIENTIFIC KNOWLEDGE by Bernard Tulsi

Mentoring is broadly acknowledged within academia, government agencies, and commercial enterprises as an effective tool for the development and nurture of scientific and technical personnel—one that also provides important economic advantages. Yet in numerous public and private sector research and service laboratories in the United States, mentoring activities are hardly situated anywhere near center stage.

"Mentoring is very spotty in the country," says Dr. Barry Logan, national director of forensic services, NMS Labs (Willow Grove, PA), who has 27 years of high-level laboratory management experience. Logan strongly believes that mentoring is critical for the optimal development of scientists and researchers.

Technology-driven operations in the US appear to eschew formal mentorship and even apprenticeship programs, opting instead for informal "follow Joe around" models in which more experienced scientists provide closer supervision to new or junior colleagues for a stipulated period. While helpful, this approach has serious shortcomings. Logan points out that numerous techniques in the field of forensic toxicology, for example, are buried in textbooks. "If one knows where to look, these techniques can be found with some effort. The best way to gain this type of knowledge, however, is to work under the guidance of someone with the experience who is willing to serve as a mentor.

"I don't see any other way to pass on key aspects of knowledge in this field, which in some ways is like a craft. You do have to learn at the elbow of somebody who has that experience," said the veteran forensic scientist.

To be sure, academic institutions such as the University of Michigan's Rockham Graduate School have developed mentoring guides for their faculty (mentors) and students (mentees). Rockham's guide urges instructors to become actively involved via interpersonal and personal relationships in the career and well-being of their mentees. It recommends that mentors support and promote their mentees' goals in keeping with the direction and aspirations of the mentees. In addition, the guide recommends that mentors adjust their approach to accommodate any cultural, ethnic, or gender issues applicable to their mentees.

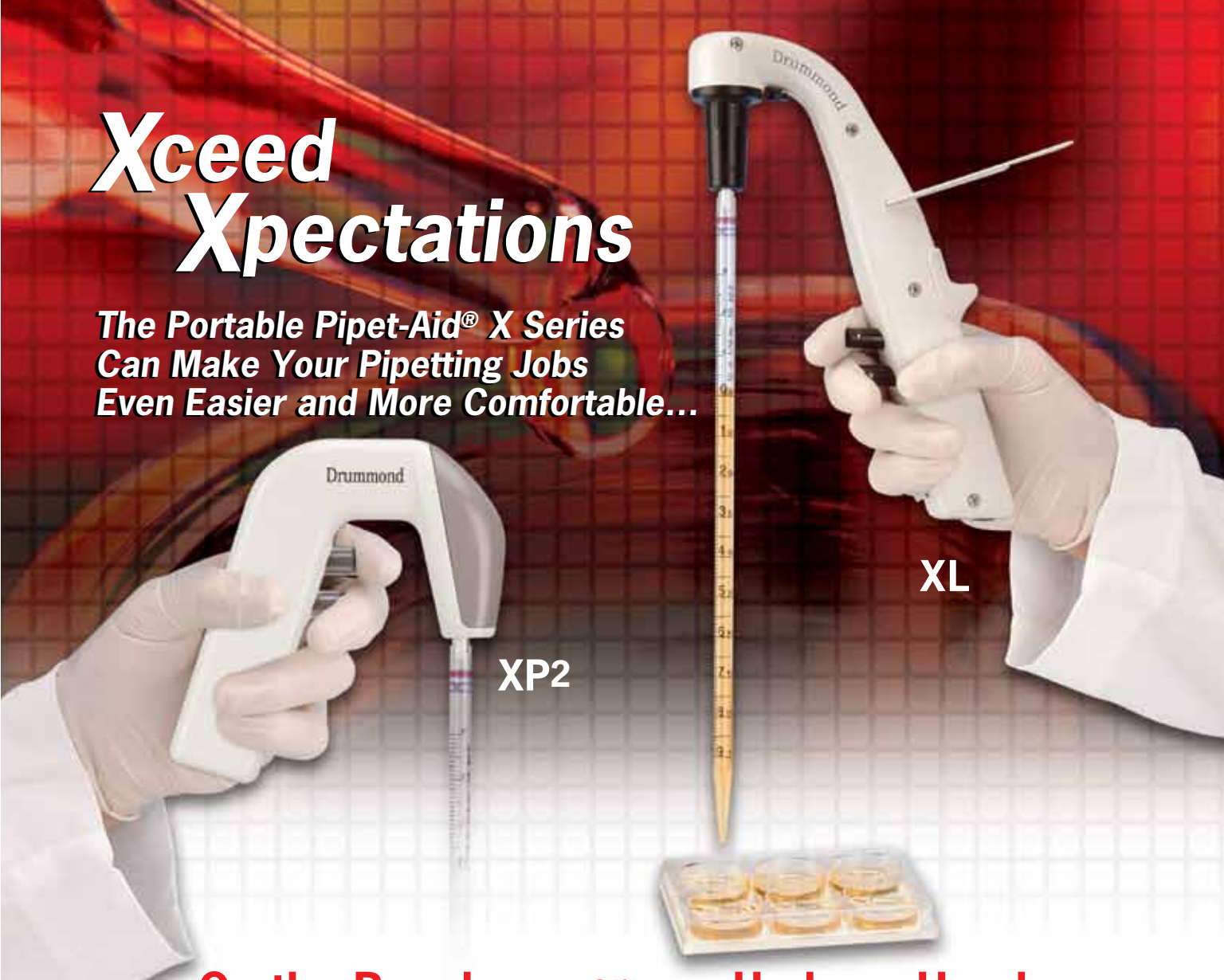
> "Mentorship entails introducing people to key aspects and people in the field to promote their professional development."

Logan joined the NMS team of about 140 technical staffers nearly five years ago. He says that NMS conducts internal mentoring activities for both its forensic and clinical laboratory operations, which generally share staff and skills. More stringent demands for data interpretation in forensic toxicology make the need for mentorship and professional development in the forensic area very important, according to Dr. Logan.

NMS hires candidates with analytical skills that enable them to interface with laboratory analysts, to

Xceed Xpectations

The Portable Pipet-Aid® X Series Can Make Your Pipetting Jobs Even Easier and More Comfortable...



On the Bench *or* Under a Hood

The New Portable Pipet-Aid® XP2 Advances Industry Standards for Comfort, Convenience, and Control

- **New Ergonomic Design–**the most comfortable pipettor you ever laid a hand on
- **New Power Source for Uninterrupted Extended Operation–**can be charged while in use
- **New Ultra Quiet Precision Pump–**great control for aspiration or dispensing

The Ergonomic Design of the Portable Pipet-Aid® XL Reduces Strain and Fatigue When Pipetting Under a Hood

- **Longer Lightweight Handle–**lowers your arm position to reduce head, neck, and upper arm strain
- **New Quiet, More Efficient Pump–**reduces noise and extends operation period between charges
- **Can be Charged While in Use–**eliminates downtime

For more information on how you can Xpedite your pipetting projects, and a copy of our new catalog, call 1-800-523-7480 or visit our website at www.drummondsci.com

MADE IN USA

DRUMMOND SCIENTIFIC COMPANY
500 Parkway, Box 700
Broomall, PA 19008

help troubleshoot methods, to design new methods, and to design validation studies for new procedures. New hires must have a thorough understanding of laboratory analytics. They have to be able to analyze and interpret and recognize errors and limitations in the data and be able to testify in court. Such skills can't be acquired as part of a university degree or training program; instead, they have to be learned from others with the relevant experience doing that kind of work, according to Logan.

"Valuing, training, and mentoring the people who work in our labs is of critical value."

"For our forensic toxicology postdoctoral entry position, we typically take people who already have some postdoctoral experience, but we don't always require that. Our structure lets them spend the first six months in our laboratory, because while they are required to have relevant analytical experience, they typically don't have casework experience." During their first six months, entry-level candidates participate in analyses, explore different techniques, and satisfy the relevant requirements. Following that they are paired with senior toxicologists and start reviewing cases and interacting with clients. "That program typically lasts three years, and that gives the person who is hired for the position three years of necessary experience to become board certified," says Dr. Logan.

Logan also runs the NMS nonprofit center for forensic science research and education, which focuses on professional development and mentorship. The center was established by NMS' owners about 15 years ago, and it currently operates two different programs. One, the Forensics Mentors Institute, an eight-week summer program for Philadelphia-area high school students, is designed to encourage students with some aptitude in science and an interest in forensic science. "We have twelve students in that program every summer. They are paired with MS students from Arcadia University's forensic science program, which we participate in," says Logan. The second is a two-year MS degree in forensic science in conjunction with Arcadia University that includes both teaching and research. Students interact closely with NMS staff members who serve as adjunct faculty in the Arcadia program.

Dr. Logan, who served for 18 years as state toxicologist and crime laboratory director in the state of Washington, says it is unusual for state forensic labs to have formal mentorship programs where someone is specifically paired with a senior scientist who is a designated mentor. "Typically, it is done more as a training program with a series of milestones to complete," he says.

Logan notes that mentoring takes place at different levels. "A lot of the MS postgraduate program is factual content; the mentorship component entails introducing people to key aspects and people in the field to promote their professional development and to help them identify contacts for the

purpose of finding or changing jobs," he says. "For junior scientists starting out in their careers—starting a postdoc or leaving a graduate program—it is important to have a sponsor or a mentor who is able to provide some context for the theory and academic training." He believes that mentors need to be subject matter experts in given areas. For the mentees, it is important to select a mentor who works in the same field and who is amenable to some kind of structured access. "It is all very well to have lab directors as mentors, but if they are so busy that their mentees can't get to see them, necessary feedback and support may be lacking."

Mentors must have people skills and be willing to provide constructive criticism and guidance. A mentor needs to understand how to motivate people, get to know their shortcomings, and help them with solutions. "One area that I believe is important is intellectual generosity—including the mentee in projects, affording them opportunities to contribute, listing them as a coauthor, introducing them to your colleagues, helping them get a toehold in professional organizations, giving them opportunities to serve on committees—all these areas will help them and their ability to build their own network and to develop as leaders and professionals in the field," says Logan. He continues, "In a company like ours and in many large toxicology laboratories, there are a number of activities that are done by committee.

We invite our junior people into those environments to participate in decision making, give them projects that will help them develop professionally outside their strict task list, allow them to pursue their own ideas, and encourage them to attend professional meetings, participate in the programs, and make presentations," he says.

Dr. Logan says that he often gets questions from people who can't find that kind of mentoring support within their organizations about how to fill the gap. "In such situations it might be necessary to approach more than one mentor who can address smaller parts of the job—and at the same time offer them some of your services, skills, time, and interest in some of the projects they are

working on. The more you reach out to them and have something to offer them, the more you can build support with people within your organization not directly in your field." He says that self-mentoring—building a network by attending professional meetings, attending poster sessions, and participating in panel discussions, among others—might also be an option.

Martin Mitchell, managing director, Certified Laboratories, Inc. (Plainview, NY) says that because a number of recent university graduates enter his workforce poorly prepared and even less motivated, "it is necessary to do a tremendous amount of in-house training and mentoring." He says that in the past new recruits were better trained in local universities and junior colleges or may have received training in food companies and smaller labs before joining the staff at Certified Laboratories, which specializes in food analysis. "Now at best you hope they have an understanding of the science, and you really have to start from scratch in training them.

"If [mentors] are so busy that their mentees can't get to see them, necessary feedback and support may be lacking."

"We typically partner our trainees with more experienced food analysts for a period when they seem to be joined at the hip," says Mitchell. He says that recruits are supplied with all the relevant written instructions and procedures, and they have access to the lab's library. There are also regular departmental and interdepartmental training sessions covering subject matter of value to all the lab's functional areas.

He defines this phase of the process as "training, not mentoring." There is a fair amount of staff turnover within the first two years of hire because new recruits, many of whom are just exploring, typically use this period to decide whether they have chosen the right field, according to Mitchell. "We find that after they have been here two years it often means that they believe they made the right choice. It is after these first two years that mentoring starts to take place."

Mitchell says that mentoring usually involves workers and immediate supervisors. "There are several monthly one-on-ones, then there are the regular performance reviews, and we are very big on mutually defined goals." Certified currently employs more than 200 people and has four labs in its corporate structure, two in California, one in Illinois, and its main corporate lab/office in Long Island, NY.

Mitchell, who has been in the food lab analysis business for the past 40 years, says, "One of the points of differentiation between the food labs that have survived and grown and those that have disappeared or been absorbed by larger organizations was the way they treated their people. At the end of the day, without my people I'll have a lot of real estate and very expensive equipment but nothing else—so valuing, training, and mentoring the people who work in our labs is of critical value."

Meanwhile, starting February 2013, NMS's Dr. Logan will assume the presidency of the American Academy of Forensic Science with a similar goal in mind—emphasizing mentoring and skill development. For his year as president, he has selected the theme "Forensic Science Mentorship and Education." He says he has chosen this area because "Within the organization, this is something we have struggled with in the past. We do have a mentorship program, but it is sort of in suspension right now because we have so many people who want to be mentored and so few who volunteer to do mentoring.

"I want to encourage the organization to be more open. I believe that people can contribute a lot without feeling that they are adopting a junior scientist or taking on another employee. That's important to me, and it will be my focus in my year in office."

Bernard Tulsi *is a freelance writer based in Newark, DE. He may be contacted at btulsi@comcast.net or by phone at 302-266-6420.*

CONFUSED?

Accelrys can point you in the right direction

Accelrys' Informatics solutions enable automated compliant data capture, statistical analysis and visualization across your enterprise and external partners. Our customers are already headed in the right direction as they:

- Capture and Catalog ALL development, analytical, quality and manufacturing data in a single database
- Easily integrate with existing IT infrastructure (ERP, LIMS, MES, etc.)
- Scale from just a few users to thousands worldwide
- Remain compliant with global regulatory requirements
- Increase lab and development productivity by 25%+
- Reduce compliant QC review and approvals by 50%+
- Reduce regulatory compliance risks by 10 X
- Decrease annual product review documentation tasks by 90%

To learn more about Going Paperless from Lab to Plant and the Accelrys Enterprise Platform, download a free whitepaper or schedule your no-fee consultation at accelrys.com/signs.

accelrys®

WHAT IT TAKES TO HAVE SUCCESSFUL VENDOR RELATIONSHIPS

By Mark Lanfear

Nurturing good relationships in business is a lot like doing the same in our personal lives. And just like in our personal lives, a one-size-fits-all approach when it comes to any type of relationship usually won't work. However, it can be wise to take at least a page or two from the book of successful relationship strategies when you're considering how to best manage a business relationship.

A vendor relationship is perhaps one of your most important in business. It should be a true partnership. It should build its foundation on a series of small, but critical, first impressions. Oh, if it were only that simple.

Yet often, it really is that simple. First, recognize that both sides in a true partnership are equal and that everyone involved brings something unique to the table. Vendors have their business models, financial goals, existing workloads, and other clients, yet many companies still treat vendor partnerships as commodities. This often happens in the pre-engagement phase when a vendor is being selected, and it suggests that there may not yet be a complete partnering mindset. However, in the economic crunch of the current global marketplace, the potential benefits of treating a vendor like a true partner and selecting the right one can be a make-or-break scenario, as all companies are realizing that the world of work has changed and strategic partnership planning is a must.

Timing is also very important. The right partner may not be available to us when we are ready. Sounds familiar, right? To remedy this, both sides need to work under some basic assumptions, starting with the bid process. Proposals, deliverables, and pricing are based on what resources vendors can have available at that time.

> "Don't ever stand someone up who is truly important and valuable."

The reason for this mutual flexibility is that both vendor and sponsor need to operate as efficiently as possible. This means that we like to keep our work capacity high, but not overloaded. Think again about your personal relationships—if you had four season sports tickets that you share with friends or family, you would want to plan so that all four tickets are used each week. But even if a friend cancels one week, that friend will still expect to go to the game the next week. Like in friendship, one side isn't more important than the other, and if you're a good friend, your parties are always full and you'll never go to the game alone. Vendors will have tuned their operations so there are very few idle resources at any point in time. When managing your vendor relationships, it will serve you well to remember these things.

What's another critical relationship strategy? Don't ever stand someone up who is truly important and valuable. Having been on the contract workforce and research side of things, I can tell you firsthand that vendors try to stay ready for their best clients. So when an "A level" client gives advanced notice or "the wink" that a certain vendor is the first choice for a project, that vendor will begin to free up resources and be ready to take on the task. The vendor may even change some allocations or invest in equipment or bring additional resources on board, all based on a verbal agreement alone.

But when the client has project launch delays, or the final decision to launch at all is delayed, all those readied resources can go to waste or, at the very least, cost your vendor partner money and increased frustrations—like being stood up on a Saturday night. A way to avoid this is to simply keep in constant, open communication and to manage expectations from the beginning. We all know that being open and honest is hard in the beginning

for any relationship, but remember we are talking about "A" clients. These are the kind of relationships in which that special person always gets that one extra open seat or that extra ticket to the game.

As we embrace New Year's resolutions, at the very least we must all try to be more conscious of the small things we can do to execute our business relationships. From the client perspective, this means no more pretending there is a shorter timeline than there is, so you have enough time to make changes—and no more holding back on part of the budget just to garner lower bids. In exchange, the vendors will not overpromise to win the contract. They won't present with the "A" team and assign with other resources, and they will ensure that their supplement supply chain to execute the work is synchronized for correct implementation. Anything less is just not partnering behavior, and our projects may be compromised. Contingency plans can compromise projects that are already on a critical path or bring in more costly resources to keep the project on track. The result may be needed cutbacks on quality or leaving out value-added extras that were planned.

"Proposals, deliverables, and pricing are based on what resources vendors can have available at that time."

Ultimately, if you plan to partner with a vendor, set a partnering tone by starting with the right behaviors during the foundation-setting phase. Invest time in knowing your partner's corporate culture, business goals, and client base. The chemistry between client and vendor, and the intangibles beyond service scores and KPIs, is something that only comes from time and relationship building. Sometimes to know if it's all going to work out, all you have to do is take small steps forward—and show up.

Mark Lanfear *is a global practice leader for the Life Science vertical at Kelly Services, a leader in providing workforce solutions. He has operated clinical trials around the world for almost two decades. In addition, Mark is a featured speaker at many of the Life Science industry conferences and a writer for its periodicals. He can be reached at MARL773@kellyservices.com or 248-244-4361.*

A POSITIVE APPROACH TO MORE SUCCESSFUL RELATIONSHIPS AND COMMUNICATIONS

By Michel Neray

I'll never forget an experience I had when I was running my advertising agency. I felt we needed a fresh look for our own branding and marketing, and so I called in a designer who had been recommended to me by a colleague. Even before she sat down in my office, she began criticizing almost everything we were doing. According to her, our colors were wrong, our logo wasn't balanced, our home page didn't send the right message …

There's no doubt in my mind that she thought she was being helpful. In fact, she had superb credentials and was obviously extremely talented. But each time she added something to the growing heap of negative criticism, my back got stiffer.

"Surely, we can't be doing everything that badly," I thought. "How else could we have achieved this level of success?"

The fact is, no matter how valid her comments were, she gave me no choice but to conclude that she didn't understand our business and would probably take it in such a drastically different direction that we simply weren't a good fit.

I politely thanked her for her comments and showed her the door. It wasn't until later that I realized that the dynamic in the relationship between us is at the heart of all relationships, whether in a sales situation, a team situation within a lab, or between managers and their direct reports. In fact, it even plays a part in the dynamic you have at home with your spouse, kids, and friends.

Do you enjoy being criticized or talking about your weaknesses?

If you're like most people, the answer to that question is a resounding "No!" None of us does, even when the other person is truly trying to be helpful. And even when we know the other person has valid points, the advice and recommendations are hard to accept if they are critical.

The solution to effectively offering criticism is to seek out the positive in the other person—or in the other person's position—before making any comments or suggestions. Now, if you think this is manipulative, like all you are doing is "buttering up" the other person, you'd be right if you don't seek out the positive in an active and genuine way.

That's the key.

Starting with a genuine appreciation of the positive helps you understand the building blocks of the other person's success to date, which in turn puts you in a far better position to help them build on that success with your suggestion or recommendation. In fact, your deeper understanding of the foundation you're building on will undoubtedly help you *improve* your recommendation.

Starting with a genuine appreciation of the positive also provides the best possible foundation for the relationship you have with the other person.

That's because our natural programming as human beings is to match the communication of people we want to understand. People who hear us say "yes" are naturally conditioned to say "yes" back to us.

Quite simply, it builds rapport, which in turn makes it much more likely that the other person will treat your ideas with the respect, trust, and appreciation that you deserve.

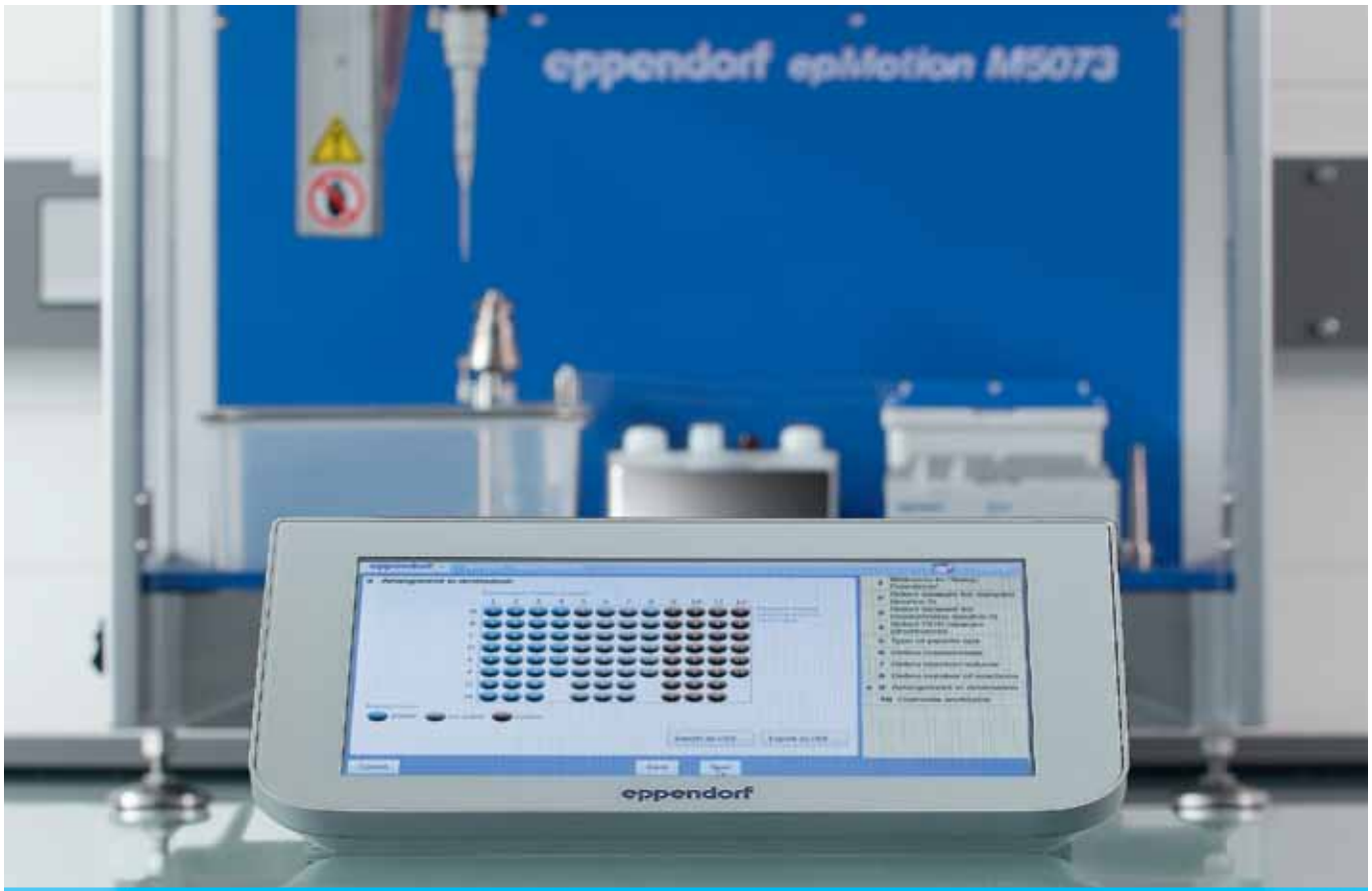
So, before you "pounce" your brilliant idea on others or talk to people about what they're doing wrong, begin by asking yourself, "What are they doing right?"

The result may just positively astound you!

Michel Neray *has a science degree from University of Waterloo, an MBA from McGill University, and over 25 years of experience as an advertising copywriter. Michel helps companies dramatically increase their sales and productivity by getting everyone in the organization to rally around and communicate core competitive advantages. He's married and has three children, two dogs, three snowboards, a white-water canoe, and a black belt in karate. For more information about Michel's company, visit www.TheEssentialMessage.com.*

LABCAST Be sure to attend Michel Neray's Lab Manager Academy webinar "How to Read Minds and Influence People: A Communications Approach That's So Effective, It Will Seem Like You're Reading Their Minds!" on Wednesday, February 6, or afterwards at **www.labmanager.com/influence**

eppendorf



Ready, Set, Prep

The new Eppendorf ep*Motion*® 5073 family members

Whether it's PCR set-up or nucleic acids purification or general liquid handling tasks, experience how easy small scale benchtop automation can be. Free up your time with high precision pipetting on 6 positions, automatic tool exchange and many other new features.

