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March 2013 Volume 8 • Number 2

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HEADING TO PHILLY?

There's plenty to look forward to if you are planning to be in Philadelphia for Pittcon 2013 later this month. Not only will there be cool new technology to check out, some of which you will find previewed in this issue's Technology News section starting on page 88, but there are also many informative lectures and workshops including *Lab Manager*'s own Bootcamp. This year's Lab Manager Bootcamp, featuring expert Bill Acheson, is all about the importance of body language in communication and how it can help you to be a better manager. The workshop, which runs from 1 to 5 p.m. on March 19, will focus on three main aspects to improving your communication skills: the power of first impressions, projecting greater personal power, and establishing rapport. If you think this year's Bootcamp is right for you, head to http://www.labmanagerbootcamp.com/ for more information and to register.

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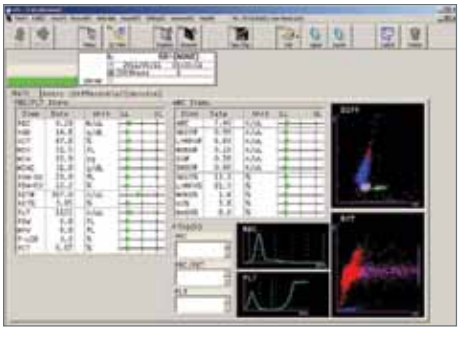

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Confident/Somewhat Confident

The good news from this year's confidence report is that the laboratory industry, by and large, is moving in the right direction—forward—though in slightly smaller steps than we would have hoped. But as author Angelo DePalma writes in this month's cover story, "Steady as She Goes," "Survival is not a dirty word in a world recovering from catastrophic financial shenanigans, and toward that end treading water is not such a terrible strategy." If you didn't participate in this year's survey, let me know if these results are in line with your own feeling of confidence as you head into 2013.

Managing relationships can be challenging, especially if those relationships affect business outcomes. One particularly complex and potentially vexing relationship is that between a lab manager and his or her equipment vendors. In "The Procurement Dilemma," author Key Kidder explains that, unlike in the past when buyers generally called the shots, a new paradigm has emerged that is less adversarial and more mutually beneficial. "As lab managers and suppliers work together and deliver on what's promised, trust builds and the quality of their information sharing improves, enhancing performance." Turn to page 20 to find out more.

Relationships among coworkers can also be difficult at times, with most managers believing it is their job to maintain peace in the kingdom by squelching any and all conflicts. However, this month's Lab Manager Academy article, "Resolving Conflict in the Workplace," takes the opposite tack. Author and speaker Michael Soon Lee says, "Successful organizations embrace conflict as an inevitable product of diverse human beings working together. Smart leaders encourage differences of opinions and work styles as a way to increase creativity."

This month's Leadership & Staffing article, "Motivate Your Lab," looks at the most challenging issue facing every manager, which is how to get the most out of your team without micromanaging them. Turn to page 34 to learn about some "recent research on keeping people motivated [that] is providing new explanations for some old tenets of good management."

For the past five years, the March issue of *Lab Manager Magazine* has provided a preview of the technologies being introduced at that year's Pittsburgh Conference. This year is no different. Turn to page 88 for a sampling of the equipment, software, services and consumables you will be seeing later this month in Philadelphia. When you're at the show, please be sure to sign up for this year's Lab Manager Bootcamp, "Nonverbal Communication: The Hidden Message," on Tuesday, March 19th from 1 to 5 p.m. Also, please stop by the *Lab Manager* booth (# 3639) to say hello.

On a separate and sad note, in late January, we lost a very dear friend to the magazine—John K. Borchardt. His knowledge of both science and laboratory management was immense and his indomitable spirit remarkable. We will miss him very much.

Pamela Ahlberg
Editor-in-Chief

Correction: On page 50 of the January/February issue, we mistakenly described the features of Sartorius' Secura® line of analytical and top-loading balances. Instead of "one-touch level control," that line features *LevelControl*, a visual display for guidance to level the balance.