> Software assistants for easy application programming
> MagSep reagents for DNA/RNA preparation
> Application specific tools and accessories included

www.eppendorfna.com • 800-645-3050

LABS ARE FROM MARS, IT DEPARTMENTS ARE FROM VENUS

UNDERSTANDING EACH OTHER'S NEEDS AND PRIORITIES IS KEY TO A GOOD WORKING RELATIONSHIP

by Joe Liscouski

My first experience with the science-IT relationship issue occurred when the analytical chemistry lab I worked in wanted to buy a computer for chromatography work. The Management Information Services (MIS) department (management as in "upper management," not "management of," and the forerunner of modern IT departments) couldn't understand why we couldn't use their computer (an IBM 360 that could only run one program at a time), since there were times when it wasn't busy. After trying to explain the situation to MIS, which needed to approve all computer purchases, the lab director agreed to use their machine on one condition: we needed only one percent of the computer's time, but we needed it every millisecond—something that wasn't possible with that system. Suffice it to say, the lab got its own computer.

> "Developing good working relations with the IT department is in your lab's best interest."

It is comparatively easy for IT departments to support office applications. IT departments use those applications too, and they are educated to work with database systems, networks, and other technologies that are covered in traditional computer science programs. Labs are a different story and different world. Aside from some references on television programs like the *CSI* or *NCIS* series, lab applications are something IT departments are not familiar with.

The issues come down to these:

- Your lab depends on computer systems to function.
- The IT group that is responsible for supporting lab computer systems may not understand how they are being used.
- The IT department may have policies concerning systems support that don't work in lab environments.

Developing good working relations with the IT department is in your lab's best interest—they have access to technologies and skills you need. Do you have a computer system running an application that is there just to gain access to historical data but isn't otherwise in active service? When people are being trained to use a database system, a LIMS for example, is there concern that their activities may put erroneous information into the system, or would you like to have each user train on his or her own copy of the application? When you are upgrading a system, would it be useful to have access to both the old and new versions during the transition?

There is a software technology called "virtualization" that allows a computer system to support those kinds of issues. It can make copies of computers—operating systems, programs, and applications—and store them as "virtual" computers, allowing users to work with them as though they were separate physical computers. In most cases you won't be able to do data acquisition, but you can analyze and access data and work with database systems. In training situations, each user can bring up his or her own copy of a program, work with it, experiment, and work through mistakes without affecting anyone else. When they are done, that copy and all the mistakes go away. Ask your IT people about it.

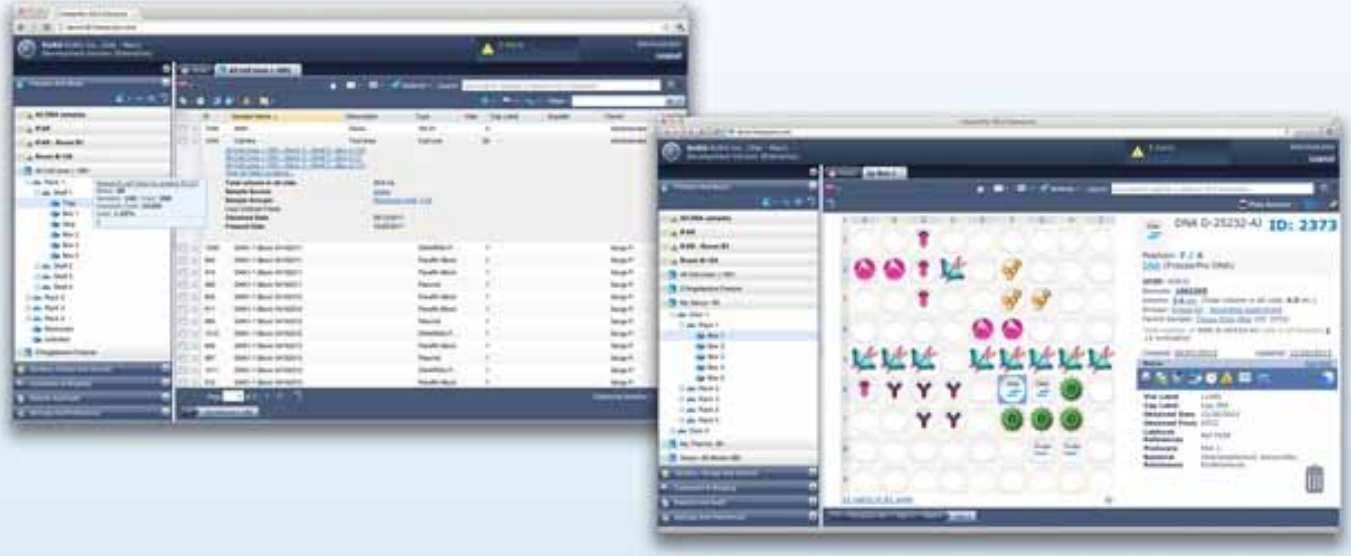
IT people can also advise you on the ramifications of different system implementations such as client-server systems for instrumental data analysis or whether cloud implementations for electronic lab notebooks or LIMS make sense in your situation. We do have to be careful of one point: the choice of products and implementation must be driven by the lab's requirements, not the convenience of IT support. That means that lab managers and

RuRo

Laboratory Information Bliss™

FreezerPro®

Sample Management System



FreezerPro was designed purely for sample management. This focus allows it to eliminate wasteful inefficiencies and help streamline laboratory production without the resource requirements associated with adopting a LIMS.

FreezerPro enhances user's ability to work, collaborate and learn through traceability, automation, configurable reporting, communication tools and hardware support. For thousands of users worldwide, FreezerPro is Laboratory Information Bliss™.

Contact us at:

888-881-RURO (7876)
301-639-5546

sales@ruro.com

Compliance:

FDA 21 CFR Parts 11, 21, 58, 210, 211, 820
cGLP/cGMP (Good Laboratory Practice and Good Manufacturing Practice)
Section 508 Accessibility Guidelines
HIPAA Accountability Act of 1996
HIPAA Patient Safety and Quality Improvement Act of 2005 (Patient Safety Act)

Compatibility:

- PC/MAC
- Tablet
- Smartphone
- Web-based

RuRo Laboratory Information Bliss™

Visit www.RURO.com for more information

staff have to be active in determining requirements and evaluating potential product candidates and not transfer that role to the IT department. It should be a partnership.

Making that partnership work

There is no magic solution to creating a working partnership. How you approach it depends on the size and type of organization that the lab operates in; one method will work well for large science-focused groups such as a research facility, another is needed for lab and IT groups where the lab is important but not the site's central purpose—a QC lab in a manufacturing facility, for example. A lot depends on how many departments are asking for support as well as on office politics—it is a factor and one reason senior management has to set priorities. We have to remember that the bottom line is simple: the labs have a job to do, and computer systems are one of the tools; those systems need to work or the lab doesn't.

One approach is to find someone in the lab who has a knack for working with computers and have that person do the support. This could work in a small lab that operates in an organization that has no formal IT group—an independent lab or startup company, for example. This can be effective, particularly if there is an outside IT support group that can provide technical assistance once things move beyond the capabilities of that person. Once a formal IT function is established, this approach will run into problems.

Your lab person with dual responsibilities will find that he or she isn't really part of the lab or the IT group; each group will see him or her as "one of them, but not really part of us." You can provide a partial remedy by elevating the position within the company so that the person's role is formally recognized as separate from both, an internal consulting/liaison position. The only problem with this strategy is that there is no career growth path unless the responsibilities grow as the company matures. This individual has to be adept at interpersonal relationships and office politics—the technical work will sometimes take a backseat to solving people issues.

Should the organization be large enough to support it, a specialized lab-IT function within the IT group would be useful. Whether the lab orientation is a minor one (they also support other departments) or a primary focus (laboratory automation engineers[1]), those individuals should be educated in the laboratory environment and the tools scientists use in their work. The goal of that education isn't to turn them into scientists, but to make them comfortable with lab work and equipment that otherwise might be unfamiliar to them. That education will make a critical difference in their ability to do their jobs successfully in the eyes of lab staff and the IT organization, as well as their own. It's the difference between walking into a lab and seeing the computers only as isolated units that are addressed independently of everything else and seeing them as what they really are: part of a working system, a system that works only when all the components work together.

Between those roles and situations, there are a lot of possible variations as you look at research labs, independent contract labs, and quality control in different industries and as those labs and companies grow. Outside consultants and advisors can play a useful role when the combination of science and IT skills isn't available within the organization. Finding people with the combination of IT skills and an understanding of lab work, along with the interpersonal and political skills to resolve conflicts, can be a challenge.

Management's role

Senior management plays a significant role in this partnership by setting the priorities for working relationships. In order to minimize support costs, IT organizations may set requirements that only particular types of computers, operating systems, database systems, etc., can be used and that all of them have to be maintained at the latest revision levels. They may also put limits on access to outside Internet-accessible services. That may work well in an administrative working group, but labs are different.

In lab work, the lab's requirements for a product may limit the possible candidates to a small list and the

vendors determine the characteristics of the underlying components. Product choice should be based primarily on its ability to do the work needed, which can force the choice of machine/operating system/database. A forced compromise may result in product selections that no one is happy with. In some cases, in particular highly specialized lab work, you may have only one or two choices, and they may not be based on the latest version of the OS. It is the application software that is key, not the underlying structure, because it is the application that determines whether needed work gets done.

Senior management has to set the policies about how priorities are addressed; they have the authority and can resolve issues of allocation of resources, both people and funding. They can resolve trade-offs between the work that gets done and cost and, in doing so, avoid conflicts.

Making product selections

A lab-IT partnership means that the needs of both the lab and IT groups have to be understood when product selections are made. While both have different points of view, both have something to contribute. The lab has requirements, and if those requirements aren't met, the purchase will fail to support the lab's work. The IT group can provide perspectives on software issues and implementation concerns. What are the ramifications of on-site vs. remote-access (cloud) implementations in your specific need? Does one have an advantage over the other, not just in general, but in your specific application? For example, remote access puts a load on communications services; can your ISP support it (it may not be an issue for a large company, but might be for a startup)? The IT specialist may also provide some insight into product quality and the vendor's ability to provide support, or give the IT group the information they need to do their job.

Informatics and computer-controlled systems are going to play an increasingly important role in lab work, and those tools are going to become more powerful, capable, and complex. For those tools to work properly, the underlying pieces need to function; and that, in part, is a role that IT groups provide. The smart choice is to develop an effective partnership that is mutually beneficial and synergistic. That requires planning and thought.

Part of the work of the Institute for Laboratory Automation (a nonprofit organization) is to build a membership community—that includes lab and IT support professionals—with a goal of advancing the practice of laboratory automation and technology management.

Joe Liscouski, *executive director of the Institute for Laboratory Automation, can be reached at liscouski@InstituteLabAuto.org or by phone at 978-732-5122.*
For more information, visit www.InstituteLabAuto.org.

FIXING THE TOP 8 LAB CHEMICAL MANAGEMENT ERRORS

STEP ONE: GET YOUR CHEMICAL INVENTORY UNDER CONTROL

by Tanuja Koppal

Jon Webb
Senior technical specialist and inventory consultant for ChemSW

In October 2012, *Lab Manager Magazine*, along with ChemSW Inc., hosted a Product Spotlight webinar, "How to Find and Fix the Top Eight Lab Chemical Management Errors." Jon Webb, senior technical specialist and inventory consultant at ChemSW, gave a brief presentation on the challenges of chemical inventory and data management and outlined some of the common errors that exist in labs today. He discussed best practices in chemical inventory management and the attributes and advantages of implementing such a chemical inventory management system. The live webinar was attended by a global audience with varying levels of expertise from diverse industries. Following the presentation, attendees asked questions, voiced their concerns, and received feedback on specific challenges they encounter in their labs. This event provided them with a unique opportunity to interact with our expert in real time and to seek his guidance and advice on various issues related to chemical inventory management. The event was moderated by Tanuja Koppal, Ph.D., contributing editor for *Lab Manager Magazine.*

Q: What are some of the key challenges of chemical inventory and data management?

A: The biggest challenge for the lab when it comes to chemical inventory is how it is managed. That's because managing the materials necessary for research isn't something the researchers want to do. They just want the materials on their bench when it is time to run an experiment. So the biggest challenge is getting everyone in the lab to use a system that tracks chemical inventory, logging materials in and out of the system each and every time. Now most organizations aren't doing this very well. They still track chemical inventory on paper, with a basic spreadsheet program, or with a legacy in-house solution. These systems are inefficient, awkward to use, and rarely provide real-time data, so the researchers don't use them consistently. The result is incorrect inventory data, which means that the lab can't rely on the system to ensure that materials are available and the lab's workflows are compromised. The problem gets worse; without accurate chemical inventory information, the organization is caught up in a vicious cycle of under- or over-ordering chemicals, which means it can't manage chemical costs efficiently. So you can see why it is important to get chemical inventory under control.

Q: Can you share with us the top eight chemical management errors you outlined during the webinar?

A: Certainly. Here's a summary of the points I covered in the webinar. The number one error is over-ordering chemical inventory. Why does this happen? Because you don't know what's really in stock. Number two: not being able to find chemicals when you need them. You think you have a container in stock, but you can't find it. Number three: throwing away expired chemicals that you found too late. Number four: not knowing specifically what chemicals are on-site. This can get you in trouble if any of those chemicals are regulated, and in today's world many of them are. Number five: tracking chemicals manually with spreadsheets. Spreadsheets are static, which means your chemical inventory data is quickly out of date, the data is

The more you investigate, the better STARLINE Plug-In Raceway looks.

Sure, it may look like other raceway products. But STARLINE® Plug-In Raceway has the unique ability to add or relocate plug-in modules anywhere on the raceway quickly and easily, eliminating panel boards and the associated costs of reconfiguring circuits, receptacles and wiring. To learn how we can meet the power distribution needs of universities, labs and research environments, visit **StarlinePower.com**.

STARLINE®
PLUG-IN RACEWAY

probably in more than one place, your spreadsheet is missing information about chemicals that someone else has ordered and not told you about, and so on. Number six: not barcoding chemical inventory upon receipt. If you don't barcode materials, you won't be able to track them accurately. Number seven: storing chemicals incorrectly and not isolating hazardous materials. This all adds up to number eight: spending more money on chemical inventory management than you need to, from the cost of the chemicals to the time you spend managing them.

"Managing the materials necessary for research isn't something the researchers want to do."

Q: What can be done to tackle some of those challenges and make processes more streamlined and efficient?

A: Organizations need to begin by adopting a chemical inventory system that promotes container-based tracking and leverages barcode technology. Once you know what chemical inventory is on hand and where it is, you'll be eliminating a lot of workflow problems, excessive chemical costs, and, of course, regulatory scrutiny. You'll want a best-practices system that uses barcode technology to provide accurate, real-time chemical container data.

Q: What are some of the disadvantages of barcoding? How do you barcode very small containers, less than 1 mL in volume?

A: That's an interesting question. There are no disadvantages to barcoding per se; however, if you have a very small inventory of just operational and maintenance materials in small quantities, then barcoding those items may or may not make sense. Do what makes sense for the size and scope of your operation. Barcoding makes sense in a setting where there are many containers of many different types of materials. And there's a simple solution to barcoding small containers. If you're tracking very small vials, for instance, just put them in a small plastic bag and put the barcode label on the outside of the bag.

Q: How do you label containers that are used to temporarily store or transport chemicals taken from the larger, bulk container (labeling of parent and child containers)?

A: You'll want to barcode both the larger parent container and the child containers or aliquots associated with it. This is because the child containers move around the facility and have a separate presence. A best practices system can easily associate such containers with the materials in the database and enable you to keep track of all the containers.

Q: Do you have any recommendations on efficiently storing, tracking, and updating material safety data sheets (MSDS)?

A: Managing multiple MSDS is not just a matter of obtaining the MSDS. It's also about managing revisions and updates to those MSDS. The answer is to automate the process. MSDS management is very closely tied to chemical inventory; hence, having a system that allows for a one-to-one ratio of MSDS to on-site material is key. I would advise using an MSDS management solution provider that can provide ongoing MSDS change management service to ensure that you always have the most current MSDS for the chemicals on hand.

"Effective inventory management involves getting the right inventory to the right place at the right time in the right quantity."

Q: What attributes should you look for when choosing a chemical inventory system for your lab?

A: There are three important attributes or operational modes to look for when evaluating a chemical inventory system. The first is the ability to track material-level information that identifies physical hazards and structures. The second should be vendor, product, and MSDS specific to ensure that you have a one-to-one match of the MSDS to the specific vendor container. The third is barcoding. The barcodes should track the container by owner, location, expiration date, etc., and provide an audit trail. Thus, you'll be looking for a system that streamlines chemical inventory workflows from receipt to disposal,

and the most effective way to do this is with a barcode system that logs all incoming materials at the container level.

Q: If you were to give some advice and share some best practices, what would those be?

A: We have a mantra that is core to how we've designed ChemSW's CISPro system: effective inventory management involves getting the right inventory to the right place at the right time in the right quantity. Once that happens, everything else falls into place and the organization can run more efficiently and confidently. The best way to ensure that this happens is to implement a chemical inventory management system that uses barcode technology. Barcode technology enables end users to efficiently manage chemicals from receipt to disposal. When chemical containers are barcoded, they are more easily tracked and accounted for, ensuring that the data is accurate and can be easily updated. When best practices are in place, associated workflows are streamlined, enabling the lab to operate more efficiently. A best-practices system makes it easy to manage and track chemicals and automate regulatory reports to streamline your workflows.

Jon Webb *is a senior technical specialist and inventory consultant for ChemSW, the leading provider of chemical inventory systems. ChemSW's solutions enable organizations to streamline laboratory processes, address regulatory requirements, and reduce chemical costs.*

ChemSW's CISPro® Chemical Inventory System is a high-performance system for tracking chemicals and other laboratory supplies. CISPro enables users to maintain a listing of all the chemicals on-site, track chemicals by location and quantity, generate reports, and quickly access hazard information during an emergency. CISPro delivers ease of use and powerful features for chemical tracking and reporting anywhere, any time.

TOP EIGHT CHEMICAL MANAGEMENT ERRORS

- Over-ordering chemicals
- Unable to locate chemicals in inventory
- Not managing chemical expiration dates
- Inaccurate data about chemicals on-site
- Tracking chemicals manually with spreadsheets
- Not barcoding chemical inventory upon receipt
- Storing chemicals incorrectly and not isolating hazardous materials
- Spending more money on chemical inventory management than necessary

(Source: Jon Webb, Senior Technical Specialist / Inventory Consultant, ChemSW, Inc.)

WINNING WITH LOTO

HOW TO DESIGN AND IMPLEMENT A SUCCESSFUL LOCKOUT/TAG OUT PROGRAM FOR YOUR FACILITY

by Vince McLeod

For those not familiar with this acronym, LOTO refers to lockout/tag out, the process by which equipment is put into a safe condition so repairs or maintenance can take place. As research laboratories become more automated and complex with sophisticated equipment such as automated pipetting systems, autoclaves, centrifuges, and ultralow-temperature freezers commonplace, facility managers stay alert to their intrinsic dangers.

Although considered necessary only in large manufacturing and production plants, LOTO is needed whenever equipment needs servicing, which, as we know, includes laboratories. Lockout/tag out measures are taken to prevent the release of unwanted or stored hazardous energy. Failure to follow good LOTO procedures can result in some of the most gruesome and often fatal accidents in the workplace. Keep reading to learn how you can design and implement a successful lockout/tag out program for your facility.

When thinking about why LOTO is important, one television commercial comes to mind. Remember the one where the handyman husband has just finished installing a new garbage disposal under the kitchen sink but dropped something into it? As he is trying to fish it out with his arm inserted up to the elbow, his wife enters the kitchen and reaches to turn on the light. Now, being a capable electrician and handyman at home, would you want to bet your arm that you are certain which switch to flip?

During the period 1982 to 1997, NIOSH (National Institute for Occupational Safety and Health) found that 82 percent of fatal incidents involving maintenance or repair to equipment resulted from a failure to completely isolate or dissipate the energy source.[1] In addition, a short four-year period between 1992 and 1996 saw accidents involving being caught in machinery kill almost 750 workers, while another 5,000 workers lost limbs by amputation.[2] Sadly, every one of these could have been easily prevented. By implementing a good lockout/tag out program you may be able to ensure that your facility does not experience an ugly accident or worse.

The premise of LOTO is simple and straightforward: Isolate, dissipate, or otherwise prevent unexpected start-up or energizing of equipment that could cause injury. However, detailed planning and intimate knowledge of the

ON-SITE GAS GENERATORS

HYDROGEN · NITROGEN · ZERO-AIR

ALL NEW

NITROGEN GAS GENERATORS

NiGen 34.1

NiGen 34.0

PROTON
THE LEADER IN ON SITE GAS GENERATION.

ProtonOnSite.com
Call us at 203-949-8697
Sarah@protononsite.com

SAFETY TIP

HAVE A WRITTEN SAFETY POLICY

By James. A. Kaufman

This is the cornerstone of a good safety program. It's a statement endorsed and supported by the administration that speaks to the fundamental responsibilities for health and safety in the academic institution or company.

For example: "It is the responsibility of our (name of company or institution) and its employees to insure that our business activities (or educational programs and other activities) protect and promote the health and safety of our customers (students), our employees, and the environment."

Your department may want to draft a sample policy statement for recommendation to your administration or board of education. It is virtually impossible to have an excellent safety program without their support. Your written safety policy will provide the foundation of your safety program.

Policy statements of this type need to be signed by the highest ranking official of the organization, dated, laminated, and mounted in the entrance of every building.

Source: Kaufman, James A., Laboratory Safety Guidelines - Expanded Edition, The Laboratory Safety Institute, www.labsafetyinstitute.org

"Employers must provide needed lockout/tag out devices to trained and authorized personnel."

equipment are paramount. For example, say a centrifuge needs servicing. Before the maintenance employee can begin work he must make sure the equipment cannot be turned on, which he does by tripping the circuit breaker and then placing a lock on the switch so someone else does not energize the unit while it is being serviced. It may be as simple as pulling the plug, but large equipment is usually hardwired, and it may not be this simple. In addition, there may be other dangers, such as stored energy.

Different types of hazardous energy

A good lockout/tag out program is exhaustive and meticulously detailed. Autoclaves, centrifuges, and other automated equipment are capable of injuring employees in numerous ways. This is because there are several forms of hazardous energy.

- Electrical energy is the most common yet still the cause of many injuries. Often overlooked are electrical storage devices such as batteries and capacitors.
- Thermal energy—either high temperature (e.g., steam) or low (e.g., liquid nitrogen)—is also easily recognized. Mechanical work, chemical reactions, electrical resistance, and radiation can also produce thermal energy.
- Potential energy is energy stored in pressure vessels (e.g., compressed gas cylinders), hydraulic and pneumatic systems, and mechanical devices (e.g., springs).
- Kinetic energy is associated with moving mechanical parts, usually resulting from release of potential energy.

Most automated equipment will contain more than one form of hazardous energy. Thus a thorough understanding of its operation and a detailed lockout/tag out procedure are needed.

OSHA requirements

The OSHA standard for the control of hazardous energy, 29CFR1910.147, covers servicing and maintenance of machines and equipment where accidental start-up or release of stored energy can harm workers.[3] It requires employers to establish a program and use procedures to lock out or tag out energy sources and to otherwise disable machines or equipment to prevent injury to employees. The first step is to develop a written program documenting the techniques and devices to be used, authorizing personnel, describing the training, and providing for program evaluation and compliance. Next, identify equipment in your facility that must follow LOTO and designate it with proper warning signs. Keep in mind that employers must provide needed lockout/tag out devices to trained and authorized personnel.

Lockout is placing a lock to hold an energy-isolating device in the safe position. Tag out is using a prominent warning device with a means of attachment, such as a tag, which can be securely fastened to an energy-isolating device. OSHA mandates that lockout take precedence over tag out. Tag out is allowed only where equipment is not capable of being locked out. Tags may evoke a false sense of security, and employees

must understand their meaning. Tags are essentially warning devices affixed to energy-isolating devices and do not provide the physical restraint that is provided by a lock.

The cardinal rule is "one lock, one key" to prevent inadvertent removal by another employee. Clearly label each lock with durable tags to identify the worker assigned to the lock. In general, the worker who installs a lock is the one who removes it after all work has been completed. The written program should have procedures on how to deal with maintenance or service that spans shift changes, special situations, and other absences.

The final check before beginning work is to verify that that all energy sources for the equipment are de-energized. For instance, the employee should try to start up the equipment and test that all forms of hazardous energy have been bled down, relieved, disconnected, restrained, and otherwise rendered safe.

After the maintenance or repair is complete, a reversal of the lockout/tag out procedures will ensure a safe start-up. Perform a final inspection to confirm that all tools and nonessential items have been removed and that the equipment components are properly installed. Make sure all affected employees are safely positioned and clear of potential danger zones. Finally, remove the lockout/tag out devices and notify affected employees of the removal and that start-up will commence.

A successful lockout/tag out program relies on good training. Regularly evaluate the program and check that proper procedures are being followed. Retrain employees whenever there are changes to job assignments or new equipment or energy control devices are installed. In addition, if you observe inadequacies in an employee's knowledge or use of the energy control procedures, then retraining is necessary.

As always, the Safety Guys welcome your comments and questions. Until next time "Stay alert" and remember "Safety first!"

References

1. "Preventing Worker Deaths from Uncontrolled Release of Electrical, Mechanical, and Other Types of Hazardous Energy," National Institute for Occupational Safety and Health, Center of Disease Control. Atlanta, GA. NIOSH publication 99-110, August 1999. http://www.cdc.gov/niosh/docs/99-110/
2. "Worker Fatalities from Being Caught in Machinery," Windau, Janice A. Compensation and Working Conditions, Winter 1998: 35-38.
3. "The Control of Hazardous Energy," Occupational Safety and Health Administration, US Department of Labor. Washington, D.C., 29CFR1910.147. May 2011. (http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9804)

Vince McLeod is an industrial hygienist certified by the American Board of Industrial Hygiene and the senior industrial hygienist in the University of Florida's Environmental Health and Safety Division. He has 22 years of occupational health and safety experience at the University of Florida, and he specializes in conducting exposure assessments and health-hazard evaluations for the university's 2,200-plus research laboratories.

ASK THE EXPERT

TRENDS IN BIOINFORMATICS

by Tanuja Koppal, Ph.D.

Joel Dudley, Ph.D.

Joel Dudley, Ph.D., Assistant Professor of Genetics and Genomic Sciences and Director of Biomedical Informatics at Mount Sinai School of Medicine, talks to contributing editor Tanuja Koppal, Ph.D. about the current changes impacting bioinformatics. While data generation gets simpler and less expensive, data search and interpretation remain a formidable challenge. Lack of standardization in data nomenclature and analysis tools continues to spur innovation in the creation of custom software programs and services. Since there exists no easy, one-stop shop for data management, Dudley advises lab managers to leverage their core facilities for bioinformatics, to look out for emerging software companies, and to get creative with informatics tools when tackling complex integrative biology.

Q: Can you tell us about your work and the types of data you handle on a regular basis?

A: The work that we are doing is around drug discovery and clinical genomics, trying to understand complex diseases through integrative and multi-scale biology. *Integrative* implies combining different types of data, taking a holistic view of the disease, and using all the molecular measurements available to us. The multi-scale piece is critical as well, where we figure out how to use informatics to connect everything, from the genomics at a cellular level to what is going in different tissues, at a broader physiological level. We look at various data types and at different scales of resolution and relevance to the disease.

Q: Where do you see the biggest challenges in your work?

A: Today, data generation is a place where you can compete easily, as it's not really expensive and most techniques can be outsourced. Data interpretation and integration are where the big wins are going to come from. A lot of labs are now trying to figure out how to leverage next-generation sequencing (NGS) data. Initially we thought that by generating huge amounts of data, we could process and compute the DNA variants by comparing them to the reference genome. What's clear though is that we need to store the terabytes of raw data so that as the science and methods improve we can go back and reanalyze the genome data and update the variant profile. That's definitely a challenge. Integrating the data is another challenge. There are no easy off-the-shelf tools for doing that. We have to write our own custom software programs because the field is changing so fast. However, there are some standard tools available. For instance, Cytoscape is a robust, open-source platform for doing complex network analysis where you are looking at how things are connected at a systems level.

Q: What other software programs and resources do you find helpful?

A: There are some good community efforts for dealing with sequencing data. There is a project called Galaxy, which is an open-source platform for managing NGS data and analysis. What's nice is that you can define analysis pipelines and workflows, save them as live protocols, and share them as they are very reproducible. NextBio is another interesting tool that provides a Google-like search interface, making it easy to mine all the public data available. Leveraging all the published data to compare how your experiments relate to other findings is hard to do. Finding what is out there is one thing, but then being able to use the data is another issue.

The other aspect is that with the explosion of data you can't get away with working on your laptop for these types of analysis. You need a server-based system, or you need to leverage informat-

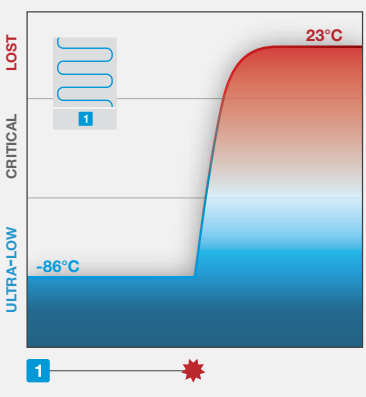
WHY RELY ON JUST ONE?

TWIN GUARD® SERIES
MDF-U700VXC

Security now comes with two

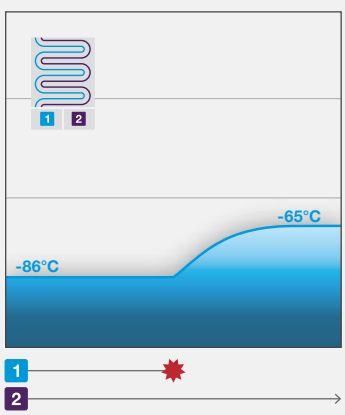
Give your samples the ultimate protection of patented Twin Guard® technology – two independent systems can individually sustain ultra-low temperatures in the event of a failure, so you can rest easy knowing your valuable work is in good hands.

TRADITIONAL FREEZER

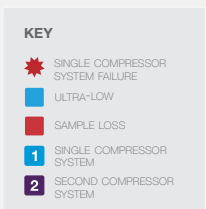


Freezer relies on a single system, causing a complete shut-down when failure occurs

TWIN GUARD® SERIES



Second independent system kicks in to maintain ultra-low temperatures in the event of a failure



Full racks or built-in LN_2/CO_2 back-up system with purchase. Up to a $5,800 value.
Visit www.TwinGuardSeries.com to learn more!

This data is based on a normal failure of the compressor within an ambient environment for representation purposes only. Actual response may vary.

Panasonic
ideas for life

Dr. Joel Dudley is Assistant Professor of Genetics and Genomic Sciences and Director of Biomedical Informatics at Mount Sinai School of Medicine. His current research is focused toward solving key problems in genomic and systems medicine through the development and application of translational and biomedical informatics methodologies. Dr. Dudley's published research covers topics in bioinformatics, genomic medicine, and personal and clinical genomics, as well as drug and biomarker discovery. His recent work with co-authors describing a novel, systems-based approach for computational drug repositioning was featured in the *Wall Street Journal* and earned designation as the NHGRI Director's Genome Advance of the Month. He is also co-author (with Konrad Karczewski) of the forthcoming book *Exploring Personal Genomics.* Dr. Dudley received a B.S. in microbiology from Arizona State University and an M.S. and Ph.D. in biomedical informatics from Stanford University School of Medicine.

ics software services or figure out how to use tools to deploy data in the cloud so you can scale up. But cloud computing is not trivial either, and without the right resources it could take weeks to put the data into the system. DNAnexus is a cloud-based system for NGS data storage and analysis. There is an interesting project called GenomeSpace coming out of the Broad Institute; it is a cloud-based centralized infrastructure for connecting existing tools and communities to do scale-up, data sharing, and computation. Sage Bionetworks has developed the Synapse platform, which is an open-source project trying to provide a reproducible and user-friendly infrastructure for managing and sharing data and computational workflows. What's nice is that it is not aimed at the power user, but it is making it very approachable for nontechnical folks.

Q: What do you think is contributing to the problems associated with data integration and interpretation?

A: The biggest challenge, honestly, is getting the right data you need. There is a lot of interesting data, but it's difficult to free it up from its source or to integrate across datasets in a systematic way. The terms used to describe the data in one dataset can be very different from the ones used in another dataset. There is very poor use of a common language or nomenclature to connect across various datasets.

Q: What specific informatics-related challenges do the students and post-docs in your lab face?

A: People in my lab have both computational and biological expertise, and we bring in clinical researchers to collaborate with us. Getting students up to speed with computational tools in the informatics space is tough because there is a lack of easy-to-use tools for this type of work. It's almost inevitable that at some point they are going to have to write their own software program and get familiar with working with large databases. There is definitely no Microsoft Office equivalent for integrative genomics, although there are a lot of software companies trying to accomplish that. There are some companies emerging that are providing user-friendly tools for doing large-scale computing, so hopefully things will change in the future.

Q: What are your perspectives on the cost and speed of computing?

A: Cloud computing is certainly interesting when it comes to cost and speed. What's really expensive today is people. Computing is relatively inexpensive. In the past people spent time optimizing algorithms to make computers run faster; whereas today, time is better spent by launching a number of servers in the cloud and running your algorithms on a bunch of different computers. It is oftentimes more economical than paying someone to optimize your software. So now you go from capital investments to operational costs. Instead of buying the big servers, computers, and software packages, cloud computing—like electricity—becomes an operational cost. It's a different model, but it can be very cost-effective. With cloud computing, the analysis can be done in a few weeks for a few thousand dollars. However, there are not too many user-friendly tools to do that. I often have to write my own software programs for cloud computing projects. But that is changing, and I see it moving more toward informatics software services with less focus on desktop-installed software packages.

Q: What is your advice to lab managers who don't have adequate resources to tackle their informatics problems?

A: I would advise lab managers to leverage their core facilities for bioinformatics at their university. I would ask them to go to conferences for discovering the emerging software companies in sequencing and other areas. Unfortunately, there is no one-stop shop. Some companies are good at data storage, some for data visualization, and others for interpretation. I am not aware of any one company that can do it all in a turnkey fashion. It's still a lot of piecing things together, and you have to get creative when looking at the various options for doing complex integrative biology. On a positive note, there are many companies looking to deal with the data deluge in biology and provide user-friendly tools. Instrumentation companies are also investing in informatics companies to provide a complete solution for data interpretation and downstream analysis.

"Cloud computing is certainly interesting when it comes to cost and speed. What's really expensive today is people."

Q: Are you concerned at all about data security?

A: I am very much into open source, but there is definitely a need for data security. Cloud computing doesn't make it necessarily secure. You still need to secure the servers that are loaded into the cloud. This is a big issue for medical centers and labs that handle large sets of patient data. They are not comfortable pushing the data outside the walls of their institution and into the hands of software service companies. People are very concerned about security and not comfortable with the paradigm of sending the data outside. The solution is not very clear, but there are some technologies trying to solve this issue. There are some Federal Information Security Management Act-compliant severs that are certified to have some level of security. But again, there are not many off-the-shelf systems for use.

SAFETY IS KEY WHEN DECIDING WHETHER OR NOT TO PURCHASE A NEW FUME HOOD

by Rachel Muenz

There are many different signs that it's time to upgrade your fume hood, but vendors say safety is the number one reason.

"The minute you realize that your fume hood isn't keeping you safe is when you should change it," says Erlab president Stéphane Hauville. "When you're doing your annual safety check on it and you're realizing it fails to pass a filtration efficiency test, yet the filters are in good condition, then there's something wrong with the hood."

He adds many fume hoods aren't getting tested as often as they should—at least once a year to ensure they are functioning properly.

According to Luke Savage, LEED Green Associate and sales engineer for ducted hoods at Labconco, customers should be careful to make sure the problem is caused by the fume hood itself before going ahead with an upgrade.

OTHER REASONS TO UPGRADE:

- Your current fume hood has broken down, and repair costs are too high.
- There is a decline in mechanical functionality (sash movement, etc.).
- You have an older, less efficient model that is becoming too expensive to operate.

"Often, loss of containment is not because the fume hood or ductless hood is doing anything wrong; it could be something else that's happening in the room," Savage says. "If the fume hood is responsible for the loss of containment, then certainly it should be replaced."

Degradation of materials is another sign that a ducted or ductless fume hood should be replaced. This includes a physical discoloration of the materials, such as etching of steel, fogging on the glass barrier or window, or loud noises coming from the internal fan of the ductless or, in some cases, ducted unit, adds Brian D. Garrett, LEED Green Associate and product specialist for Class II BSCs and carbon-filtered enclosures at Labconco.

There are also many benefits to having the newest technology, including higher efficiency, better containment of a larger number and variety of chemicals, and a higher safety level.

"Just like an automobile, they keep getting safer," Hauville says of the latest hoods. "There is nothing a newer product with newer technology won't do better than an older product."

Savage adds that greater efficiency can lead to a payback of two years in a ducted hood (in terms of costs).

"In a lot of cases, by simply changing the fume hood and making either modifications or replacements to the mechanical system that supports that fume hood, we see a payback for upgrading to a new modern fume hood within a couple of years," he says.

OTHER REASONS NOT TO UPGRADE:

- Your current model is a fairly recent model and passes all containment tests.
- The disruption caused by upgrading would be too costly.
- The limited or rented space of your lab makes it physically impossible to bring in the latest fume hood technology.

The cons of upgrading are similar to integrating any new equipment into the lab: disruptions caused by installing the new system, the time lost due to the need to become familiar with the new hood, and the up-front costs of the system. However, Savage, Garrett, and Hauville agree that, in most cases, the advantages gained from acquiring the latest technology outweigh those drawbacks.

"If you don't upgrade your ductless hood, you'll end up with an older technology that may not keep your employees, scientists, and researchers as safe; you'll end up with an older product with filtration technology that's not able to last as long," Hauville says. "So you think you may be saving by not upgrading, but

JOIN THE CAUSE

AirSafe™ NXT

Touchscreen Safety Controller

Join PATRIOT™ in the fight to:

- reduce energy use
- reduce installation costs
- reduce operational costs
- reduce ductwork
- reduce over-built HVAC systems
- reduce construction + renovation red tape

PATRIOT™
Ductless Fume Hoods

Sign up to become an AirClean® Patriot™ at ACS 2012 Booth #731 in Philadelphia.

AirClean® Systems will donate $5 to the Wounded Warrior Project for each visitor to our booth. Stop by and ***Join the Cause!***

PATRIOT™ Ductless Fume Hoods from AirClean® Systems

patriotfumehood.com

facebook.com/airclean

Founded, Designed & Made in the USA

One of Labconco's oldest fume hoods from the early 1960s.

The first ductless fume hood, invented by Erlab in 1968, had filtration capabilities that were limited to just a few chemical contaminants of the same family.

Erlab's latest ductless fume hood, the CaptairFlex, is equipped with the newest BE+ Flex technology, allowing for the handling of multiple chemical families. It was released in 2012.

Labconco's latest fume hood line, the Protector XStream, contains new Eco-Foil™—an aerodynamic sill that reduces energy consumption 7% to 10% over flat airfoils. The latest fume hoods are much more energy efficient than older models.

today's filtration technology on ductless hoods is capable of lasting longer than it used to and it's capable of handling more chemicals than it used to, so the products are safer."

However, vendors caution users to do their homework before buying. Because the fume hood industry serves only a small number of consumers, it isn't regulated, Hauville says.

"Don't upgrade your product thinking you'll immediately get the latest technology, the latest filtration, and so on; manufacturers aren't obligated by law to actually perform any test or provide any upgrade," he explains.

Savage adds that for ducted hoods, upgrading to the latest high-performance technology requires more than just buying a new unit.

"Unless you change the mechanical system, or specifically the volumetric rate of air that's being pulled to that mechanical system, you won't realize any actual savings by changing just the fume hood," Savage says. "It can be a bigger project than people realize."

OTHER THINGS TO KEEP IN MIND WHEN PURCHASING:

- The difference between "ductless" and "filtered" hoods: Filtered hoods can replace conventional fume hoods, while ductless hoods remain limited-application products.
- Ask the manufacturer to provide you with test reports and independent test data on their fume hoods.
- Ensure the fume hood meets the proper safety standards for your region (such as the AFNOR NFX 15-211 performance standard for filtration fume hoods and/or SEFA-9 for the design and use of ductless hoods).

STIRRERS

BAR-BASED AND OVERHEAD PLATFORMS MAKE NEW WAYS TO MIX

by Mike May, Ph.D.

Researchers use stirrers for many laboratory applications, from dissolving powders to mixing reagents. To get the right results, it takes more than placing a stir bar into a vessel and turning on the stirring device.

Today's devices accommodate simple and specialized applications. For example, Laura Geenen, product manager at Bel-Arts Products (Wayne, NJ), says, "We make a large volume stirrer that stirs a 55-gallon drum for industrial uses."

Special stirring situations

Large-volume or highly viscous mixtures demand special requirements from a stirrer. For example, rare-earth magnets work better for viscous mixtures. In addition, small volumes require special attention. "Sample volumes are getting smaller in life science labs," says Geenen. For instance, she mentions stirrers for microplates. "We can stir in five-milliliter vials, and tiny volumes can be harder to stir than large ones."

The magnetic stir bar plays as big a part as the stirring platform, and different mixtures need different bars. "Our new Spinfinity stir bar," says Geenen, "has a hard-plastic casing that is designed for use in granular slurries." This bar's casing is more durable than a Teflon stir bar. "It is resistant to flaking," Geenen says.

Justin Whiteman, senior scientist in product development at Stiefel, a GSK company (Research Triangle Park, NC), uses stirrers to develop semisolid liquids for topical application. "We use stirring elements for small-scale production units," he says. "We try different paddle and blade configurations to generate the formulations." To make that development as consistent as possible, Whiteman says, "we like electrically driven stirrers because they maintain speed and increase torque as required."

The overhead approach

When mixing needs more than a magnetic stirrer, some devices take an overhead approach. When asked what is important for the user of an overhead stirrer, Stuart Gibb, director of sales for laboratory and analytical equipment at IKA Works (Wilmington, NC), says, "Users require systems that are reliable, deliver accurate mixing, and afford them the ability to work with varying viscosities and volumes safely."

These characteristics accurately describe IKA Works' new Eurostar line. For example, these units include the first-ever wireless controller (WiCo). The removable WiCo controller allows the user to control and monitor every function of the mixer in real time," Gibb says. "The WiCo controller with its USB interface allows real-time monitoring of speed/torque changes, temperature, and many more parameters."

Beyond convenience, the WiCo controller enhances lab safety. "The wireless control can be removed from the Eurostar, allowing total control even in a completely enclosed hood from up to 30 feet away," Gibb explains.

Pointers on purchasing

When buying a new stirrer, Geenen offer some key tips. "Know what kind of vessels you'll be using and their size," she says.

To get the right bar, Bel-Arts Products is launching an app that Geenen says will "select by size and shape of your vessel, like a round-bottom flask." She points out that stir bars come in many sizes and shapes.

So for your next stirring needs, pick the right device and stir bar pair to ensure the desired results.

Mike May is a freelance writer and editor living in Austin, TX. You may reach him at mike@techtyper.com.

FOR ADDITIONAL RESOURCES ON STIRRERS, INCLUDING USEFUL ARTICLES AND A LIST OF MANUFACTURERS, VISIT WWW.LABMANAGER.COM/STIRRERS

ANALYTICAL BALANCES

CONNECTIVITY, COMPLIANCE LEADING FEATURES

by Angelo DePalma, Ph.D.

Markus Jansons, product manager for weighing at A&D Weighing (San Jose, CA), correctly notes that analytical balances are a mature product category and that "everybody has one." The task for balance manufacturers, therefore, is to "democratize" these instruments—to make them both physically and operationally accessible. One obvious strategy is to improve the user experience through simplicity, data features (e.g., calculation), rapid method development and validation, and computer connectivity. Anyone who has logged several dozen six-digit weights recognizes the value of automated data logging.

The second is to make them small enough for deployment wherever they are needed. A&D has recently introduced two upgrades to their Galaxy line, the HR-A and HR-AZ. Their size sets them apart, Jansons says. "With a footprint of eight by 12 inches, they take up about the same benchtop space as a top-loading balance." Both instruments comply with Good Laboratory Practices, Good Clinical Practices, and ISO; both perform standard calculations and connect to LIMSs. The AZ model also features one-touch automated calibration.

Sartorius (Bohemia, NY) has taken a similar tack with its Secura® line of analytical and top-loading balances, which each have an identical (small) footprint. Secura's Advanced Pharma Compliance feature simplifies documentation and monitoring under GLP and includes one-touch level control.

The LIMS challenge

The value of dedicated control, data handling, and report-writing software can easily be lost on casual analytical balance users, particularly those who already have a laboratory information management system (LIMS) in place.

When implementing a LIMS with several weighing stations, one Mettler Toledo (Columbus, OH) customer was challenged with connecting balances to the information system: There is no "one size fits all" LIMS configuration. "Customers frequently document weight data manually, then re-enter it into a LIMS," comments Ian Ciesniewski, technical director at Mettler Toledo. "Plus, LIMSs capture only a fraction of a balance's output, greatly reducing their functionality." LIMSs also typically require workflow initiation from an adjacent PC instead of the instrument itself, which complicates workflows.

Mettler Toledo's LabX software, Ciesniewski says, offers more seamless workflows and SOP control through the balance's benchtop control. This particular law enforcement customer's goal was for each balance to act as a stand-alone client without a PC at each balance. Operators enter case and exhibit numbers at the balance display, either manually or via barcode reader. After weighing, the parsed data automatically exports to the LIMS.

With LabX, creating a weighing application involves clicking and dragging functions and checking boxes—no code-writing. The software automatically establishes weight and monitoring measurement uncertainties, minimum weights, and tracking/alerting for all minimum weight violations. "If a test fails, LabX blocks the balance and provides traceability back to the weight, last calibration, weight certificate number, who checked and when, and all other relevant meta-data," Ciesniewski says.

This customer also required a flexible reporting function that was comprehensive with respect to report configuration. For example, after confiscation of potential contraband, operators enter case and article numbers at the balance. LabX automatically stores the weight, performs calculations, and generates a report suitable for legal proceedings. "Try doing that with a LIMS," Ciesniewski says.

***Angelo DePalma** is a freelance writer living in Newton, NJ. You can reach him at angelo@adepalma.com.*

FOR ADDITIONAL RESOURCES ON ANALYTICAL BALANCES, INCLUDING USEFUL ARTICLES AND A LIST OF MANUFACTURERS, VISIT **WWW.LABMANAGER.COM/BALANCES**

pre·ci·sion (prĭ-sĭzh'ən) *n.* The state, property, or quality of being precise.

Precision is valuable,
but sometimes it comes at a cost. Some balance manufacturers would like you to believe that precision and value don't go hand in hand.

Adam Equipment balances bring you the performance you need with the features you want, at a value far superior to other balances in their class. With more than 40 years of delivering quality balances and moisture analyzers to professionals around the world, Adam is the one you can rely on.

Learn more about our precision balances at www.adamequipment.com

The right balance
speed, performance and value.

PITTCON™
CONFERENCE & EXPO
2013 PHILADELPHIA MARCH 17-21
Booth #925

ADAM®

888-355-3868
sales@adamequipment.com
adamequipment.com

AUTOMATED LIQUID HANDLING

CENTRAL COMPONENT FOR LAB AUTOMATION

by Angelo DePalma, Ph.D.

Automated liquid handling (ALH) is arguably the main attraction in life sciences laboratory automation. Based on the cost and complexity of early systems, one would not have predicted a bright future for ALH, or for lab automation generally. Yet the pharmaceutical industry's decade-long embrace of very high-throughput screening, followed by high-throughput genomics studies, created the necessity that made automation commonplace.

ALH systems span the range from semiautomated multichannel pipettors to room-sized systems. Jason Greene, sr. product marketing manager at BioTek Instruments (Winooski, VT), estimates total worldwide annual demand for ALH at $400 million to $500 million. High-end systems may cost as much as $175,000, while modular units go for less than $20,000. BioTek's target market is entry- to midlevel throughput applications where user-friendliness, functionality, and reasonable cost help to overcome purchaser anxiety (and sometimes remorse as well).

Smaller, simpler, more modular

While very large, complex liquid handlers still dominate large industrial and academic projects, the industry is trending toward versatile, modular ALH systems—seemingly for every budget. Instrumentation, software, and methods have followed the trend toward greater user accessibility. Assay manufacturers have also bought into the inevitability of automation, and many supply tests in both manual and automated formats.

The "low" end of the ALH marketplace is not necessarily fated to low-level applications. BioTek's products, for example, are often integrated with larger instruments through third-party automation specialty companies to provide additional functionality, like plate washing or reading. "The integrator is usually the company that makes the large-deck liquid handler," Greene says.

> **"The industry is trending toward versatile, modular ALH systems—seemingly for every budget."**

ALH vendors are eager to combine workflow steps in their devices to enhance productivity and further narrow the gap between high- and low-end instrumentation. BioTek's EL406™ Microplate Washer Dispenser, for example, combines separate wash and dispense technologies into a single instrument. This saves equipment costs and valuable bench space but also reduces operator contact. "Users spend less time moving microplates from one instrument to another," says Greene. "This alone could add up to an hour or more per day."

The wash function also comes in handy for media changes, where it serves to remove spent media. "A high-end ALH [system] could do this as well, but you could spend five times as much for it," Greene says. Even more functionalities could be combined or added in, such as shaking or heating.

Functionality has been a trend across the spectrum of ALH systems. Agilent Technologies (Santa Clara, CA) recently announced a new ALH, the Encore Multispan Liquid Handling System, which features standard liquid handling functions plus dual "multispan" pipetting and a built-in robotic arm.

Multispan allows each pipette in an array to move independently, through multiple axes, in addition to the standard side by side. Any tip may dispense into any well (or tube or vial), regardless of where its previous "neighbor" is located. The robotic arm provides a span of up to 21 inches off-deck with one-touch "easy teaching" that facilitates workflow integrations. The Encore also comes with a software package featuring a 3-D simulator that provides researchers with the ability to set up, visualize, and optimize protocols remotely and offline before actually running experiments.

The New Echo® 525 Liquid Handler

- The first large-volume acoustic liquid transfer system
- Build biochemical and genomics assays from 100 nL to 10 µL
- Ready out-of-the-box without calibration

www.labcyte.com/products

LABCYTE™

Quality, not speed

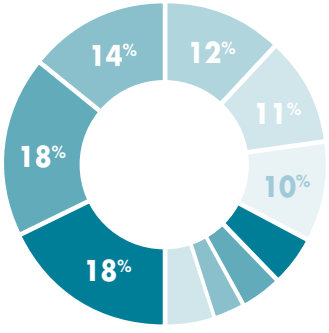
Speed and throughput seem like logical reasons to acquire an ALH system, but most users quickly realize that consistency of results is a far more valuable asset. "As a contract research organization, it is important for us to maintain accuracy and reproducibility, particularly when analyzing clinical samples for pharmaceutical companies or medical research institutes or universities," says Alamgir Khan, Ph.D., technology services manager at the Australian Proteome Analysis Facility (Sydney). Khan believes that achieving those quality goals is impossible without an ALH system, particularly when reagents are expensive and samples precious.

One could, in fact, make the case that consistency, a reduction in pipetting errors, and human/ergonomic factors—not speed—are what tip the scales in favor of automation. Agilent's Peter Mrozinski likes to say that an ALH system is about as fast as a good technician on a good day. That is perhaps false modesty when one considers the repetitive aspect of pipetting.

Even where labor is relatively inexpensive, as in academic labs, one could argue that even a junior scientist's time is better spent designing experiments or analyzing data than performing mind-numbingly repetitive, error-prone pipetting. "Today's scientists are under pressure to finish projects and to publish papers," observes Dr. Carsten Buhlmann, international product manager for automation at Eppendorf (Hamburg, Germany).

Christina Schott, senior technician at Munich's (Germany) Technical University, says she was "facing the acquisition of a liquid handler with great skepticisim." Before the purchase of an Eppendorf epMotion system, her group put the device through a rigorous test: Schott vs. the Machine, which the Eppendorf passed with flying colors. Schott now refers to the ALH system as she would a coworker. "I like 'him' very much. He is now one of us!"

THE PROCEDURES THAT APPLY TO THE LABS OF OUR READERS WHO USE ALH SYSTEMS OR ARE PLANNING TO BUY AN ALH.



SERIAL DILUTION	18%
PCR SETUP	18%
PLATE REPLICATION	14%
HIGH-THROUGHPUT SCREENING	12%
CELL CULTURE	11%
PLATE REFORMATTING	10%
WHOLE GENOME AMPLIFICATION	5%
ARRAY PRINTING	4%
HIGH-DENSITY ARRAY PRINTING	3%
OTHER	5%

Overcoming hurdles

The challenge in reaching first timers, or labs unfamiliar with or frightened of automation, is to overcome fears of the unknown, then convince them of the payback. Mehul Vora, global product manager at Beckman Coulter's (Brea, CA) Life Sciences Automation group, defines entry level as labs that process five or ten samples or two to three microplates per day. This is where the connection between manual and automated processing seems most intuitive. These labs can also be the hardest sell because managers tend to underestimate time spent in manual pipetting and the preparation of samples and standards.

Fear of automation is a common hurdle for lab workers of all ages. During a "voice of the customer" exercise, a seasoned Beckman customer related how his daughter, an undergraduate biology major, refused to use automation. Her excuse was that she believed she would have to learn programming, and besides, she could do by hand everything an ALH system could do.

That's why control software, an intuitive interface, and canned methods are critical. "Having an intuitive system helps," Vora says, using the tried-but-true example of a smartphone vs. an iPhone, where every feature is accessible by touch, dragging, and dropping. "Having someone try the software, without having to program anything, and be able to run an assay in 15 minutes is the ideal."

***Angelo DePalma** is a freelance writer living in Newton, NJ. You can reach him at angelo@adepalma.com.*

FOR ADDITIONAL RESOURCES ON AUTOMATED LIQUID HANDLING, INCLUDING USEFUL ARTICLES AND A LIST OF MANUFACTURERS, VISIT WWW.LABMANAGER.COM/LIQUID-HANDLING

Redefining Microplate Washing...Again.

405™ Touch

- Enhanced, high-resolution touch screen
- Simple protocol creation and execution
- USB ports for multi-user functionality
- Decades of proven expertise

NOW WITH VERIFY™ TECHNOLOGY

Enhance your microplate washing experience at **www.405touch.com**

BioTek®

Scan with your mobile device to learn more.

China | France | Germany | India | Singapore | South Korea | Switzerland | United Kingdom | United States

FILTRATION

TECHNOLOGIES EVEN ENHANCE SAMPLES FOR SPECIALIZED ASSAYS

by Mike May, Ph.D.

Filtration makes up a key procedure in a wide range of laboratories, from basic biological and chemical research to industrial applications, including food processing, pharmaceuticals, and more. Many biologists, for example, filter smaller and smaller volumes of sample. The amount that qualifies as truly "small volume" sample filtration depends on whom you ask. For example, Vivek Joshi, principal scientist at EMD Millipore, a division of Merck KGaA (Darmstadt, Germany), says, "In my perspective, small volume is about a couple [of] hundred microliters of sample or less." Navin Pathirana, global products manager - lab devices at GE Healthcare (Waukesha, WI), draws the line at up to one milliliter. Some researchers take the line even higher.

"The reason people are going down to these small volumes is because of the research they are conducting," Joshi says. For small-volume sample filtration, the research often involves analysis of tissue-level analytes or even components at the single-cell level.

For example, when a drug researcher uses small animals, such as a mouse or rat, for pharmacokinetic or pharmacodynamic studies, only small amounts of plasma can be withdrawn. To prepare such a small sample for analysis, it must often be filtered. When performing high-performance liquid chromatography (HPLC), for instance, Joshi says, "you need to at least filter the sample because particles and impurities affect the HPLC performance."

When customers do fewer than ten samples a day, they can use syringe filters. "At that number of samples, it's not that big of a deal," Joshi says. "If you process hundreds of samples a day, you might go to a 96- or 384-well plate to process multiple samples in one go."

"Scientists look for sample-filtration solutions for small volumes that make the process simpler and faster."

While the sample volume decreases, researchers want to run more samples. "Even smaller labs are trying to process more and more samples," Joshi explains. "So scientists look for sample-filtration solutions for small volumes that make the process simpler and faster." In fact, small academic laboratories to larger biotechs and big pharma keep needing to process more samples. Consequently, these samples must be processed as efficiently and consistently as possible.

Saving the sample

As researchers filter small volumes of sample, they can afford to lose less and less. "When you do filtration on a membrane," Joshi says, "some amount of sample is held by the membrane." That loss can be fluid or even the analyte of interest.

For scientists who filter ten to 100 samples a day, they needed a better solution. "They could not go to a plate-based solution because they didn't process enough samples, but the syringe format is not convenient when you have to process so many samples." He adds that about 60–70 percent of researchers filter ten to 100 samples a day.

So researchers want to use filtration systems that work with small volumes, preserve sample, and fit their sample-throughput needs. Because of so many needs, says Joshi, "we introduced our Samplicity, which is a vacuum-based filtration system using membranes that allows eight sample filtrations side by side." This system filters a sample as small as 100 microliters and preserves 80 percent of the sample.

High-performance filtration

The accuracy of HPLC depends on sample preparation, including filtration. In this case, researchers don't want to lose sample to the filter, and they also do not want anything from the filter getting in the sample. "So researchers should use filtration systems that are extremely clean and certified for HPLC applications," Joshi says.

The challenges in small volumes get even more complicated with ultra-HPLC (UHPLC). "A consequence of switching from HPLC to UHPLC is that the sample-filtration step becomes the bottleneck," says Pathirana. "Often the time it takes to filter and get the sample ready to load onto the autosampler is at least equal to the run time of the sample." In addition, says Pathirana, "filtration of the sample is critical for UHPLC because of the particle size of the media in UHPLC columns."

"A consequence of switching from HPLC to UHPLC is that the sample-filtration step becomes the bottleneck."

Despite those challenges, researchers will continue to make the transition to uHPLC. "The benefit to the customer from switching to UHPLC from HPLC is improved resolution, sensitivity, and speed." Pathirana says. "However, for the customer to see the full benefit of speed, the sample filtration speed also needs to be improved. This is where we see opportunities to improve the UHPLC workflow."

For one thing, researchers can use a combined filter and autosampler vial, which GE Healthcare makes for its Mini-UniPrep syringeless filter. So in one step the sample gets filtered and put into an integrated autosampler vial. This system comes in plastic or glass versions (new Mini-UniPrep G2).

The technology depends on the technique

What a researcher needs when filtering small-volume samples really depends on just what is being done. It depends on the kind of sample and its source; it depends on the question at hand and how it will be analyzed.

Oliver Hyman, a doctoral student at Arizona State University, once filtered samples of pond water—ranging from 60 to 1,000 milliliters—in search of DNA from a pathogen. Hyman says, "I used a small Lure Lok syringe to push the water through a 0.22 micron filter." This technique provided some clear benefits to Hyman. As he says, "I liked it because it was much simpler than sampling animals." Still, some technological improvements would have made this work even more effective. As Hyman explains, "It would be nice to have tools—pumps, prefilters, and so on—to help filter more water."

So even as sample volumes plummet in some research areas, the volume of samples to filter expands. Consequently, the approaches to filtration grow in step. Today, researchers can choose from many approaches, even ones specialized for processes such as UHPLC and high-throughput techniques. Sometimes, the choice depends on the particular scientist doing the work.

***Mike May** is a freelance writer and editor living in Texas. You may reach him at mike@techtyper.com.*

FOR ADDITIONAL RESOURCES ON FILTRATION, INCLUDING USEFUL ARTICLES AND A LIST OF MANUFACTURERS, VISIT WWW.LABMANAGER.COM/FILTRATION

REFRACTOMETERS

OLD SOLUTION TO NEW ANALYSIS PROBLEMS

by Angelo DePalma, Ph.D.

Refractometers come in all sizes, shapes, capabilities, and prices. Some readers may recognize refractometry as a "high school" analysis method or a specialized technique for measuring specific analytes like sugar in water. Increasingly, lab and process engineers employ refractometry to provide quick measures of key quality attributes that under normal circumstances would require much lengthier assays on significantly more expensive equipment.

Titration replacement

Anton Paar (Ashland, VA) launched a new line of refractometers, the Abbemat 300 and Abbemat 500, in 2011. As of this writing, 20 months later, real-world data suggest that Abbemat models are living up to their promise.

Refractive index measurements for the Abbemat 300 and Abbemat 500 are accurate to ±0.0001 and ±0.00002 nD, respectively. Their precision, and design for harsh environments, makes these models suitable for quality control as well as routine analysis. Both models sport hermetically sealed stainless steel casings that are impervious to most spills or foreign materials. But can the instrument withstand the ravages of one of the most corrosive substances in the world?

An Anton Paar customer—a manufacturer of hydrofluoric acid (HF)—recently tested Abbemat's robustness in a harsh manufacturing environment. Nicknamed "devil's work," HF is one of the nastiest substances known. Used as an etchant and starting material for organofluorine compounds, HF is a severe poison that can eat through skin and flesh down to the bone, causing very severe, painful wounds that heal extremely slowly.

> **"Increasingly, lab and process engineers employ refractometry to provide quick measures of key quality attributes."**

Assaying HF concentrations is traditionally done by a lengthy titration measurement that takes three hours and exposes operators and equipment to highly corrosive acid. Moreover the assay is cumbersome, as the titrator must be kept in a fume hood some distance away from the controls.

Abbemat was up to the task. The system employed by the "HF customer" consisted of the refractometer, sampler, and pump from Funk, a custom PTFE polymer sample cell, and custom control software from Anton Paar's OptoTec subsidiary. Conducting a "longtime prism test" confirmed that the yttrium-aluminum-garnet prism employed by Abbemat refractometers resists serious acids like HF. The PTFE sampler is also acid-resistant.

What's significant about this test is that a refractometer has successfully replaced a longer, more tedious titration assay involving highly corrosive chemicals. A refractometry run takes between five and ten minutes, compared to several hours to set up, run, and clean a titrator.

According to Alex White, a product specialist at Anton Paar, refractometers are now routinely used in the pharmaceutical industry for quality control and characterization of new substances.

"In many instances refractometry replaces much more expensive equipment such as gas chromatography and mass spectrometry. I would assume that hydrochloric acid concentrations might also be more easily measured with a refractometer than through titration," White says.

In-process analysis

Refractometry's accessibility and accuracy is improving in-line analysis in process environments as well. Traditionally, manufacturers

sampled their process and submitted vials to a lab behind the scenes, which returned results hours or days later—often when it was too late to remediate components that were out of spec.

Digicom Electronics (Oakland, CA), which manufactures printed circuit boards, uses a proprietary chemical mixture to clean their finished products. Highly efficient removal of metal ions significantly reduces circuit board failures.

A critical aspect of the cleaning process involves ensuring that the "green" cleaning solution itself is not contaminated by picking up metals. General Manager Mo Ohady says that a refractometer is the secret to maintaining the proper composition of his solution. "We use it to check the stability of the mix in the tank to see that it's not compromised," he says. As someone more familiar with electronics than chemical analysis, he calls his in-line analysis tool "a new, better mousetrap for testing solutions."

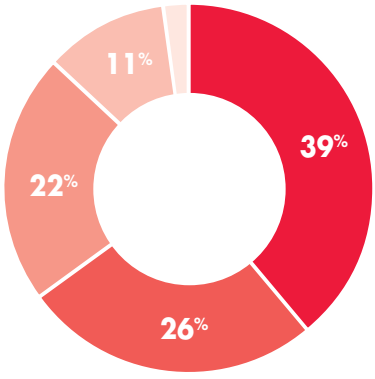
Bring the lab to the plant

"For many applications, refractometers hit a sort of 'sweet spot' of precision and convenience," says Noah Radford, sr. product specialist at ATAGO USA (Bellevue, WA). Refractometers may be even more precise and empirical than methods they replace. "Think reagent strips, which rely on color-matching and have a very narrow time frame of validity."

For still other situations, refractometers become the "quick and dirty" or "mobile" alternative to more bench-bound methods that might be more accurate but require more time, more energy, and hazardous reagents and/or cannot take place near the product line (such as titration systems for harsh acids).

In these instances, refractometers may not be the "golden" or AOAC-approved test method, but they can supplement them or screen for situations where the full method should be used. Many users save more precise, validated methods for quarterly tests sent to regulatory bodies, for spot checking samples, or to validate standards used in other measurements. Refractometry is reserved for more day-to-day internal QC checks, for which they are more suited thanks to their speed and simplicity.

TYPES OF REFRACTOMETERS RESPONDENTS TO OUR LATEST SURVEY ARE USING:



MANUAL PORTABLE	39%
DIGITAL BENCHTOP	26%
ABBE (MANUAL) BENCHTOP	22%
DIGITAL PORTABLE	11%
OTHER	2%

Often, there is a small but predictable discrepancy between readings achieved through different methods. "Continuous emissions monitoring and vacuum ovens typically generate percent solids values that are higher than a refractometer's brix measurement," Radford notes. "Users need to be cognizant of this and apply corrections when necessary."

Radford relates a success story, from the bioethanol industry, where by using refractometry his client was able to automate a test for percent solids on their digestion/fermentation line. This allowed them to monitor and control the rate of addition of an expensive enzyme into the feedstock. "Mass flow and hourly percent solids checks by hand were not enough," Radford relates.

The customer first tested the efficacy of several refractometers that they could wheel around on carts between lines and checkpoints, plugging them into a PLC to transmit data and communicate with upstream operations. "Eventually, they permanently installed six in-line refractometers. The monitoring improvement improved yield by three percent. "Combined with the savings on the enzyme, they figured they were netting an extra $2,000–$3,000 per batch," Radford says.

***Angelo DePalma** is a freelance writer living in Newton, NJ. You can reach him at angelo@adepalma.com.*

FOR ADDITIONAL RESOURCES ON REFRACTOMETERS, INCLUDING USEFUL ARTICLES AND A LIST OF MANUFACTURERS, VISIT WWW.LABWRENCH.COM/REFRACTOMETERS

ARE YOU IN THE MARKET FOR AN... ELECTRONIC LABORATORY NOTEBOOK?

Electronic laboratory notebooks (ELNs), one component of a lab's information infrastructure, help laboratories capture and manage knowledge, streamline data management, protect intellectual property and foster collaboration. Both non-specific/generic ELNs (which compete directly against paper notebooks) & application/task-specific ELNs exist, each with their own fans.

Top 6 Questions You Should Ask When Buying an ELN

1. How local are resources and how available are resources for deployment, training and extensions? What is the timeline for availability and cost?
2. How easy is it to extend the application? Does it require IT or super users? How long does training take to make modifications and how extensive is the API for modifications?
3. How easy is it to get data back out of the system? Is all information indexed and searchable? Can users query and combine data from multiple experiments, not just return a list of experiments?
4. What is the typical number of hours of admin time required to upgrade for a major release and a minor release?
5. What level of support is offered? How many support staff are there, where are they located and what language do they support? How is the support rated by other customers?
6. Is your IP system safe in their system? What is the chance the company will be around in five years? What is the chance that the company will switch technologies and force an expensive migration? What credibility does the company have in the past for delivering robust, scalable, secure, and 21 CFR Part 11 compliant systems?

Types of ELNs respondents currently have

Client/Server	36%
Web-based	33%
Stand-alone	17%
Thin client/server	8%
Other	6%

The biggest challenge survey respondents are facing on an ELN purchase:

Data migration into the new system	29%
Staff adoption and training	22%
Integration with other systems	17%
Investing in software that will become obsolete	13%
Demonstrating ROI	9%
System selection	5%
Other	4%

Top ten features/factors survey respondents look for in ELNs

Versatility	100%
Ease of use	99%
Security	99%
Service and support	99%
Price	96%
Up time	95%
Customization	94%
Ease of installation	94%
Scalability	94%
Multi-Platform	93%

The primary purpose for the ELNs used in our readers' labs:

Infrastructure for capturing, accessing and sharing experimental information	21%
Accelerating the documentation and reporting of experimentation	12%
Improve productivity	12%
Centralized data repositories	9%
Streamlined regulatory compliance	6%
Improved communication between instruments and related software	3%
Enabling scientists to collaborate effectively on multi-stage projects	3%
Workflow coordination across geographic and business boundaries	3%
Intellectual property (IP) protection	3%
All of the above	29%

COMPLETED SURVEYS: 247

For more information on ELNs, including useful articles and a list of manufacturers, visit www.labmanager.com/eln

ARE YOU IN THE MARKET FOR A...
ROTARY EVAPORATOR?

A rotary evaporator, found in every chemistry lab, allows users to perform chemical separation or purification using heat and agitation — or stirring — under vacuum. Key applications for evaporators include sample concentration, solvent recycling, extractions, and separation of solvent mixtures.

Top 5 Questions You Should Ask When Buying an Evaporator or Evaporation System

1. What are your sample sizes? Microtiter plates and micro centrifuge tubes work best in a centrifugal vacuum concentrator. For large samples up to 450mls, a vortex evaporator is recommended.
2. What are your samples? Acids require an acid resistant system. Solvents damage plastic and rubber components; an appropriate system to prevent damage is recommended. A -50C cold trap is ideal for aqueous based samples, a -85C cold trap traps most solvents and a -105C cold trap is recommended for alcohols.
3. Are your samples heat sensitive? Even at ambient set point, vacuum concentrators add heat through friction. A concentrator that has refrigeration built into it will give you the temperature control recommended to maintain the viability of heat liable samples.
4. Do you have limited space? A floor model with casters or small all-in-one bench top model can be moved out of the way when not in use.
5. Do you prefer vacuum evaporation or nitrogen blow down? Some samples require evaporation under nitrogen (which is more gentle) for volatile solvents.

Top ten features/factors survey respondents look for when buying a rotary evaporator

Ease of use	100%
Safety	98%
Low maintenance/easy to clean	98%
Low operating cost of ownership	96%
Reliability	95%
Ease of installation	91%
Service and support	89%
Price	85%
Warranty	77%
Built-in vacuum controller	72%

Rotary evaporators are used for the following primary application(s) in respondents' labs:

Concentrating substances	58%
Distilling low-boiling solvents	40%
Extractions	28%
Drying powders	22%
Distilling temperature-sensitive substances under vacuum	20%
Separating material mixtures	15%
Recycling solvent waste	14%
Distilling oxygen-sensitive substances under inert gas	5%
Other	5%

The type(s) of rotary evaporator(s) used in our readers' labs:

Hand lift	58%
Motor lift	43%
Other	6%

The size of rotary evaporator heating bath used in respondents' labs:

Less than 1 liter	12%
1 liter	21%
2 liters	20%
3 liters	11%
4 liters	15%
5 liters	14%
10 liters	2%
More than 10 liters	4%

The rotary evaporator components being used by survey respondents:

Condensate trap	45%
Digital bath	42%
Diagonal condenser	39%
Re-circulating cooler	34%
Vertical condenser	32%
Diaphragm pump	30%
Chiller	28%
Dry ice condenser	20%
Reflux condenser	18%
Cold finger condenser	9%
Other	2%

For more information on rotary evaporators, including useful articles and a list of manufacturers, visit www.labmanager.com/evaporators

ARE YOU IN THE MARKET FOR A... MASS SPECTROMETER?

Mass spectrometers, measuring the mass-to-charge ratio of charged particles to determine their molecular weight, have not quite become a routine acquisition for every lab that might benefit from them. Four parts are standard in all mass spectrometers: a sample inlet, an ionization source, a mass analyzer and an ion detector.

Top 6 Questions You Should Ask When Buying a Mass Spectrometer

1. What factors come into play when determining the MS specifications you require in terms of throughput, sensitivity, robustness, software control, ease of use, and ease of maintenance?
2. What differentiates the vendor's MS from others offered, in terms of performance and how easy it would be to upgrade?
3. How do you validate the specification claims presented by the vendor?
4. Has the data processing software been designed for enhanced analytics, with lab workflow in mind and does it support critical compliance requirements?
5. What are important price points to keep in mind when selecting a MS?
6. Laboratories need fast and effective services, including an effective distribution of spare parts, instruments, service personnel and education/ training. How does the company serve these needs globally?

Type(s) of stand-alone mass spectrometer systems recently purchased or to be purchased by our survey respondents:

GC-MS	32%
Triple Quad	18%
Inductively coupled plasma mass spectrometry (ICP-MS)	16%
Time-of-Flight (TOF)	11%
Matrix-assisted laser desorption/ionization (MALDI)	5%
Don't Know	8%
Other	8%

Type(s) of integrated mass spectrometer systems recently purchased or to be purchased by our survey respondents:

GC-MS quadrupole	22%
LC-MS quadrupole	17%
LC-MS time of flight (TOF)	10%
LC-MS ion trap	8%
GC-MS-MS	7%
GC-MS ion trap	6%
GC-MS electron ionization (EI)	6%
Maldi-TOF	6%
Don't know	8%
Other	10%

Top ten features/benefits survey respondents look for in mass spectrometers

High sensitivity	96%
Higher quality of data	94%
Reliability	93%
Ease of maintenance	91%
Data output, storage and retrieval	85%
Warranties	82%
Training	76%
High mass resolution	76%
Fast scanning speed	75%
High mass accuracy	74%

Survey respondents are using their mass spectrometers to perform the following analyses:

Test water quality or food contamination	32%
Determine structures of drugs and metabolites	23%
Screen for metabolites in biological systems	20%
Perform forensic analyses	18%
Quantitate (relative or absolute) proteins in a given sample	13%
Monitor enzyme reactions, chemical modifications and protein digestion	9%
Determine protein structure, function, folding, and interactions	9%
Detect specific post-translational modifications throughout complex biological mixtures	6%
Detect disease biomarkers	6%
Other	33%

COMPLETED SURVEYS: 208

For more information on mass spectrometers, including useful articles and a list of manufacturers, visit www.labmanager.com/mass_spec

Lab Manager Magazine is now on your iPad.

Lab Manager® MAGAZINE
Run Your Lab Like a Business

Available on the App Store

Here's proof that big things do come in small packages

Introducing Ti-Touch for routine titrations.

- Burette, stirrer and full-color touch control all in a single, tiny footprint
- No-Touch reagent exchange on Karl Fischer models for maximum safety
- Networking, remote printing and paperless PDFs – no PC needed!
- Hundreds of pre-programmed methods included
- Direct access to 14 methods and common functions

www.metrohmusa.com

Metrohm

866-METROHM (638-7646)

See us at PITTCON Booth 1141

Lab Manager MAGAZINE
Run Your Lab Like a Business

INSIGHTS
LAB TECHNOLOGY BUYER'S REPORT

INSIGHTS ON AUTOMATED SAMPLE PREPARATION

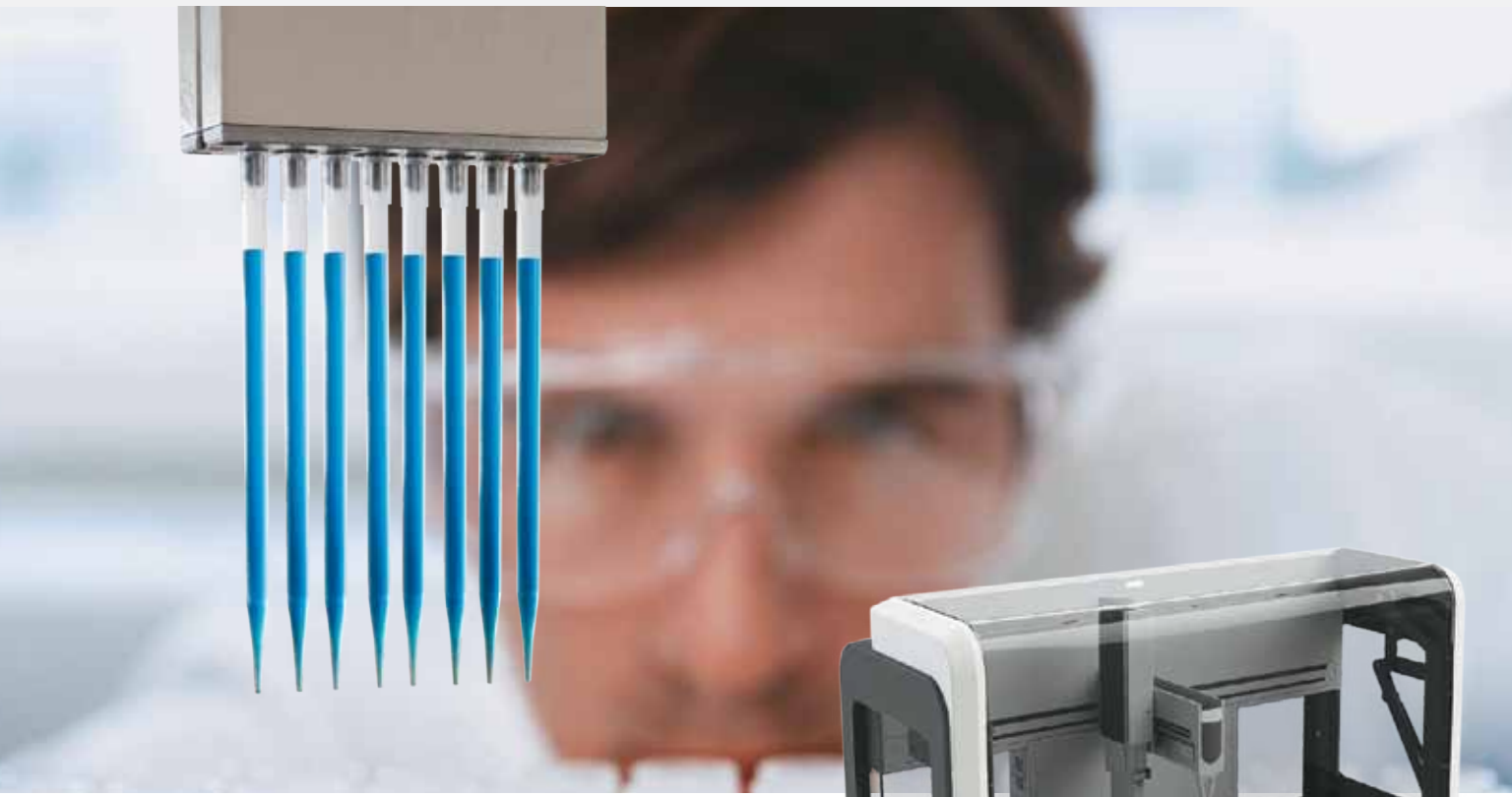
A LAB MANAGER MAGAZINE TECHNOLOGY BUYER'S REPORT

SUPPLEMENT TO LAB MANAGER MAGAZINE

Please visit our facebook page: *www.facebook.com/labmanager*

January / February 2013
VOLUME 2
NUMBER 1

REMOVING HUMAN ERROR.
NOT HUMAN BRILLIANCE.



BIOMEK 4000 LABORATORY AUTOMATION WORKSTATION

Automate tasks. Explore more possibilities. The new Biomek 4000 Workstation takes your productivity and accuracy to new levels, so you can spend less time on process and more time on powerful discoveries.

- Ready-to-use genomic and cellular application methods available
- Precise and robust pipetting from 1 µL to 1000 µL, both single- and 8-channel
- Complete automation system with accessories for cooling, heating and shaking available
- Off deck tool rack and liquid waste station maximize deck space
- Optional enclosure*
- Backed by a 25-year legacy of innovation in automation solutions

Streamline your workflow with the Biomek 4000 Workstation.
www.biomek4000.com/lbm
VISIT US AT BOOTH #921, SLAS 2013

BECKMAN COULTER
Life Sciences

* In development.
Beckman Coulter, the stylized logo and Biomek are trademarks of Beckman Coulter, Inc. and are registered with the USPTO.
Manufactured at Beckman Coulter's Center of Excellence in Indianapolis, Indiana, USA.

INSIGHTS ON AUTOMATED SAMPLE PREPARATION

All articles by **Angelo DePalma, Ph.D.**

INSIGHTS
LAB TECHNOLOGY BUYER'S REPORT

Angelo DePalma is a freelance writer living in Newton, NJ.
You may reach him at angelo@adepalma.com

CONSISTENCY, ECONOMY, ERROR REDUCTION, AND FREEDOM FROM ROUTINE ARE COMMON DRIVERS

Sample preparation ("prep") is a tedious, time-consuming task but a necessary part of nearly every analytical workflow, regardless of industry or laboratory type.

Sample prep involves collecting, treating, and manipulating a physical substance before subjecting it to some operation, usually instrumental analysis. Some samples, like pure liquids taken from reagent bottles, hardly require preparation at all. Generally speaking, the intricacy of the preparative workflow is the product of the sample's complexity, the analytic specificity, and the ability of the instrument to discriminate from nontarget substances within the sample.

SPE Extraction System / SmartPrep™ / Horizon Technology / www.horizontechinc.com

A typical manual sample preparation workflow consists of gathering labware and reagents; calibrating measurement, delivery, and analytical systems; preparing solvents and reagents; recording relevant identifiers (lot numbers, expiration dates, weights, concentrations); labeling containers; weighing; calculating; filling; obtaining standards; and completing physical/mechanical operations such as filtering, grinding, or sonicating. Each of these steps involves multiple operations on its own. For example, glassware must be cleaned, dried, and moved around the lab, while standards need to be created, tested, and rendered into usable form through dilution, titration, and dispensing. An additional layer of recordkeeping and compliance applies to regulated laboratories.

The more complex and numerous the samples, the more critical become informatics, sample tracking, and knowledge handling. Most automated sample prep systems are connected to a laboratory information management system or are accessible through an electronic laboratory notebook, but often these require a level of "middleware" intermediary software to enable communication between system and computers.

Automatic Liquid Sampler / 7693A / Agilent Technologies / www.agilent.com

High-caliber analysis modes such as GC- and LC-MS have raised the quality standard for sample prep. As a result, laboratories view sample preparation as a bottleneck in terms of cost and worker hours.

Yet according to estimates from Agilent Technologies (Wilmington, DE), 70 to 80 percent of prep work is still performed manually. Given the concentration of automation in very high-throughput venues, it is safe to say that close to 90 percent of all labs still engage in sample prep. Reasons for not automating include acquisition and operating costs, system complexity and steep learning curves, and perceived lack of system reliability and support.

"Users expect the same robustness, usability, and uptime from sample preparation as from their analytical instruments," says Peter Mrozinski, product manager for workflow automation at Agilent. "They believe that constant tweaking at the low end and steep learning curves at the high end defeat the purpose of automation."

tasks. Very high-throughput genomics, proteomics, and medical laboratories would not exist without automation. These markets are adequately served by large, high-end systems costing hundreds of thousands of dollars. But as the number of samples decreases, nagging issues persist about learning curves, fear of automation, cost, lack of familiarity with automated workflows, and ignorance of what is possible. In other words, automation is not always an easy sell.

"Automation has recently shifted from screening toward sample preparation."

Lab automation developed from the growth of high-throughput screening in the pharmaceutical industry and then was revived by the Human Genome Project. Automation has recently shifted from screening toward sample preparation, which caused the trend away from large, complex, integrated systems to smaller, more compact, dedicated workstations.

In a review published in *Bioanalysis* (2011; 3(13), 1415–1418, Jim Shen of Merck Research Laboratories (Summit, NJ) writes that "the key to improve throughput for sample preparation in a modern laboratory is to attack any bottlenecks that may exist in the process. While balancing budgetary concerns, training, and complexity of automation, laboratories should automate as much or as little of their existing processes [as] their comfort level with technology [allows]."

Shen's specific recommendations include heavy investment in automation such as parallel extraction/processing, liquid-handling robotics, online extraction/chromatography, chromatography multiplexing, and ultrahigh-pressure LC to improve turnaround and data quality.

The business case for automation is nearly identical for every workflow and boils down to greater consistency, fewer errors, and freeing up workers for other

"Most people don't appreciate how significant a problem sample prep poses for laboratories," notes Zoe Grosser, Ph.D., director of marketing at Horizon Technology (Salem, NH). "There's a lot of talk about the instrumentation and analytical methods. Sample prep is key to obtaining good results, yet it has been ignored over the years. Usually the most inexperienced people are assigned sample prep to learn their craft. It makes sense to improve an area where so much error occurs and to which so little attention has been paid."

INSIGHTS ON AUTOMATED SAMPLE PREPARATION

PREPARING EXACT CONCENTRATIONS IN JUST THE RIGHT QUANTITIES

Arguing against lab automation is becoming more difficult, particularly for sample prep. With reagents and solvents costing what they do, a business case based on direct cost savings for critical materials stands on its own.

Conventional sample preparation generates on a cost or weight basis much more waste than product. Mettler Toledo estimates that more than 99 percent of prepared solutions are never used and that manual prep of samples and standards for analytical methods accounts for up to 82 percent of a lab's solvent usage, 61 percent of labor time, and 49 percent of out-of-specification (OOS) errors. Moreover, continuing improvements in data management capabilities—the second-leading time killer in a lab, at 27 percent—will have the effect of increasing the share for sample preparation in nonautomated laboratories.

"Creating standards 'on demand' in appropriate volumes can cut solvent use by 95 percent."

"Manual handling always entails the risk of process failure and unacceptable variability from user to user," says Dr. Carsten Buhlmann, international product manager for automation at Eppendorf (Hamburg, Germany).

The most obvious effects of OOS errors are rework and time wasted in the (often vain) attempt to identify, remediate, and report on the root cause of the error. Rework, arguably a lab manager's worst nightmare, involves redeploying personnel, instrumentation, reagents, etc., to a job that should have been completed the first time and diverting those resources from new work. According to Mettler Toledo, OOS results cost between $3,000 and $10,000 and can shut down critical lab functions for anywhere from three days to several weeks, resulting in serious loss of revenue and/or productivity.

Laboratories with the capability of taking a lean/six sigma approach to OOSs go through the normal drill of analyzing and identifying waste and variability. This approach quickly leads to the observation that the more human steps involved in a process, the more likely the incursion of systematic and nonsystematic errors.

According to Dr. Charles Ray, former associate director of analytical R&D at Bristol-Myers Squibb and currently a consultant at CWR Consulting, a formal lean program is often not necessary to resolve OOS incidents. "A team can simply sit down and go through a very detailed workflow chart and highlight the problem areas. These may be steps that no longer make sense, that have a high likelihood of involving both determinate and indeterminate errors, and where efficiencies and cost reductions can occur."

Gravimetric (weighing) automation is becoming an acceptable strategy for avoiding overprep or inaccurately formulated solutions, yet most systems remain unautomated. Automated balances still require operators to add and remove vials. Their main benefits, as noted by Joanne Ratcliff, Ph.D., an analytical chemist and current communications project manager at Mettler Toledo, involve recordkeeping and allowing investigators to prepare just the right quantities of buffers or reagent solutions.

A typical system, exemplified by Mettler's Quantos instrument, employs both solid and liquid dispensing to create solutions of exact concentration in any container. After the system dispenses the solid, it adds precisely enough liquid for the desired concentration. The two-step process eliminates the burden on the technician of weighing solids and dispensing liquids precisely. When the operation is complete, Quantos prints a label describing exactly what is in the vial and records that information.

"The benefits are that you can now make up much smaller volumes of sample," Dr. Ratcliff tells *Lab Manager Magazine*. "That's because the minimum weight is lower than what might be accurately measured by hand, and you don't need to round up the liquid levels in a volumetric flask." For example, a worker expecting to make 50 HPLC injections of 10 microliters each can accurately produce one mL of solution instead of having to fill a 10 mL or 100 mL volumetric flask. This approach also shields workers from potentially toxic solids and replaces expensive volumetric glassware, which requires cleaning, with disposable, low-cost vials.

DOLLARS AND CENTS

The cost of automation is always a consideration in lab managers' decisions on whether to automate. "Some decision makers think they will save money by not automating," says Mehul Vora, global product manager in Beckman Coulter Life Sciences' (Brea, CA) automation group. "But in the long run, as automated sample prep becomes a routine part of your lab, the quality improvements and wiser deployment of human resources will pay for themselves in a very short time."

▲ *Liquid Handling System / Encore Multispan / Agilent Technologies / www.agilent.com*

Real life experience confirms this view. Analysis by Agilent indicates a rapid return on investment for sample and standard prep automation based on the cost of labor, glassware, lower consumption of reagents and solvents, and reduction of rework.

A technician spending just five minutes on each of 300 samples per week costs the lab about $7,000 per month, assuming salary and overhead at $70 per hour. Creating standards "on demand" in appropriate volumes can cut solvent use by 95 percent and reference standard consumption by up to 75 percent. An Agilent customer reported solvent-related savings of $16,000 per year for just one assay, including much lower disposal costs and savings on glassware replacement and cleaning of more than $60,000 per year.

A case study from Horizon Technology summarized in Table 1 illustrates direct cost savings plus labor savings from switching from manual to automated prep.

BENEFIT	COST SAVINGS	COMMENTS
Reduced solvent use	$9,336	Reduction in solvent use
Reduced waste disposal	$3,960	Less waste generated
Reduced labor	$16,688	Reduction of overtime, greater flexibility
Reduced solvent contact	unknown	Safety
Reduced glassware use	$15,055	Minimized replacement costs
TOTAL	$45,039	

The $45,039 in savings represents an approximately three-year payback on a $141,000 system consisting of an eight-position extraction system, a DryVap add-on for drying and concentrating samples, and vacuum pumps. Direct ROI was only a minor part of the equation for this customer, however. They estimated that the automation capability enabled them to take on approximately $150,000 per year in more-complex contract work in addition to retaining Method 525.2 in-house, valued at $117,000 yearly. EPA Method 525.2 is a complex drinking water analysis protocol involving a very large list of analytes. Solid phase extraction enabled this lab to meet the method's strict quality requirements more easily.

All the arguments for automating sample preparation are equally valid for standards prep. Standards preparation rivals sample preparation in repetitiveness, reliance on precise measurement, and in many cases, the number of units. While standards prep is somewhat more predictable in terms of operations (dispensing, diluting, etc.), it is no less critical to data quality. Some protocols, particularly in food safety testing, call for preparing dozens of potential reference analytes at several concentrations each.

Automating standards preparation saves reagents and samples by producing the right quantity of standard solutions. As with sample prep, technicians tend to "overdo" standards prep, sometimes creating 10 or 20 times as much stock solution as may be needed. Automated systems can be set up to make up just enough solution for one day's assays fresh at the beginning of the first shift. "Labs are much less likely to use expired standards when they have an automated solution to do all the work," observes Agilent's Peter Mrozinski.

As with sample prep, automating benefits standards prep not so much through speed as by introducing consistency and efficiently utilizing human resources. Raw sample numbers play a surprisingly insignificant role in the decision to automate.

"Automation's contributions are its consistency and reproducibility," Mrozinski adds. "It's as accurate as your best technician on a good day but with the reliability and reproducibility one expects from an analytical instrument."

In November 2012, Agilent introduced the Encore Multispan Liquid Handling System for advanced automated sample preparation. Encore combines innovative pipetting with a built-in robotic arm that automates a substantially larger portion of sample prep workflows while increasing walkaway time.

Equally important for a lab's business and worker satisfaction, automation creates an atmosphere of accomplishment. "In the end, a robot isn't necessarily any faster than a skilled technician," says Jason Greene, product manager at BioTek Instruments (Winooski, VT). "But it does provide uniformity and performance, accuracy, and precision, and it gives workers the opportunity to be elsewhere."

◀ *Deep Well Washer / ELx405™ Select / BioTek / www.biotek.com*

INSIGHTS ON AUTOMATED SAMPLE PREPARATION

LIMITATIONS OF SAMPLE PREP SYSTEMS VARY BY INSTRUMENT TYPE AND SAMPLE

▲ *Liquid Handling Workstation / Biomek 4000 / Beckman Coulter / www.beckmancoulter.com*

Despite protestations to the contrary, automation is not something to undertake casually. Due to the dizzying array of possibilities and workflows, the technology has not yet achieved the simplicity of consumer products.

Given the diversity of analytical samples, the first few steps of sample preparation have little in common. Consider how one might acquire and initially process an orange, oil sludge, soil, or water. The first few steps might consist of filtering, grinding, adding stabilizers, sonicating, or a hundred other things. Convergence in prep operations and techniques occurs as the sample gets closer to the actual analysis. At this stage, diluting, dispensing, reconstituting, adding reagents, chemical derivatization, and mechanical operations such as heating, cooling, mixing, and extracting become more standardized.

One area that remains challenging for automation is primary sample handling: acquiring samples and getting them into a suitable format for further study. A geologist or an environmental scientist must still travel to the field to collect rock or water samples and get them ready for lab work. Some primary steps, such as drawing blood or excising tumor tissue and rendering it into a plate or tube from which it is accessible to the automation system, involve a very high level of skill. "While these examples require a good deal of human intervention, there are opportunities to address those types of workflows as well," notes Jeremy Lambert, director, automation and liquid handling at PerkinElmer (Hopkinton, MA).

"Convergence in prep operations and techniques occurs as the sample gets closer to the actual analysis."

A typical sample workflow may involve collecting the sample, subjecting it to the reagents and purification, transferring it to some form of labware, applying physical/mechanical conditions (heating, cooling, shaking, amplifying), and introducing it into the analysis system. "A lab technician can perform all these operations by hand," notes Mehul Vora of Beckman Coulter, which just introduced the latest product on its Biomek platform, the Biomek 4000 Laboratory Automation Workstation. "But the scientist is after only the data." Nothing that occurs before that DNA analysis or spectroscopy reading adds value to the scientific exercise, Vora

explains. "If scientists could wave a magic wand and have the sample ready for analysis, they would do that. That's not the real world, but the relevant question is what is the best way to get there?"

> "If scientists could wave a magic wand and have the sample ready for analysis, they would do that."

PHYSICAL LIMITS

Limitations of sample prep systems vary by instrument type and sample. Most are related to the fact that samples tend to be fluids—but not all liquids are created equal. Viscous samples require more work, time, and care than standard samples do. "Many viscous samples are difficult to filter," observes BioTek product manager Jason Greene. "You may have to increase the vacuum, pull on the sample longer, or watch it more closely to get through that step."

For drug assays, the predominant solvent, dimethyl sulfoxide (DMSO), presents assaying problems due to its hygroscopicity. Solutions rapidly equilibrate in laboratory air to 70 percent DMSO and 30 percent water, which can interfere with many assays or provide erroneously low concentrations. Companies looking for very accurate inhibition constants for drug candidates need to take this into account.

From a concentration standpoint the inverse of hydration is evaporation, which is always an issue with very low-volume, water-based assays. Greene hears about this problem "a lot, which is why many customers have backed away from ultralow-volume 1536-well plates and are beginning to readopt 384- and 96-well formats."

Finally, Greene warns lab workers to know the limitations of everything they work with, including complex sample prep systems. "It's funny how diligent scientists can be in testing everything except instruments. They don't realize the wide variability that can occur over time. It takes way longer to troubleshoot bad results than to perform due diligence up front."

Vendors of prep equipment and systems, reagents, kits, and labware strive mightily to accommodate the need to automate routine lab tasks, but what are the limits? We know that an automated liquid handler cannot grind tissue or dispense many liters of solvent at once. Yet they have the bases covered for most preparative workflows in the life sciences.

"When we ask our experts, they say anything related to life science workflows is possible," notes Mehul Vora. "Give me the assay and I can automate it, provided it fits into a tube or a microtiter plate." What about an assay that does not fit the standard ANSI/SLAS (formerly ANSI/SBS) format or was previously not automated or is perhaps too complex and operator-centric for standard automation tools? With the input of assay vendors, engineers from Beckman's Integrated Solutions division can design labware that enables automation of many customer workflows.

LEARNING CURVE

For labs unfamiliar with automation, particularly for sample prep, vendors such as BioTek Instruments serve a vital role in dispelling doubts and opening up vistas. "We know a lot of super high-end systems are out there," Greene observes. "What we offer is that same general capability in a smaller, more affordable format. Like many automation firms, BioTek reaches out to equipment and reagent companies to combine their analytical capabilities with BioTek automation systems. Examples include an off-the-shelf vacuum manifold that required a special labware holder and an oligonucleotide sequencing reaction cleanup kit, which was automated on a BioTek platform. Both additions resulted from a collaboration with Millipore. BioTek's other automation partners reads like a Who's Who of laboratory equipment: Caliper, Hamilton, Agilent, Tecan, Beckman Coulter, and others. These efforts are "very well received" by reagent, kit, and labware companies as well as by customers, Greene says.

Despite operating at what one might call the entry level of automation in terms of throughput, BioTek is integrated within the automation market, selling detectors, robots, liquid handlers, and data systems. Of the latter, Greene believes that the software and

interface should match the ease of use of the automation system itself. "Users don't want to spend days writing a liquid handling protocol." High-end systems can offer significantly more capability but cannot always boast the same user-friendliness.

"Lab workers [need] to know the limitations of everything they work with, including complex sample prep systems."

CARE

Care and maintenance of automated sample preparation systems are difficult topics because so many types of "sample prep" exist. Limited to liquid handling systems as we are, one finds the usual issues of replacing valves and washers and maintaining cleanliness. Rinsing is critical after a run on a liquid handler. With pipetting tools, O-rings may require replacement every few months, depending on frequency of use and type of liquid. Simple tests determine whether a pipette seal has been compromised.

A common issue with automated microplate washers, for example, is buildup of proteins and salts, which clogs equipment. The most effective way to remove this buildup is through ultrasonic cleaning. The manifold is typically removed from the instrument and placed in an ultrasonic bath for cleaning. BioTek offers integrated ultrasonic cleaning so that the manifold can remain in place and the cleaning can be preprogrammed and run without user intervention.

Filtration System / Samplicity® / EMD Millipore / www.millipore.com

In the end, failure to understand what manufacturers recommend for routine care is one of the biggest maintenance issues, says Greene. "There are things with liquid handlers that you should be doing daily, weekly, monthly. Given the high turnover in some labs, this doesn't always happen. When things are let go for too long, you wind up with cumulative errors—you reach a point where your data is no longer within acceptable tolerances. Care and maintenance don't take a lot of time, but they need to be done based on the manufacturer's recommendations and the lab's workflow priorities."

IMPROVED SAMPLE PREP SPEED AND ACCURACY DEPEND UPON WORKFLOW

A comprehensive review of sample preparation would require a multivolume work. Beyond that, covering the possible number of workflows given the hundreds of potential "unit operations" would fill an encyclopedia, especially when solids (rock, soil, animal tissue) are considered.

ENVIRONMENTAL

While the major market share for automated sample prep lies in the life sciences, which operate with very small samples, many advantages are achievable outside biology, where larger samples rule—albeit perhaps not always at the same level of automation. For example, Horizon Technologies specializes in automating the extraction of large volumes of aqueous samples, principally for environmental analysis. EPA methods call for collecting up to two liters of water when testing for various contaminants. Due to sometimes very low concentrations of analytes, some tests demand collection of even larger volumes.

Horizon's SPE-DEX 4790 automated extractor system accepts sample bottles without manipulation. Samples are initially filtered to remove particulates and then adsorbed onto a solid phase extraction disk. The system then extracts analytes from the disk. Additional concentration steps, which render the sample suitable for LC or GC analysis, are also automated. Up to eight extractors may be run simultaneously through a single computer controller.

"Most testing labs are still using 'bucket chemistry' to process large-volume samples."

➤ *Sample flow through automated extraction, drying and evaporation/concentration processes.*

Upcoming Lab Manager® MAGAZINE Webinars

Run Your Lab Like a Business

Academy | PRODUCT SPOTLIGHT | TECHTRENDS

Innovations in HPLC Column Chemistries and Applications

Thursday February 21, 12:00 - 1:30 P.M. ET

There is no dearth of options when it comes to choosing columns of high-performance liquid chromatography (HPLC) and ultra high-performance liquid chromatography (UHPLC) separations, in terms of materials used, size, price and performance. In this webinar learn how to pick the right column to analyze the given sample efficiently and accurately.

Register for Free Today
www.labmanager.com/lccolumntrends

Webinar Sponsored By:

PerkinElmer

What's New in Biological Safety Cabinets?

Thursday February 28, 12:00- 1:30 P.M. ET

This free online event will provide attendees an opportunity to interact with the panelists in real-time and get their advice on best practices for using and maintaining biological safety cabinets in their labs.

Register for Free Today
www.labmanager.com/bsctrends

Webinar Sponsored By:

Protecting your laboratory environment
LABCONCO

Overcoming Key Technological Challenges in Mass Spectrometry (MS)

Thursday March 7, 12:00 - 1:30 P.M. ET

Our panel of technical experts will provide details and data showing how mass spectrometry can be effectively used for diverse applications such as, compound analysis, protein characterization, biomarker discovery, and metabolite profiling. They will call on their experience and expertise to highlight some of the current challenges in using MS and how those can be minimized or eliminated.

Register for Free Today
www.labmanager.com/massspectrends

Webinar Sponsored By:

PerkinElmer

Agilent Technologies

Thermo SCIENTIFIC

"Most testing labs are still using 'bucket chemistry' to process large-volume samples," says Zoe Grosser. "Conventional extraction, drying, and concentration from volumes that large can take anywhere from one to three hours, depending on the sample's complexity and the analytes of interest. Here it takes just 30 minutes per extraction, and it's a walkaway operation."

Grosser outlines the usual list of benefits: increased user productivity, decreased solvent consumption, fewer errors, greater consistency, lower labor costs, fewer re-extractions, freeing workers for other tasks, reduced glassware purchase and cleaning (the extractor cleans sample bottles after emptying them), and improved external ROI. "Labs are able to convert more samples per unit time, reduce customer support costs, and improve brand value of their services by informing customers of their automation capabilities. Automation sells."

GENOMICS

In high-throughput genomics, assays are lengthy, consume many thousands of dollars in reagents, and are limited by tissue availability and quality. Sample preparation can consume several days. "Researchers don't know how the tests are going until the very end," says PerkinElmer's Jeremy Lambert. PerkinElmer's key market areas are high-throughput genomics (mostly next-generation sequencing assays) and biotherapeutics discovery.

Kits originally developed for high-throughput genomics were designed for manual lab processing: An operator with a multichannel pipette might process up to 15 samples at a time through a workflow several days long that is highly demanding of hands-on time. "Transforming bench-worthy workflows to automation while maintaining quality requires significant optimization," Lambert says.

> "In high-throughput genomics, assays are lengthy [and] consume many thousands of dollars in reagents."

Genomics labs tend to conduct similar protocols that rapidly evolve due to improvements in techniques, methods, reagents, and scientific understanding. Vendors introduce new protocols approximately every three to six months. To prevent "method creep," some vendors employ single, fixed configurations for much of their liquid handling equipment, so new methods can be deployed to the installed base very quickly.

PerkinElmer's other specialty, biotherapeutics, involves a completely different set of tools. Where genomics chews up DNA and RNA to determine their molecular sequences, cell-derived proteins are analyzed for size, purity, charge, activity, and other critical quality attributes, usually by high-performance liquid chromatography and LC-mass spectrometry. Sample preparation is critical to ensure that analytical tests provide the right information in a competitive environment where one-day delays in market entry are punished. "In protein labs researchers are highly trained biochemists who need to focus not on sample preparation but on more challenging tasks, such as interpreting assay results. Automation frees them to do so."

MICROFLUIDICS: HOW LOW CAN YOU GO?

DNA extraction from cell cultures for subsequent amplification is an example of a complex sample prep that is often the rate-limiting step of a microbiological workflow. DNA is separated on microscale chromatography columns in a process that requires pipetting, dispensing, and pressurizing to elute the sample through a Q-Sepharose column. All three functions are available in automated formats but typically as separate instruments. A group at the Fraunhofer Center for Manufacturing Innovation at Boston University (Brookline, MA) has developed a prototype device, the Tripette, which combines the three essential functions through a six-by-six-inch microchanneled polycarbonate manifold that sits above a standard microtiter plate. Backing up the Tripette are standard fluid delivery and pressure systems. "The innovation is not the services behind the scenes but the manifold itself," says Alexis Sauer-Budge, Ph.D., one of the Tripette's inventors. Fraunhofer is interested in

codevelopment and collaboration on the Tripette and other sample prep technologies found at the website http://bit.ly/RImeSs.

In contrast to the almost macroscale Tripette, Akonni Biosystems (Frederick, MD) has built an integrated, microfluidic-controlled microarray platform for sample prep and analysis of genetic mutations known as single-nucleotide polymorphisms (SNPs). Targeted at forensic applications, the microarray incorporates Akonni's gel drop microarray technology, a thermal cycler, a reader, and a cartridge dock in a single-use "sample to analysis" microchanneled platform.

"DNA extraction from cell cultures for subsequent amplification is an example of a complex sample prep."

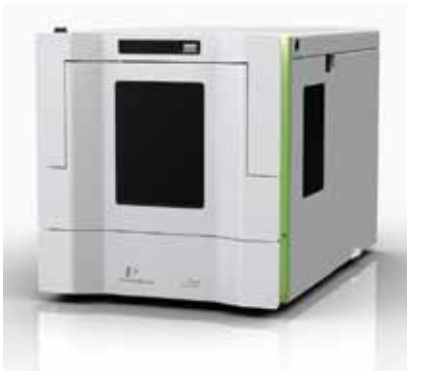
A WORD ON SPEED

A misconception regarding automation in general and automated sample preparation in particular is that it improves throughput. This line of reasoning suggests a barrier—some number of samples per day—before which automation is unwarranted and beyond which it becomes sensible.

According to Beckman's Mehul Vora, the "throughput" argument collapses in the face of the realities of quality and workflow. "Intuition says if you're dealing with just a few samples, you might just as well do them by hand because it's faster than setting up a machine. But our customers tell us otherwise." Automation's major advantages over manual sample prep are fourfold: avoiding human error, eliminating operator-related contamination, enhancing data quality, and maintaining consistent results.

Manual sample prep offers the illusion of control over the process. The question is what is controlling whom? A prep may take five steps that are mostly walkaway; for example, weighing, dissolving, filtering, adding reagent, and heating. Each operation may require only ten or 15 minutes of attention, but the process keeps drawing the scientist or technician back from other work. Five samples can easily keep a lab worker tied to prep work for half a day, even more if operations require monitoring. "And if the number is 55 samples, the value of automation becomes even more clear," Vora says.

Automation does not necessarily speed up prep work. If one includes time to set up the method, absolute throughput—the number of samples processed per day—may hardly be affected. If productivity is measured by what a typical worker can accomplish in a shift, however, the equation changes. Now, instead of babysitting samples and individual operations, a worker may spend half an hour setting up reagents and selecting a method, occasionally moving plates, taking a few peeks during the day. In other words, the worker is freed to perform less repetitive, more challenging tasks. "Even low-throughput labs can save value-added time."



HPLC Autosamplers / Flexar / PerkinElmer / www.perkinelmer.com

Automated Extraction System / SPE-DEX 4790 Horizon Technology / www.horizontechinc.com

INSIGHTS ON AUTOMATED SAMPLE PREPARATION

A Q&A WITH SELECT AUTOMATED SAMPLE PREP EXPERTS

OUR EXPERTS:

Gang Xue, Ph.D.,
Associate Research Fellow
Pfizer
Groton, CT

Dhara Patel
Research Instructor
Washington University
St. Louis, MO

Q: Describe your sample prep workflow(s).

A: **Gang Xue:** The typical samples involved in pharmaceutical analysis include raw materials, intermediates, active pharmaceutical ingredients, excipients, and formulated drug products. Reference standards are used for quantitative analyses. The majority of sample preparation methods target chromatographic potency and purity analyses, such as for developing processes and performing release or stability testing. We use the Mettler Toledo Quantos; FreeSlate Powderium; and tablet extraction systems such as Sotax TPW3, RTS SoliPrep, Polytron, and ASE (accelerated solvent extraction). Hamilton Microlab and CTC autosampler are also used for sample dilution.

Dhara Patel: We employ two types of automation. We use what I classify as full-automation for our compound screening, or HTS. This takes more effort to set up and validate the entire process, but minimal manual intervention is required once the process is validated. We use liquid handlers, plate handlers, automated incubators, and readout instruments like plate readers and automated imagers. The manual intervention required involves stacking plates and placing reagents when an operation starts. The other type of automation we perform is what I classify as semi-automated, which automates only the most labor-intensive and repetitive steps. We use semi-automation for validation assays after HTS and also for any basic science experiment. In this case, to decide whether a process is worth automating, we weigh the effort required to fully validate the steps against performing the steps by hand.

Most of our samples involve cell lines that are treated with cytokine and/or small molecules, staining of cells thereafter, readouts using plate readers, and an automated imager. We are now preparing to automate such processes for primary cells that require growth on air-liquid interface and work with live viruses (BSL2). This requires automation in a biosafety cabinet, which is the main challenge.

Q: What are the principal benefits to your organization of automating sample preparation?

A: **Gang Xue:** The key benefits include resource savings and enhanced method robustness. Sample preparation and data analysis are the most labor-intensive unit operations in pharmaceutical analyses. An automated system reduces the time for scientists to develop and operate the sample preparation method. A recent trade publication survey reported that sample preparation consumes about 60 percent of a scientist's time and that approximately 30 percent of out-of-specification (OOS) errors are due to sample preparation.

In a regulated GMP environment, investigations of OOS results generally take significant time and resources. Via the use of automation, we reduced the sample preparation time for a sustained release tablet from 24 hours through manual methods to 15 minutes. An added benefit was the significantly improved precision of the assay. In most cases, automation doesn't necessarily reduce the overall cycle time of the analysis because of the sequential nature of most automated systems.

Dhara Patel: The biggest advantage of our fully automated process for HTS, especially for a phenotypic cell-based screen, is data quality from consistent timing between plates. This and our data analysis technique enable us to compare data from multiple screens, which for an academic lab like ours that is not a core and can afford to screen smaller libraries at separate times, often months apart, is extremely important. In the long run, being able to hit-pick from multiple screens collectively saves a lot of effort invested in hit-validation and further follow-up. For our semi-automated processes, the biggest advantage or benefit is time savings. When validating any automation process, we always compare to data obtained by performing the experiment by hand. So we can quantify data quality.

Q: What sources of methods or techniques do you rely on most for automated sample preparation?

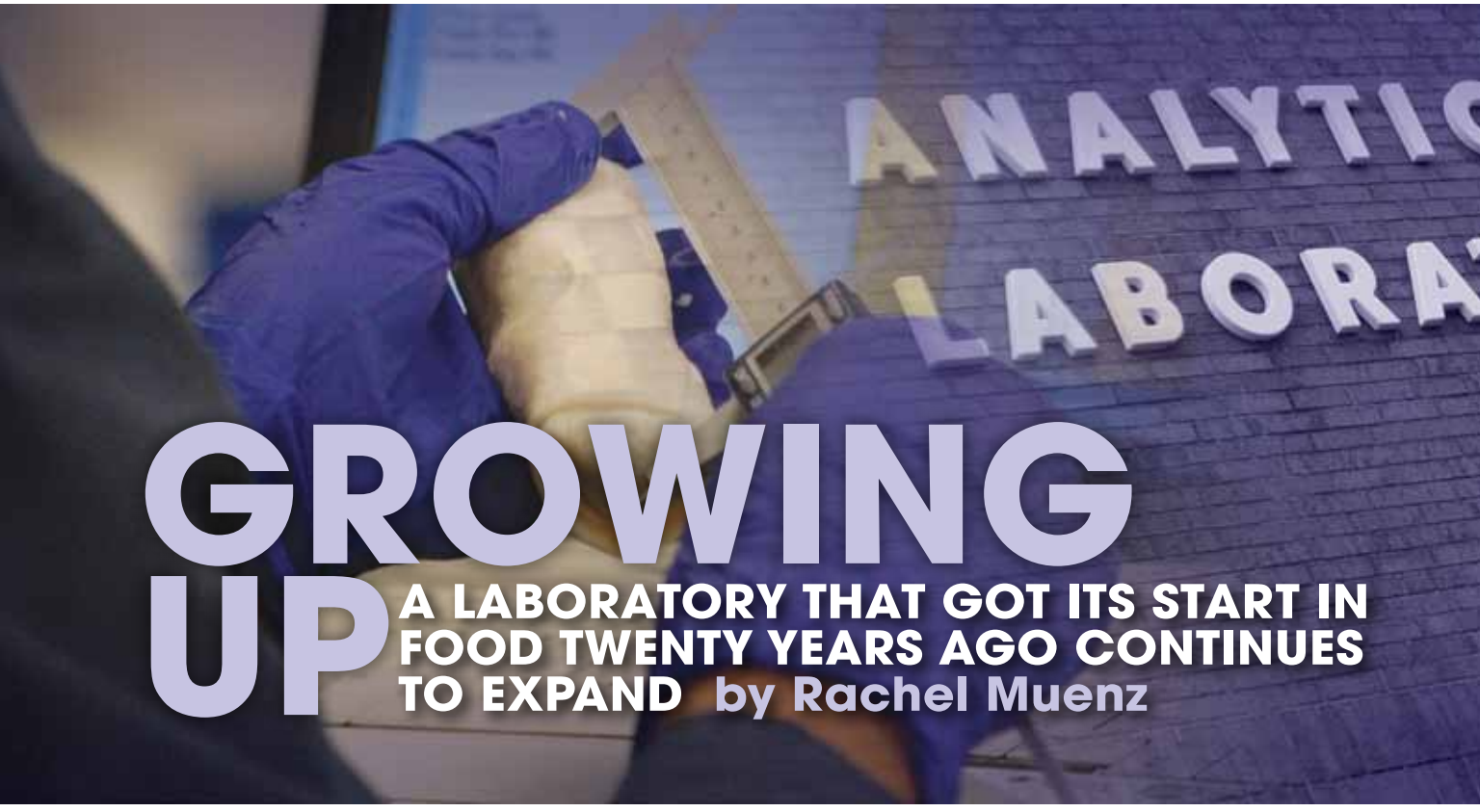
A: **Gang Xue:** Usually lab automation-related conferences and trade shows—such as the Pittsburg Conference, Lab Automation Conference (SLAS) in the United States, and Analytica in the EU—are the most valuable sources for innovative automated sample preparation techniques. The precision of the automated methods varies by the scale, throughput, and unit operation. However, the method robustness is mostly reported to be on par with or better than manual methods. The reliability of the instruments can be an issue though. Commercial instruments are typically more reliable than custom-built systems, and smaller systems targeting limited unit operations are better than large, integrated solutions. Additionally, these smaller, targeted systems are more cost-effective and typically more user-friendly, resulting in general lab use, not just use by specialists.

Dhara Patel: For broad-stroke methodology and learning about new methodology, I rely on publications in journals. When starting a new methodology, I look for any algorithms or workflows or examples that may have been developed by the automation equipment company. When troubleshooting, I turn to message boards online. I talk to tech experts from the companies. I also talk with sales representatives, especially to keep up with what's new in plasticware. When I read journals or magazines, I look for broad-stroke ideas. When I read information from vendors, I'm looking for details in methodology. Generally speaking, I think what I read is reliable. However, I always think that the devil is in the details and care needs to be taken when implementing what I read for my own use.

Q: How can vendors of automation equipment and reagents/disposables improve the quality and consistency of automated sample or standards prep?

A: **Gang Xue:** Building smaller modular systems that sell to relatively large user bases would help improve the overall robustness of the instruments as well as reduce operational complexity while lowering costs. Providing standardized hardware and software interfaces to allow easy integration (plug and play) would enable both workflow flexibility and reliability. Standardization of consumables would also be welcome. Many of the challenges with robotic operations are related to the different sizes and shapes of the vessels they have to manage.

Dhara Patel: In general, I think that vendors of both automation equipment and reagents and disposables are good at listening to understand what the customer requires. But I think more progress would be made if more attention were given to smaller markets of niche applications. When purchasing equipment, I think what needs to happen more is that the vendor needs to understand what the usage is going to be and discuss equipment options. Many times details of one system (or even a sample preparation platform) are discussed without paying due attention to whether it would be the best choice for the application.



GROWING UP

A LABORATORY THAT GOT ITS START IN FOOD TWENTY YEARS AGO CONTINUES TO EXPAND

by Rachel Muenz

Analytical Food Laboratories (AFL) in Grand Prairie, Texas, has come a long way since it was started in 1992 by president/CEO Rebecca Pfundheller.

Back then it was a small, low-cost business, with her husband, who is a teacher, helping pick up samples in the summer. Now the company, which does third-party testing for the food, pharmaceutical, cosmetic, and nutraceutical industries, runs two shifts of more than 60 employees and operates seven days a week, 365 days a year.

"I was managing a lab that was acquired by a national laboratory, and my clients came to me and said, 'Go do this on your own; we'll follow you,'" Pfundheller said of how she decided to start her own testing business. "So I bit the bullet and went out there and started up a very low-cost, Cinderella-type story."

In those early days, Pfundheller used space from a former employer who was in the cosmetic industry, paying low rent in exchange for doing free testing for him. Currently, the company operates out of a 12,000-square-foot space and is in the process of moving to a 25,000-square-foot facility.

"We started off with food—food microbiology was our mainstay," Pfundheller said of how the business has grown. "We've expanded into chemistry and also product quality and USP [United States Pharmacopeia] testing. We have a full-service chemistry laboratory right now that does all types of chemistry analyses."

The ISO 17025-certified laboratory now has five different departments: microbiology (which also does research), USP microbiology, analytical chemistry, wet chemistry, and a department focused on the restaurant and food service/hospitality industries.

The restaurant department, Pfundheller explained, does "vendor product evaluation testing to make sure that what the restaurants are purchasing under their purchasing contracts is actually what the supplier is providing them in terms of physical attributes: weights, thicknesses, and lengths and fat content and diameters."

Management structure

Pfundheller's duties as president/CEO of the company go beyond just running the company, including everything from sales and marketing tasks to working with clients.

"My duties now are pretty much the strategic planning, the operational side, making sure the company is running and that we're profitable and moving forward," she said. "I deal a lot with clients too—I do a lot of trade shows and client visits."

Other senior management staff working with Pfundheller include an executive vice president, who's also involved in strategic planning; the

An AFL microbiology technician at work in the lab.

senior director of operations, who oversees the various lab departments; a director of administration; and a senior director of analytical research.

While managing the company as a whole takes up most of her time, Pfundheller, who has her degree in microbiology, does get back into the lab often to check up on her employees and make sure they are OK.

"We have a very family-oriented business," added Pfundheller, who has thirteen-year-old triplets with her husband. "One of my really big beliefs is that people are at work more than they are at home and they work very hard, so I want them to have a lot of fun when they're doing it. We have a very comfortable environment around here."

The technicians and other AFL staff have biology, microbiology, chemistry, or biochemistry degrees; some have master's degrees, and the director of research has a Ph.D. in biochemistry. As in most labs, there is also a training program that they must complete once they start at AFL.

"Depending on which department they're going to be working in, they have specific training that they have to go through and check off before they can start performing any of the individual tests by themselves," Pfundheller explained. "They'll shadow people and make sure that they're running samples right, and then once they're all approved and they've passed the training, they can go and start doing the analyses on their own."

AFL also helps give students real-world experience in the lab through partnerships with two nearby universities that offer food science degrees.

"We have a lot of part-time technicians who come in to gain some experience as they're still going to school, which I think is extremely valuable for them to do," Pfundheller said of the programs.

Aside from a flexible environment that allows employees to step out for appointments during work hours, giving employees ownership of their work is another way AFL motivates its staff.

> "You've just got a large group of people working in unison to keep everything flowing."

"We're always improving and updating the flow and the conditions to make them more acceptable so the technicians get the most out of what they're doing," Pfundheller said. "We keep very open communication. It's a very open-door policy. If they have any questions, they're welcome to come right to me to get answers,

➤ *Assorted products that AFL tests.*

so there's not a stringent hierarchy."

She adds that AFL also shares how the company is doing with its workers to keep them in the loop.

"We share the vision of the company, we share where the company is going, we share with them what they can do and any challenges that are coming up and what we foresee," Pfundheller explained. "We're just very open and honest."

> "One of my favorite parts is working with the employees & seeing them grow & helping them."

An employee appreciation award—the Lab Rat Award—which is decided through a staff vote, rewards particularly hardworking employees every quarter with a plush rat to keep things fun.

"We're always trying to do those types of employee appreciation things and events," Pfundheller said.

Talk about high throughput

In a very high-throughput laboratory, that employee motivation is critical, as AFL deals with around 6,000 samples and about 200 clients each month, meaning days in the lab are very busy, with the first workers getting in at 6:00 a.m. and the last leaving at midnight. Samples come in constantly, with AFL's four couriers traveling around the Dallas–Fort Worth metroplex all day, dropping off samples starting at 8:00 a.m. and finishing at around 8:00 p.m.

"Any microbiology work that comes in that day gets tested the same day, so there's no lag at all on the turnaround time for microbiology," Pfundheller said. "There are constantly people around here working, and even on the weekends we have couriers who

➤ *The GE Instruments Sievers 900 lab TOC analyzer used at AFL.*

go around Saturday and Sunday and pick up samples all the time."

However, those hours sometimes run even later if a client needs samples picked up past 8:00 p.m.

"If a client is running a second shift and they have samples that need to be picked up at 9:00 p.m.—because that's when their shift is done—we'll be there to pick them up; we won't require them to wait until the next morning," she said. "We know how important it is for them to get those test results so they can ship their product and get it out in the market."

Once those samples are received at AFL, they are logged into the lab's Accelerated Technology Laboratories Sample Master LIMS, which Pfundheller says they've been very pleased with.

"It's a new program we got a couple years ago, and it has automated a lot of stuff that we've been doing, and it's been a great product for us," she said of the LIMS.

Once the samples are in the system, the testing begins. For the microbiology department in particular, the results are released either in the morning or afternoon, depending on the time frame they are working in.

With all that activity plus phones ringing with client calls for new requests, testing results, or sample pickups all day long, things sound pretty chaotic at AFL, but Pfundheller says her staff is what keeps everything running smoothly.

"You've just got a large group of people working in unison to keep everything flowing," she says, to explain how it all stays organized.

Technology and the government

With such a heavy workload, technology also plays a key role in AFL's operations and has made things much easier on the lab's technicians.

"We used to do everything manually, and we're getting more and more automated in both the microbiology and the chemistry areas," Pfundheller said. "For instance, in the microbiology department we have a bioMérieux TEMPO reader, and we use it for anaerobic plate count and coliform and yeast and mold. That has helped take some technician time off that and automate those processes."

In the chemistry department, equipment such as autosamplers and autotitrators are also helping make things easier on staff, but Pfundheller said her most important piece of equipment is probably the AB Sciex 4000 QTRAP LC-MS the company recently purchased.

"We are using it for sunscreens, a lot of the OTC [over-the-counter] drugs, vitamin assays, fat-soluble vitamin assays, pesticides—things that

are going to be very important in our growth for the future and for what we're currently doing. So I would say that's the most important piece that we have right now."

She adds the company is constantly updating its equipment, and the biggest challenge with technology is just getting it up and running and making it part of the regular work routine. Careful planning and meetings are important to ensure that the process goes smoothly.

"It's a lot of communicating and getting everyone on board and staying on top of it and updating to make sure that everything is progressing," Pfundheller said.

Other challenges AFL faces include changing government regulations, some of which don't always have definite implementation dates. One recent regulation is the U.S. Food and Drug Administration's (FDA) requirement to have restaurant menus include calorie counts.

"We're geared up to do that type of testing with a lot of the restaurant groups, and now they've put it on hold because FDA hasn't said, 'Here's an implementation date,' because they just haven't made up their mind yet," Pfundheller said. "So once they do set that date, it'll be a big rush for a lot of these restaurant groups to get this done. Those are some of the challenges of working with the government. They're not quick on their feet."

Moving to a new space has also presented some challenges.

"We're not like an office building where you can just say, 'OK, Friday we're shutting down, we're moving on Saturday and Sunday, and Monday we open up in the new building,'" she explained. "Because we work seven days a week and we work basically 18 hours a day or so, there's someone always here and someone always going, so strategically putting that in place—what's going to happen next, what needs to be moved—that type of stuff is fun."

Pfundheller is quick to add there are many more benefits than difficulties to her job.

"One of my favorite parts is working with the employees and seeing them grow and helping them," she said. "I like to help their growth and their motivation because, in turn, they help the company and everything, so it gives back tremendously."

She added that working with clients is also a big plus.

"Our clients are family to us. We get good feedback from them; that's important to me," Pfundheller said. "I'm very personally involved with everyone. The majority of my staff and managers have been here [for some time]; I think eight years is the lowest on the manager side up through 12 to 13 years, so I have very good longevity of staff, which helps a lot with knowing the business and seeing the vision of the business. I'm very proud of that."

Rachel Muenz, *assistant editor for* Lab Manager Magazine*, can be reached at rachelm@labmanager.com or by phone at 888-781-0328 x233.*

Main Instruments used for Pharmaceutical / Food Grade Products:

- AB Sciex 4000 QTRAP liquid chromatography mass spectroscopy (LC-MS) instrument used for vitamins, pesticides, antibiotics, and amino acids
- Varian 3800 gas chromatography w/ Saturn 2000 mass spectroscopy system (GC-MS) used for pesticides
- Dionex U3000 high performance liquid chromatography (HPLC) instrument used for testing vitamins, sugars, organic acids, preservatives capsaicin, and OTC actives including sunscreens
- GE Instruments Sievers 900 lab TOC analyzer
- Varian SpectrAA for analysis of heavy and alkali metals
- Varian FTIR for raw material ID

Main Microbiology Instruments:

- bioMérieux TEMPO reader used for APC, coliform and yeast & mold quantitation
- Applied Biosystems Bax Q7 for pathogen detection
- Biocontrol GDS for pathogen detection
- bioMérieux VIDAS for pathogen detection
- bioMérieux VITEK 2 Compact for bacterial ID
- AO Scientific Instruments Darkfield Quebec colony counter
- 3M Petrifilm™ plate reader
- Biolog MicroStation for bacterial ID

Thermo SCIENTIFIC

Efficiency

Automating and simplifying testing and quality control in **food, beverage and water** laboratories, Gallery and Gallery Plus analyzers deliver significant time and cost savings and easiness of use. Hosting various powerful features, like simultaneous analysis of several parameters from one sample, real-time reagent monitoring and automated dilutions, the Gallery systems eliminate various manual steps. Optimized Thermo Scientific system reagents cover a wide range of applications and provide high quality and excellent analytical performance for colorimetric and enzymatic measurements.

excellent performance

• see more at thermoscientific.com/gallery

Gallery, automated discrete photometric analyzer
throughput up to 200 tests/hour

Gallery Plus, automated discrete photometric analyzer
throughput up to 350 tests/hour

Ready-to-use Thermo Scientific system reagents
Over 40 system applications for food, beverage, water and soil applications

TECHNOLOGYNEWS

ANALYTICAL

Raman Microscopectrometer

Artemis™

- Designed to be added to many different types of optical microscopes
- Offers very high sensitivity, high resolution, a broad spectral range and rapid sampling times
- Enables scientists and engineers to measure the Raman spectra from microscopic samples or microscope sampling areas of large samples, such as semiconductors

CRAIC www.microspectra.com

DLS Nano Particle Size and Zeta Potential Analyzer

NanoPlus

- Features an extended analysis range, intuitive software, and multiple sample cells to fit the user's application
- Can measure particle size in the range of 0.6 nm to 10 μm with sample suspension concentrations from 0.00001% to 40% and zeta potential of sample suspensions in the -200 mV to +200 mV range with concentrations from 0.001% to 40%

Micromeritics www.micromeritics.com

Direct Mercury Analyzer

DMA-80

- Enables the operator to analyze for mercury in any matrix—solids, liquids, and even gases
- Tri-Cell DMA-80 offers the highest sensitivity, giving labs the lowest detection limits from ppb to ppt with no sample prep
- Easy to use and is a good fit for a variety of industries such as environmental, food, clinical, energy, and more

Milestone www.milestonesci.com

Simultaneous Thermal Analyzer

STA 8000

- Delivers high performance thermal analysis and is used for compositional analysis and kinetic studies
- Enables high temperature thermal analysis up to 1600°C for fuel cell, ceramics, catalysis applications, coal and challenging academic research
- Controlled by PerkinElmer's Pyris™ software
- Applies sensor technology and efficient design to yield high accuracy and precise results

PerkinElmer www.perkinelmer.com

Thermal Analyzer

TL-9000

- Combines the power of thermal analysis, with the specificity of separation and the sensitivity of detection available in spectroscopic and chromatographic methods
- Offers an accessory that enables hyphenation
- Provides scientists the ability to identify and study low levels of materials in highly complex matrices

PerkinElmer www.perkinelmer.com

BASIC LAB

Evaporative Light-Scattering Detectors

1290 Infinity & 1260 Infinity

- Suited for the analysis of non- and semi-volatile compounds in pharmaceutical, drug discovery, QA/QC, food quality testing, nutraceutical and fine chemical analysis
- Screen pharmaceutical compound libraries without tedious sample preparation by eliminating interference from DMSO
- 1290 Infinity shows up to 9x lower limits of detection than the previous model
- 1260 Infinity provides enhanced performance at an affordable price

Agilent Technologies www.agilent.com

Balance Enclosures

PowderSafe™ Type A

- Line now includes the AC705, a 24"-wide model
- New AC705 provides operator protection from exposure to harmful powders and particulate, without disturbing balance readings
- Features an electrostatically-charged pre-filter and HEPA filtration for fine particulate capture
- A mini-helic air flow gauge and HEPA filter change indicator light and integral polypropylene base are also standard

AirClean Systems www.aircleansystems.com

Heating Block System

DrySyn MULTI

- Allows scientists to perform safe, productive heating and stirring experiments with the widest possible range of laboratory glassware
- Converts any standard hotplate stirrer into a reaction block accommodating 3 flasks of 10ml - 100ml, or up to 12 reactions in tubes or vials
- Offer excellent heating performance to over 300ºC

Asynt www.asynt.com

POWERING INNOVATIONS IN LIFE SCIENCE DISCOVERY

Attending Pittcon, the world's largest annual conference and exposition for laboratory science, gives you the power to get a hands-on look at newest equipment, learn about industry trends, and discover recent applications and methodologies used in the life sciences. Technical presentation topics include the latest in genomics, proteomics, biotechnology, metabolomics, bioanalytical, and more.

For more information on technical sessions, exhibitors and short courses, **visit www.pittcon.org**.

follow us

PITTCON™
CONFERENCE & EXPO
2013 PHILADELPHIA
MARCH 17-21

Pittcon 2013 App Now Available

Scan this or go to www.pittcon.org to save 50% on registration.

Bottletop Dispensers

BRAND® seripettor® and seripettor Pro

- Now includes 0.2-2mL size in addition to the previously available 1-10mL and 2.5-25mL sizes
- An inexpensive replaceable wiping seal dispensing cartridge renews the wearing parts for long life
- Suited to laboratories that do not need all of the convenience features of a Dispensette®
- Includes one extra cartridge

BrandTech www.brandtech.com

Multi-Purpose Vacuum Pump

MZ2C NT +AK+M+D

- Integrated with the essential accessories for basic rotary evaporation and other common laboratory tasks
- Features the MZ2C NT chemistry-design oil-free pump with a 5 Torr ultimate vacuum, and 38 liter per minute free air capacity
- Flow control knob helps match pumping speed to vapor flow to quietly help prevent bumping and foaming

BrandTech www.brandtech.com

Tablet Image Recording System for Microscopes

Tab4Lab

- Tablet comprises a touch pad and the required software
- In combination with the AxioCamERc 5s camera, the two components form an image recording system
- Has been specially adapted to tablet PCs and can be operated via touchscreen minimizing both the learning curve and the time required for routine applications

Carl Zeiss Microscopy www.zeiss.com/micro

Tubing Pumps

Masterflex® C/L®

- Redesigned head provides more secure tubing retention and more consistent performance over the full range of tubing sizes and flow
- A single motion opens the cover and releases the occlusion bed for quicker and easier tubing changes
- Three motor speed ranges deliver a flow range of 0.002 to 43 mL/min depending on tubing size

Cole-Parmer www.coleparmer.com

Top-loading Balances

Symmetry® EC

- Offer accuracy and traceability, including a print function for GLP compliance
- Now include a bigger screen and easier-to-use keypad
- A single-unit draft shield is more durable and the balance's adjustable feet offer greater stability
- Feature a capacity tracker that warns of approaching overload conditions and a security lock-down port

Cole-Parmer www.coleparmer.com

Wireless Radio-Signal Refrigerator Thermometer

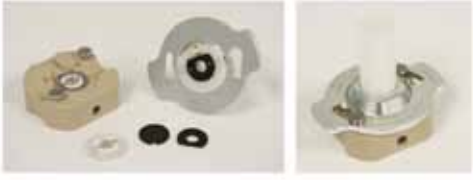
Traceable®

- Receives readings from up to three remote refrigerator sensors via 433MHz radio signals
- Sealed GRAS bottle sensor is insulated from rapid temperature changes when refrigerator door is opened and eliminates concerns about incidental contact with food/water
- Suited for use in operating environments with temperature ranges of –22.0 to 158.0°F (-30.0 to 70.0°C)

Control Company www.control3.com

Electro-osmotic Pumps

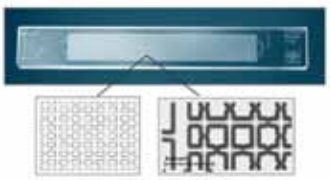
- Reduce the influence of electrochemistry and bubble formation in microfluidic systems compared to conventional EO pumps
- Extremely small in size for easy integration into custom systems and portable instruments
- Range of pumps includes two EO Pump Cores, Basic and Bubble Free, as well as an EO Pump Open Interface with 1/4 – 28 outlet



Dolomite
www.dolomite-microfluidics.com

Porous Media Chip

- Enables statistically representative modeling of complex porous sandstone rock structures
- Features an idealized 2-dimensional net like structure of intersecting 100 μm diameter capillaries, forming pore bodies joined by different types of throats
- Can be used in single and multi-phase fluid (oil, water or gas) flow studies through porous media



Dolomite
www.dolomite-microfluidics.com

Ductless Filtration System

ChemTrap™

- Eliminates noxious vapors generated by chemicals stored in the fireproof cabinet
- Allows laboratories equipped with fireproof cabinets to also benefit from a protection against chemical inhalation risks without having to connect to an expensive energy consuming ductwork
- Provides a simple and fast connection utilizing a universal pipe fitting sheath to a fireproof cabinet

Erlab www.erlab.com

Sample Preparation System

Model OFCU-1

- Provides a safe tool for preparing samples for elemental analysis of halogens, phosphorus and sulfur using the oxygen flask combustion procedure
- Copes easily with a wide range of sample types and is simple to set up, use and maintain
- Remotely ignites samples inside a safety interlocked chamber using focused infrared heat from two tungsten-halogen lamps

Exeter Analytical www.exeteranalytical.co.uk

Thermal Imaging Camera Packs

SC650 and SC450

- Offer users the flexibility of an R&D grade camera they can take from experiment to experiment
- Include ResearchIR software which allows high speed recording and advanced thermal pattern analysis
- FLIR SC650 camera generates crisp and clear 640 x 480 pixel images
- FLIR SC450 camera generates 320 x 240 pixel thermal images

FLIR Systems www.flir.com

%RH, Dewpoint, Temperature Probe

RH-AS2

- Now available for GrayWolf's hand-held AdvancedSense HVAC/OH/FM/IAQ meters
- Capable of measuring relative humidity, dewpoint, absolute humidity, specific humidity, wetbulb temperature, and drybulb temperature
- Features small diameter (14 mm, 0.6 inch Ø, 40mm, 1.6 inch L)
- Provides a humidity range of 0 to 100%RH (non-condensing) with accuracy of +/-2%RH

GrayWolf Sensing Solutions www.GrayWolfSensing.com

PRODUCT SPOTLIGHT

AN ACCURATE GUIDE

SYSTEM BRINGS LOW-COST, AUTOMATED PIPETTING TO THE LAB

At the beginning of December, the pipette industry got its first guided pipetting system as Hamilton Company's Laboratory and Sensor Products Division released the Microlab 300 series pipettor. The new pipettor aims to bring automated liquid handling into the hands of laboratory technicians at a low cost and without complex programming.

"The innovative design of the Microlab 300 series pipettor replaces three to four manual or electronic pipettes with one device. Users can dispense between 0.5 to 1000 μL without needing to exchange pipettes," says Jason March, marketing director of the Laboratory and Sensor Products Division. "The Microlab 300 achieves this range with just one probe and two tip sizes, instead of the three pipette sizes and three tip sizes typically required."

This lightweight, hand-held device enables laboratories to achieve excellent quality assurance through reproducible and traceable methods, and to reduce sample preparation time by eliminating inefficient steps, the company adds.

Accuracy is another main aspect of the MicroLab 300, which meets GLP/GMP, RoHS, 21 CFR Part 11, and ISO-8655 regulations.

"One of the core benefits of the Microlab 300 is its ability to improve pipetting accuracy through standard and customizable Liquid Classes," says Hamilton product manager Devon Bateman. "Technicians can establish pipetting speeds and delays easily for any fluid, giving them the power to successfully pipette the most challenging liquids."

The system's software is another unique feature, going beyond pre-programmed pipetting operations for common techniques, like reverse pipetting and aliquoting, and allowing technicians to easily create, save, and execute pipetting applications from start to finish, the company says.

For more information, visit www.hamiltoncompany.com/microlab300

Peristaltic Pumps

- Remote-controlled design and sealed pump head make this pump suited for use in incubators and fume hoods
- Interchangeable pump heads allow for economical ease of use over a broad flow rate range
- Easy to use with pre-programmed profiles for constant flow, flow ramps, pulsatile flow, and concentration based fluid delivery

Harvard Apparatus www.harvardapparatus.com

Automated Gas Standards Generator

FlexStream™

- Along with TraceSource™ permeation tubes, dynamically blends trace concentration calibration standards of acetaldehyde in carbon dioxide
- User may achieve concentrations from over 400 ppb down to 25 ppb using a single permeation tube
- Lower concentrations, or variable concentration in constant flow, are available using optional secondary dilution

KIN-TEK www.kin-tek.com

Solenoid-Driven Diaphragm Metering Pump

FMM80

- Dispenses liquids accurately in adjustable volumes between 30 µl/stroke and 80 µl/stroke
- Can be driven with single impulses to deliver discrete micro-volumes or can be operated with a pulsed signal at a frequency up to 10Hz to provide continuous flow rates up to 48 ml/min
- Offers service life of over 500 million strokes

KNF Neuberger www.knfOEM.com

Size and Molecular Weight Detector

Zetasizer µV

- Can be added to any system to boost experimental productivity by maximizing information flow from a single experiment
- Easily connects to an existing GPC/SEC system using standard chromatography tubing
- Results reporting and analysis are efficiently handled through OmniSEC software
- Uses dynamic light scattering to secure precise molecular size measurement

Malvern www.malvern.com

Recirculating Chillers

Benchtop Chillers and 6000 Series Chillers

- Provide a reliable and cost-effective alternative to expensive, inconsistent, and wasteful tap water cooling
- Help ensure maximum yield in the bioproduction of pharmaceuticals, antibodies, and vaccines
- Benchtop Chillers offer a compact and easy-to-operate solution for cooling bioreactors up to 10 liters in size while 6000 series chillers are recommended for bioreactors larger than 10 liters

PolyScience www.polyscience.com

Wireless Data Logger

RTR-576

- Features a CO_2 range of 0 to 9.999 ppm, a temperature range of 0 to 55°C and a humidity range of 10 to 95% RH
- Recorded data from the RTR-576 can be collected via wireless communication and can also be used for data monitoring, warning monitoring and data management
- Offers a logging capacity of 8,000 data sets

TandD www.tandd.com

Chiller Unit

FlowSyn Polar Bear™

- Provides faster and more efficient cooling than conventional chiller units
- Compatible with the FlowSyn range of reactor modules
- Designed to prevent ice formation so that users can clearly observe reactions as they occur
- Easy to install and simple to operate
- Delivers rapid cooling down to -88°C at the touch of a button

Uniqsis www.uniqsis.com

Calibration Gas Generator

Model 150 Dynacalibrator®

- Designed to generate precise ppm or ppb concentrations of chemical compounds in a gas stream
- Digital temperature controller maintains the chamber temperature at a set point with an accuracy of ±0.01°C, traceable to NIST standards
- Features a wide range of temperature settings (5°C above ambient to 110°C)

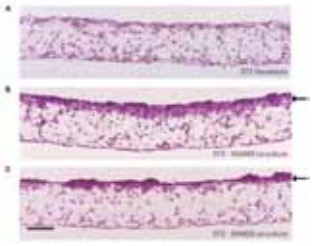
VICI Metronics www.vicimetronics.com

CELL CULTURE

3D Cell Culture Scaffold

Alvetex®

- Available in a range of flexible, easy-to-use formats
- Fully compatible with a wide range of assays
- Highly porous polystyrene scaffold engineered into a 200μm thick membrane
- Provides a 3D space into which cells can invade, proliferate and grow
- Vertical axis of the third dimension enables additional layers of cells to form complex 3D interactions with adjacent cells



AMSBIO www.amsbio.com

Cell Imaging System

IN Cell Analyzer 2200

- Suitable for both investigative microscopy and automated high-content screening of organelles, cells, tissues and whole organisms
- Can be configured to the specific needs of the researcher, with a wide range of optional modules and accessories available
- Images a two-colored 96-well plate assay in less than 2.5 minutes and a one-color 1536 plate in under 20 mins

GE Healthcare www.gelifesciences.com

Cell Culture Vessels

CELLSTAR

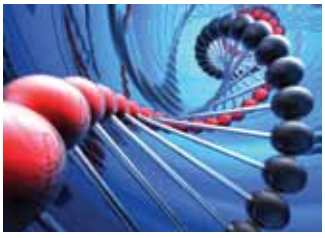
- Feature a surface that has been specifically developed to effectively prevent the attachment of semi-adherent and adherent cell lines
- Supports in particular the formation of spheroids and "embryoid bodies"
- Free of detectable DNases, RNases and human DNA
- Contain no detectable endotoxins or cytotoxic substances, are sterile and have a shelf life of two years

Greiner Bio-One www.greinerbioone.com/en

CHEMICALS, KITS & REAGENTS

Small RNA and mRNA Sample Library Construction Kits

- Designed to enable fast and cost-effective Next-Generation Sequencing (NGS)
- Reduce NGS workflow complexity
- Shorten sample library preparation time and labor
- Minimize errors by eliminating extra steps and optimizing the experiment protocol
- Can be used for sample preparation from rare and difficult to obtain sources, such as pathological samples



AMSBIO www.amsbio.com

Human Monoclonal Antibodies

Trillium Diagnostics

- Flow cytometry portfolio includes 14 new human monoclonal antibodies from Trillium Diagnostics
- Analyte specific reagents (ASRs) provide high specificity, convenience and flexibility in flow cytometry
- A new cell permeabilization reagent is also being offered
- New monoclonals include human anti-hemoglobin F, CD163 markers, and CD64 markers
- Rounding out the line is a monoclonal for MNDA

Beckman Coulter Life Sciences www.beckmancoulter.com

Certified Reference Solutions

Certified Spiking Solutions®

- New reference solutions of nicotine metabolites norcotinine and trans-3-hydroxycotinine as well as nicotine nitrosamines NNN, NNK, and NAB now offered at concentrations of 1.0 mg/mL in methanol for each solution standard
- Can be used as Snap-N-Spike® starting materials in the laboratory's matrix of choice for preparation of calibrators and controls in nicotine testing and other clinical or diagnostic applications by LC/MS or GC/MS

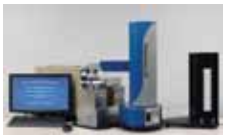
Cerilliant www.cerilliant.com

LAB AUTOMATION

Automated Barcode Labeling System

PA1000 Print & Apply

- Prints multiple format barcode labels on any SBS footprint microplate
- Can print 1D, 2D and/or human readable text on 1, 2 or all 4 sides of a plate
- Includes easy to use software allows for anyone to set up a run
- Applies every label with +/- 0.020" precision and will operate with standard and deep well microplates



Hudson Robotics
www.hudsonrobotics.com

Plate Washer

RapidWash™

- Provides high throughput washing for ELISAs, cellular assays, and other processes requiring washing and aspirating
- Offers a small 9.25"W x 15"D footprint
- Gives users a high speed of less than 9 sec. 96-well fill/aspirate cycle and low residual volume of <2uL per well
- For 96-well and 384-well microplates, standard height and deep-well

Hudson Robotics www.hudsonrobotics.com

Automated Storage Modules

comPOUND® and arktic™

- Capable of storing up to three times the number of samples of a standard -80°C freezer within almost the same physical space
- Have no moving parts within the cold zone, instead relying on TTP Labtech's proprietary pneumatic transport technology
- Samples are stored individually under nitrogen or dry air in hermetically sealed chambers eliminating contamination worries and improving sample stability

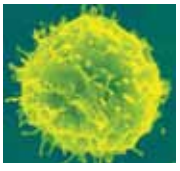
TTP Labtech www.ttplabtech.com

LIFE SCIENCE

Newborn Human Foreskin Fibroblasts

NuFF-RQ™

- Have been functionally validated to support the generation of induced pluripotent stem cell (iPSC) colonies providing an optimized feeder layer during mRNA reprogramming
- Available in conjunction with AMSBIO's highly modified synthetic 5-capped mRNAs for safe, non-integrated human cell reprogramming
- All AMSBIO feeder cells are meticulously derived and comprehensively tested on mouse and human ES stem cells



AMSBIO
www.amsbio.com

Qualification Plate

CFX

- Accurately verifies the performance of any CFX real-time PCR system
- Preloaded with an optimized master mix containing Bio-Rad's SsoAdvanced™ SYBR® Green supermix
- Provides a five-point standard curve, two unknown groups, and no-template controls, allowing for the rapid determination of a pass/fail instrument performance result

Bio-Rad www.bio-rad.com

UV Curing Chamber

UV Crosslinker AH

- Enables operators to use the device at different internal heights to enhance the crosslinking effect or detail the amount/distance required for a controlled reaction
- Features the ability to adjust the height of the internal bulbs and a self-calibrating energy sensor
- Designed for crosslinking of DNA/RNA to cellulose membrane lattice when conducting Northern or Southern Blot experiments

Boekel Scientific www.boekelsci.com

Lab Automation Workstation

Microlab AutoLys STAR

- Automates sample lysis and DNA extraction
- Improves bottlenecks for forensic scientists and other molecular biologists isolating nucleic acids from samples
- Includes a 2D barcode reader, Hamilton heater-shakers, new AutoLys tubes, four robotic channels to manipulate and transport AutoLys tubes, and a centrifuge
- Can also run overnight, increasing laboratory productivity

Hamilton Robotics www.hamiltonrobotics.com

Multimode Reader Module

AlphaScreen®

- For Tecan's Infinite® F200 PRO multimode reader
- Provides customers with a cost-effective solution for AlphaScreen and AlphaLISA® assays
- Offers excellent sensitivity for screening and research
- Further extends the flexibility of the Infinite F200 PRO for low and medium throughput applications
- Ensures optimal assay performance without the need for a specialized reader

Tecan
www.tecan.com

Vibration Free Chilling Incubators

EchoTherm™

- Provide a 100 liter capacity and are Peltier-based for heating and chilling
- Have no compressors or CFC's and are vibration-free, making them suited for doing protein crystallizations
- Two models available— the IN55 is fully programmable and the IN50 is simple digital
- Settable from 4.0ºC to 70.0ºC and feature PID temperature control to ± 0.1°C

Torrey Pines Scientific www.torreypinesscientific.com

CO_2 Controller

Okolab Bold Line

- Mixes Air or N_2 and CO_2 and controls the gas concentration with digital accuracy
- Allows users to mix CO_2 from 0-18% concentration with an accuracy ±5% of the concentration
- Easily operated via a touch screen interface, OKO-Control 2.0 software, or Nis Elements software
- Fully integrated with Bold Line temperature controllers

Warner Instruments www.warnerinstruments.com

LIMS & SOFTWARE

GC/MS Software

TargetView™

- Capable of detecting and identifying both target and 'unknown' compounds in complex GC/MS chromatograms, for either trace-level work or for routine screening
- Delivers rapid screening of chromatograms against compound libraries, and provides the analyst with the capability to quickly and easily create bespoke spectral libraries
- New batch-processing option now allows multiple files to be screened against a single library

ALMSCO International www.almsco.com

3D Molecular Viewer, Sketcher and Editor

torchV10lite

- Free software handles 2D and 3D structures
- Shows the molecular field patterns of user's molecules, giving a visual representation of their physicochemical properties
- Enables users to compare the Structure Activity Relationship (SAR) of up to 10,000 molecules, giving them a rich, informative view of how their compounds behave in biological systems

Cresset www.cresset-group.com

ELSD Control Driver

- For the Alltech® 3300 evaporative light scattering detector (ELSD) from Grace Discovery Sciences
- Officially released with Clarity Chromatography Software version 4.0.2
- Clarity software allows the control of more than 400 different instruments from a single source and offers its users very high flexibility

DataApex www.dataapex.com

NIR Analyzer Software Package

Vision 3.60

- Designed for use with the FOSS NIRSystems Near-Infrared (NIR) laboratory and process analyzers
- Can now be installed and run on both 32 bit and 64 bit versions of Windows XP, Windows Vista, and Windows 7
- Supports the NIRS DS2500 analyzer
- 21 CFR Part 11 compliant and supports PAT through numerous process analysis options and process communication capabilities

FOSS NIRSystems www.foss-nirsystems.com

Inter-Laboratory Data Management Program

Acusera 24.7 Live Online

- Web-based program is specifically designed to complement the Acusera range of third party quality controls
- Aims to improve the effectiveness of quality control processes within the clinical laboratory whilst also helping to interpret QC results
- Allows users to extensively monitor analytical performance and access peer group reports quickly and easily online 24 hours a day, 7 days a week

Randox www.randox.com

Flow Chemistry Control Software

Asia Manager

- Offers powerful walk-away control and analysis of flow chemistry experiments
- Designed for use with Asia flow chemistry systems
- Automatically detects Asia modules connected via the Asia Automator and tracks each module's status, allowing methods to be created, edited and run intuitively
- Provides full and easy automation of the entire flow chemistry process

Syrris http://syrris.com

Sample Management Software

Mosaic™ 5.0

- Provides comprehensive inventory management features, which include handling multiple substance types, managing storage locations and supporting configurable sample-set management and usage restrictions
- Gives users convenient interfaces to order stock samples and request the dispensing, customizable selection, reformatting and dilution of samples into the desired format
- Communicates effectively with third party systems

Titian Software www.titian.co.uk

Non-Drip Couplings

- Designed for broad use in low-pressure fluid and vacuum applications
- Suited for connecting all types of fluid lines, including beverage, electronic coolant, salt water, and oil transfer lines
- Ensures virtually zero spillage and eliminates pollution and air inclusion during connection and disconnection
- Offered in three safety levels

CEJN www.cejn.com

SUPPLIES & CONSUMABLES

Black Screw-Top Centrifuge Tubes

- Provide secure storage of light sensitive materials
- Manufactured from black, RNAse/ DNase-free polypropylene
- Fully resistant to most organic solvents, can be autoclaved clean, and enable high integrity storage of samples and reagents down to -80°C
- Available initially in 15ml and 50ml sizes
- Supplied sterile and include a recessed HDPE lid that prevents leakage

Asynt www.asynt.com

Limited Volume Inserts with Bottom and Top Springs

- Ensure that autosamplers extract even the smallest sample volumes every time, without damaging injection needles or breaking sample containers
- Preassembled with polymer bottom springs or the patented Top Spring™, which act as shock absorbers to protect sample needles from bottoming out during sample extraction
- Permit maximum sample withdrawal

J.G. Finneran
www.jgfinneran.com

Universal Phase Separators

- A flexible alternative to the traditional glass funnel separation of immiscible liquids
- Unique design allows the organic phase to pass through the internal frit wherever it is located, providing a universal approach to separating two liquid phases
- One-size-fits-all approach enables any volume under 80 mL to be processed in one step, or larger volumes by serial batches

Biotage www.biotage.com

Two-Part Vial System

Vista Vial

- Consists of a glass base and a polyethylene top that snaps together to form a standard 12x32mm autosampler vial
- Glass base provides a wide target for pipettes and is suited for highly viscous and foaming samples
- Depending on the sample, disposal of vials is easier as the plastic can be incinerated intact without the need for closure removal

J.G. Finneran Associates www.jgfinneran.com

Safety Coated Amber Bottles

- Can be used with BrandTech used with our Dispensette® and seripettor® dispensers and Titrette® bottletop burettes
- Bottles are made of soda-lime glass with a LDPE pouring ring and polypropylene screw cap
- Ethylene acrylate coating helps contain contents in case of accidental breakage
- Available in 250mL, 500mL and 1 liter sizes

BrandTech www.brandtech.com

Centrifuge Cell Windows

- Made from sapphire and single crystal quartz for OEM and field replacement applications
- Feature an arrow scribed on their edges that projects the optic access to simplify alignment and measure 19.03 mm dia. ±0.3 mm by 0.5 mm thick ±0.10 mm
- Suitable for use with Beckman and other centrifuges

Meller Optics www.melleroptics.com

2.00ml Storage Tube

Micronic

- Combines higher sample storage capacity and absolute sample traceability in an industry-standard 96-tube rack format
- Uses a unique 2D code laser encrypted on the tube bottom to enable easy identification and traceable storage of your samples
- Certified RNase / DNase free and non-toxic
- Come with a choice of push cap or screw cap closures

Micronic www.micronic.com

0.5mL Vial

CryoELITE®

- Designed for preserving and shipping small volume samples
- Feature a high integrity closure, freestanding design and a larger footprint to assure the vials can be clearly marked for identification
- Manufactured from low binding, cryogenic-grade virgin polypropylene that meets USP Class VI classification
- Offer a storage temperature range of 196°C to 121°C

WHEATON www.wheaton.com

Black Microplates and Seals

- Manufactured from ultra-pure grade polypropylene
- Resistant to a wide range of solvents and have near zero leachates ensuring long-term sample integrity
- Black plates are supplied RNase / DNase free meaning they can be used with even the most sensitive biological samples
- Available in a choice of 96-well formats

Porvair Sciences www.porvair-sciences.com

24-Well Microplates

Krystal 24

- Offer 24 high volume (3.1ml) wells in an industry standard 96-well plate footprint
- Provides a large surface area per well, enabling excellent cell growth
- Tissue culture treated to ensure optimal cell growth and attachment
- Precisely manufactured to ANSI / SLAS microplate dimensions
- Fully compatible with all commercially available plate readers, robotic sample processors and automated liquid handling systems

Porvair Sciences www.porvair-sciences.com

PRODUCT SPOTLIGHT

PERMANENT MARKING

UNIQUE BARCODE SYSTEM HELPS LABS WITH LARGE SORBENT TUBE STOCK

Specialist ceramic decal developer Xerital has come up with a system of serialized barcodes that can be applied to glass substrates. The Xerital barcode decals can be applied to new or existing tubes and are particularly useful for large-scale monitoring studies and for labs with significant sorbent tube stock.

High-temperature barcodes can be serialized to customers' required size and code and integrated into their existing IT system.

The decals are actually fired on to the glass tubes, resulting in a permanent marking that is strongly resistant to scratching, chemical attack and thermal processes. The final, fired product is durable and provides for a high resolution output.

Sorbent sample tube manufacturer Markes International has switched entirely to this method for glass tube marking in order to help its customers reduce errors when recording and tracking samples and eliminate time-consuming manual data entry.

Markes found the Xerital process to be the best for their particular application, which involved heating their tubes to temperatures as high as 400°C.

"The samples they provided for us were applied using a kiln-fired ceramic decal and our testing showed these to be extremely good," said Steve Oldfield, consumables product manager at Markes International. "In particular, the white ceramic background made barcode-reading far more reliable than with sorbent tubes from other suppliers, where the barcode had been applied directly on the glass."

Because Xerital barcode decals are heated up to 700°C as part of the firing process, they can perform well at the high temperatures reached during laboratory analysis.

"This project at Markes International has turned out to be an excellent demonstration of the advantages of our specialist ceramic decals for glass applications," commented Howard Quinn, Xerital director.

For more information, visit www.xerital.com

A SAMPLE LYSIS & DNA EXTRACTION WORKSTATION

Problem: Forensic labs in the US are faced with backlogs of samples waiting to be processed[1]. Since 2004, the US Department of Justice has spent more than $550M to improve crime labs' workflows and infrastructure to help reduce the backlog[1,2].

Delays in processing samples can interfere with the criminal justice system. In 2010, for instance, an estimated 14 percent of open homicide cases, 15 percent of open rape cases, and 23 percent of open property cases faced a delay[3].

DNA identification is one rate-limiting step used to identify criminals. Sample processing is often delayed because isolating DNA genotypes requires specific expertise, can be a manual and difficult task, and may require complex and lengthy protocols depending on the sample type.

▲ *The Microlab AutoLys STAR workstation recently launched by Hamilton Robotics.*

Solution: A sample lysis and DNA extraction automation system such as the Microlab AutoLys STAR workstation, recently launched by Hamilton Robotics, can help solve such issues.

This instrument platform improves forensic labs' overall throughput by automating sample preparation, collecting clear lysate followed by DNA isolation, and replacing manual protocols at an affordable price. The workstation has been tested and performs well with blood, saliva, and other biological sample types.

The workstation includes the equipment needed for isolating DNA, including a 2D barcode reader, heater-shakers, robotic channels that manage sample processing, a swing-out centrifuge, and consumables such as new AutoLys tubes. The proprietary AutoLys tubes can process up to 600 µL of sample DNA lysate. Customers who tested the Microlab AutoLys STAR system found the extracted DNA quality to be comparable to that of their in-house manual methods[4].

Automating sample lysis also reduces manual errors, lowers contamination risk, improves chain-of-custody traceability, and enables labs to improve productivity by running assays overnight. A system like the Microlab AutoLys STAR workstation eliminates a rate-limiting step in identifying criminals and improves crime laboratory efficiency, making it a powerful new tool in the fight against crime.

For more information, visit http://www.hamiltonrobotics.com/hamilton-robotics/standard-solutions/autolys-star/

References:

1. *Mark Nelson, "Making Sense of DNA Backlogs—2010 Myths vs. Realities," US Department of Justice, National Institute of Justice, Special Report (2011).*
2. *"DNA Backlog Reduction Program Awards, last modified Sept. 21, 2012. National Institute of Justice. http://www.nij.gov/nij/topics/forensics/lab-operations/evidence-backlogs/backlog-reduction-awards.htm*
3. *"Untested Evidence: Not Just a Crime Lab Issue," accessed online Nov. 16, 2012, http://www.nij.gov/nij/journals/266/untested.htm*
4. *"Fully Automated Sample Lysis Solution," accessed online Nov. 16, 2012, http://www.evidencemagazine.com/index.php?option=com_content&task=view&id=851&Itemid=9*

Lab Manager MAGAZINE®

CREATE A CONVERSATION

Post a Comment on the Lab Manager Manager Website.

Have an opinion, idea, or input pertaining to something you have seen or read in our print or digital publication? Let us know and post a comment on our site today.

Lab Manager MAGAZINE®

www.labmanager.com

CELL LINE AUTHENTICATION

Problem: Cross-contamination of human cell lines with other cell lines and/or misidentification of cell cultures is reported to be 18–36 percent.[1,2,3] Contamination can be from other human cell lines (intraspecies contaminant) or cell lines of different species altogether (interspecies contaminant). Generation of erroneous data with subsequent publication not only affects the individual laboratory utilizing the contaminated culture, it also has negative consequences for the entire research community.[4] Use of contaminated cell cultures impacts research significantly both in terms of wasted financial resources and time. The continued high prevalence of cell line contamination and the consequences of utilizing these contaminated cultures highlight the need to establish the identity of cell lines being used in a research study, as well as detecting and eliminating contaminated cell cultures as quickly as possible.

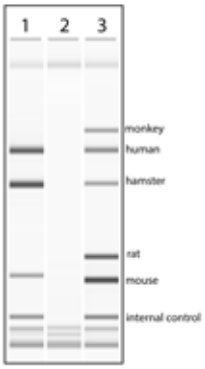
Solution: One way to deal with the cell contamination problem is through something like CellCheck,™ a comprehensive cell line authentication service that combines interspecies and intraspecies testing to verify the identity of human cell lines.

Testing for interspecies contamination is performed by multiplex PCR and identifies DNA from the species of cell lines that are most commonly used in biomedical research, including: *Mus musculus* (laboratory mouse), *Rattus norvegicus* (laboratory rat), *Cricetulus griseus* (Chinese hamster) and *Chlorocebus pygerythrus* (formerly *Cercopithecus aethiops*[African Green Monkey]). Screening is also available for less commonly used animal cell lines, including: *Sus scrofa* (pig), *Oryctolagus cuniculus* (domesticated rabbit), *Canis familiaris* (dog), and *Felis catus* (cat).

Testing for intraspecies contamination and/or misidentification is performed by Short Tandem Repeat (STR) analysis utilizing human specific markers and verifies that the genetic profile of the sample matches the known profile of the cell line.

STR profiling is a useful quality control procedure for any human cell line or tumor. After the initial profile is determined, the cells can subsequently be retested and compared back to the original profile. STR profiling is a useful monitoring tool for tumor banks, cell culture facilities and any research study working with human cellular material. Establishing a baseline STR profile on human origin cellular research materials allows for subsequent monitoring and confirmation of the identity of the human origin materials being utilized in a research study.

➤ *Interspecies contamination: The human cell line in lane 1 is contaminated with both mouse and Chinese hamster origin cells (Lane 2–negative control, Lane 3–positive control lane).*



STR Marker Name	Expected Profile	Sample Profile
Amelogenin	X	X,Y
CSF1PO	12	10,11,12
D13S317	12	11,12
D16S539	11	11,14
D5S818	12	10,12
D7S820	9,10	9,10
TH01	7	7, 9
TPOX	11	8,9,11
vWA	16	16,17

➤ *Intraspecies contamination: The genetic profile for the sample contains both the expected alleles in black and contaminant alleles of a second cell line in red.*

Since most cell line monitoring programs are in their infancy, guidelines on when to test and how often to monitor have yet to be established. However, the following recommendations can be used as a guideline when designing and implementing a cell line monitoring program in your laboratory: 1) authenticate cell lines at the beginning and the end of a study, 2) authenticate frozen materials stored for future use, 3) consider quarterly to semiannual testing of cell lines in continuous use, and 4) consider more frequent testing for experiments in which cell line growth is reduced (for example, cell cultures treated with therapeutic agents, cells grown in media in which factors critical for growth are removed, etc.), as these compromised cultures are more susceptible to overgrowth by contaminating cells.

For more information, visit www.idexxbioresearch.com

References:

1. *Lacroix M. Persistent use of "false" cell lines. Int. J. Cancer. 2008; 122:1-4.*
1. *Chatterjee R. Cell biology. Cases of mistaken identity. Science. 2007; 16:928-931.*
1. *Hughes P, Marshall D, Reid Y, Parkes H, Gelber C. The costs of using unauthenticated, over-passaged cell lines: how much more data do we need? Biotechniques. 2007; 43:575-583.*
1. *Torsvik A, Rosland GV, Svendsen A, et al. Spontaneous Malignant Transformation of Human Mesenchymal Stem Cells Reflects Cross-Contamination: Putting the Research Field on Track. Cancer Research. 2010; 70:6393-6396.*

Don't Gamble with ...your results ...your funding ...your reputation

1 in 56 human cell lines and tumors are positive for a pathogen of significant human health concern.

h-IMPACT™
***Mycoplasma* & Contamination Testing**

20% of all cell lines are thought to be misidentified.

33% have inter- or intra-species cross contamination.

CellCheck™
Cell Line Authentication

- ***Authenticate*** the identity of your cell lines
- ***Validate*** the pathogen-free status of your cell cultures
- ***One easy step!*** • ***One low price!*** • ***Results in 5 days!***

CellCheck™ and h-IMPACT™ were developed and are performed by leading scientists at IDEXX RADIL™ laboratory.

IDEXX RADIL™

U.S./Canada 1-800-544-5205 x1
Europe +44-7970-245-064
www.idexxbioresearch.com

A PIPETTING SYSTEM

Problem: Pipetting is a fundamental activity for a laboratory scientist. Almost every experiment requires small and precise volumes of liquid to be transferred from one container to another. Researchers are often challenged with pipette tips that appear to be seated properly and sealed, but leak air, loosen or fall off in the middle of protocols. This causes inconsistent or unreliable results, and ultimately degrades research results and overall efficiency.

Solution: To reduce pipetting variables, a system such as the Thermo Scientific F1-ClipTip pipetting system can help. The Thermo system uses ClipTip interlocking technology to enable researchers to deliver consistent, reproducible pipetting with higher quality results.

With this particular system a light touch 'clips' each tip securely on the F1-ClipTip pipette and will only release when ejected regardless of application pressure. The ClipTip technology is based on flexible clips positioned evenly around the upper sealing portion of the tip. During attachment, the pipette tip cone expands the clips, allowing them to pass over a fitting flange and then return to the closed position, and locking the tip into place. The pipette and tip form a complete seal between the tip and the pipette tip cone, securing the sample volume in each tip for enhanced accuracy and precision. Whether lab workers are using a single or multichannel pipette, they will get the exact volume they expect to accelerate discovery.

The F1-ClipTip product offering covers a volume range from 1 µl to 1000 µl and includes variable and fixed volume single channel pipettes as well as multichannel pipettes. Also, a convenient color-coding system makes it easy to identify the correct ClipTip by volume. Each ClipTip tip utilizes low retention technology in the molding process to enable maximum sample recovery and reproducibility. ClipTips are also available with a filter and are certified free of DNA, RNase, DNase, ATP and endotoxin contamination.

A system like the Thermo Scientific F1-ClipTip pipetting system ensures that tips don't fall off, without requiring excessive force or banging of the tips onto the pipette, and can improve the efficiency of a researcher through improved data integrity.

For more information, visit www.thermoscientific.com/cliptip

The Thermo Scientific F1-ClipTip interface is strong enough that users can hang a 2lb weight off the tip and the tips only release when users decide to eject them.

When the Thermo Scientific F1-ClipTip pipette tips are on, they are sealed and will not loosen.

www.labwrench.com

Ask Questions

Post Answers

Lab Equipment Troubleshooting, Recommendations, Tips and Tricks

LabWrench

Lab Equipment Information and Discussions.

MARKETPLACE

PROFILES

ADVERTISER INDEX

Company	URL	Page
A.I.R. Systems, Inc.	www.airsystems-inc.com	41
Accelrys, Inc.	accelrys.com/signs	25
Adam Equipment Inc.	www.adamequipment.com	51
Agilent Technologies	www.agilent.com/chem/CrossLab	108
AirClean Systems, Inc.	patriotfumehood.com	47
Beckman Coulter Inc.	www.biomek4000.com/lbm	66
BEVCO Ergonomic Seating	www.bevco.com	71
BioTek Instruments, Inc.	www.405touch.com	55
BrandTech Scientific, Inc.	www.brandtech.com	84
Brookfield Engineering	www.brookfieldengineering.com	37
Conquer Scientific	ConquerScientific.com	105
Douglas Scientific	www.DouglasScientific.com	23
Drummond Scientific Company	www.drummondsci.com	21
Environmental Express	www.environmentalexpress.com	17
Eppendorf North America	www.eppendorfna.com	29
EquipNet, Inc.	www.EquipNet.com	105
Erlab, Inc.	www.captair.com	3
GenTech Scientific, Inc.	www.GenTechScientific.com	105
Gilson, Inc.	www.gilson.com	11 & 104
Hamilton Company	www.hamiltoncompany.com/microlab300	7
HEMCO Corporation	www.HEMCOcorp.com	22 & 104
IAC Industries, Inc.	furnitureforlabs.com	69
IDEXX Laboratories, Inc.	www.idexx.com	101
IKA Works	www.ika.com	27
International Accreditation Service	www.iasonline.org	104
JM Science Inc.	www.jmscience.com	75
KNF Neuberger Inc.	www.knflab.com	14
Labconco	www.labconco.com	45
Labcyte Inc	www.labcyte.com/products	53 & 104
LabWrench	www.labwrench.com	103
Metrohm USA, Inc.	www.metrohmusa.com	64
Mettler Toledo Inc.	www.mt.com/justthink	2, 50 & 104
Mystaire™ Inc.	www.mystaire.com	107
Panasonic Healthcare	www.twinguardseries.com	43
Phenix Research Products	www.phenixresearch.com	15
Pittcon	www.pittcon.org	89
Pro Scientific Inc.	www.proscientific.com	9
Proton Onsite	ProtonOnSite.com	39
RADWAG USA L.L.C.	www.radwagusa.com	33
Ruro	www.ruro.com	31
Saint-Gobain Performance Plastics	www.LabPure.com	85 & 104
Sonntek, Inc.	www.sonntek.com	24 & 104
Thermo Fisher - Diagnostics	www.thermofisher.com	87
Thermo Fisher Scientific Inc.	www.thermoscientific.com	5, 6 & 13
Universal Electric	starlinepower.com	35
W.A. Hammond Drierite Company	www.drierite.com	32

PRE-OWNED EQUIPMENT MARKETPLACE

PARTING POINTS

Takeaways from this month's issue:

THE PATHWAY TO MANAGEMENT

While there are specific skills one needs to develop in order to be an effective manager, there are also five mental attitudes or mindsets that aspiring managers need to develop. Four of these include:

- Developing an external focus
- Adopting a commercial mindset
- Delivering results by motivating people to succeed, etc.
- Providing speed in all of the above by making effective decisions quickly

10

20

MENTORING MATTERS

Mentoring is broadly acknowledged within many circles as an effective tool for the development and nurture of scientific and technical personnel—one that also provides important economic advantages. Good mentors must:

- Have people skills and be willing to provide constructive criticism and guidance
- Need to understand how to motivate people
- Possess plenty of intellectual generosity
- Be able to help mentees build their own network and to develop as leaders

30

LABS ARE FROM MARS, IT DEPARTMENTS ARE FROM VENUS

It is comparatively easy for IT departments to support office applications. Labs, however, are a different story and different world. The main issues come down to:

- Your lab depends on computer systems to function
- The IT group that is responsible for supporting lab computer systems may not understand how they are being used
- The IT department may have policies concerning systems support that don't work in lab environments

38

WINNING WITH LOTO

LOTO refers to lockout/tag out, the process by which equipment is put into a safe condition so repairs or maintenance can take place. Major parts of the process include:

- Isolate, dissipate, or otherwise prevent unexpected start-up or energizing of equipment
- Detailed planning and intimate knowledge of the equipment are paramount
- Lockout is placing a lock to hold an energy-isolating device in the safe position
- Tag out is using a prominent warning device with a means of attachment, such as a tag, which can be securely fastened to an energy-isolating device

65

INSIGHTS ON AUTOMATED SAMPLE PREPARATION

Sample preparation ("prep") is a tedious, time-consuming task but a necessary part of nearly every analytical workflow, regardless of industry or laboratory type. In our latest INSIGHTS, we examine the following aspects of sample prep:

- Trends and developments in the field
- A business case for automating sample prep
- The challenges and drawbacks of automation
- The diversity of technologies in this key area

AURA® DUCTLESS CHEMICAL FUME HOOD

QUALITY • SAFETY • SERVICE

Why Aura®?

Filtrak™ Positive Locking System

Eversafe II™ Controller

110V or 220V models

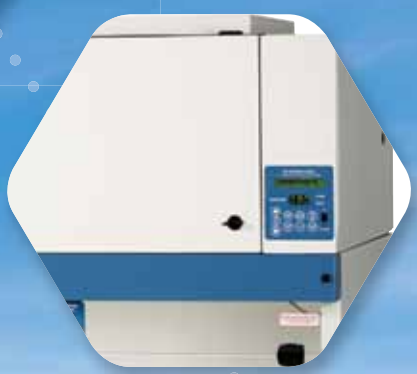
ASHRAE 110 tested

ESD models available

UL & CSA Approved

Chemical Resistant Fiberglass Base

Operator and Environmental protection from toxic fumes, vapors and particulate



Epoxy-Coated Aluminum Construction

1-919-229-8511 MYSTAIRE® | MISONIX® www.mystaire.com

MAD014

ORCHESTRATE PRODUCTIVITY ACROSS YOUR LAB

Agilent CrossLab Services helps you work seamlessly across your labs to improve productivity. We provide a suite of services that helps keep your analytical instruments and labs running at peak performance, regardless of instrument manufacturer. From award-winning, multi-vendor repair, maintenance and compliance to single-source laboratory solutions, Agilent CrossLab delivers what you and your lab need to maximize your instrument uptime and availability. The sound of an efficient lab is a symphony; Agilent CrossLab Services keeps your analytical instruments in tune.

Learn how you can maximize your lab's productivity with Agilent CrossLab Services. To view our portfolio of services and solutions, including supplies for your non-Agilent instruments, visit:
www.agilent.com/chem/CrossLab

The Measure of Confidence

AGILENT-QUALITY SERVICE
REGARDLESS OF INSTRUMENT MANUFACTURER
Visit agilent.com/chem/CrossLab

Agilent **CrossLab**
SERVICES | SUPPLIES

Agilent Technologies