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Lab Manager Magazine's 2012 Investment Confidence Survey, conducted in late Q4 2012, revealed a slight increase in optimism compared with the end-of-year 2011 survey. The good news is that on average survey takers were no more pessimistic than they were a year ago.

Demographics

Four hundred and two laboratory personnel responded to the 2012 survey. Figure 1 shows the breakdown according to industry affiliation.

MARKET/INDUSTRY

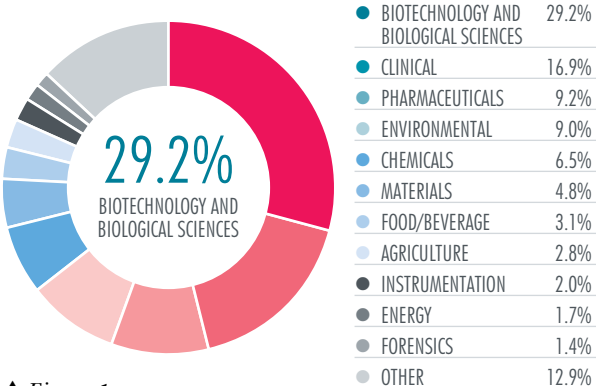

Figure 1

Sixty-three percent of respondents indicated a managerial or supervisory role, compared with scientific or engineering job titles at 23.4% and technician or "other" at 13.6%. Figure 2 illustrates the percentage of respondents falling into various technical disciplines. R&D, QC, operations, and technical services were by far the leading categories, comprising 74.7% of all respondents.

JOB TITLE AND FUNCTION

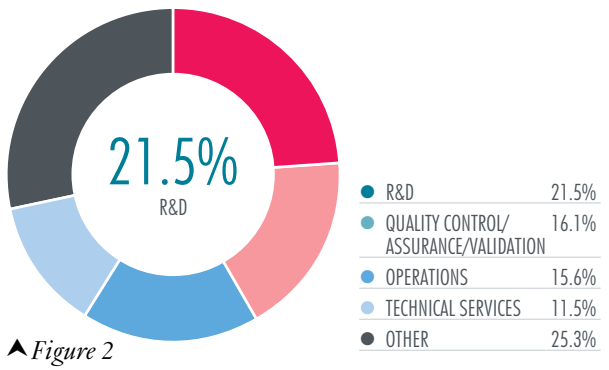

Figure 2

Figure 3 shows that nonprofit (university, hospital, government) labs dominated private and corporate lab survey takers with 52% of the total, compared with 33.4%.

NON-PROFIT VS. PRIVATE

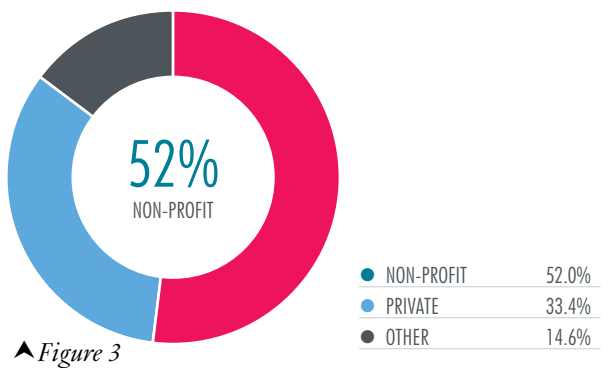

Figure 3

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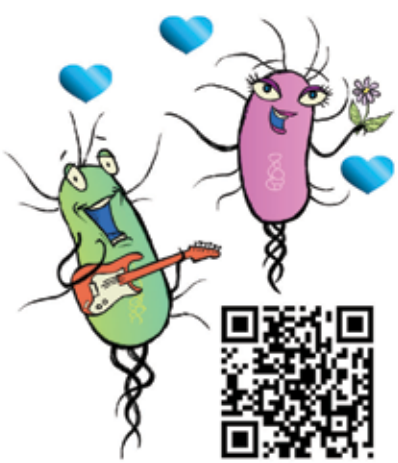

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Small labs continue to dominate the landscape, with nearly half of all respondents working in organizations with 10 or fewer individuals. (Figure 4).

GENERAL BUSINESS CONDITIONS

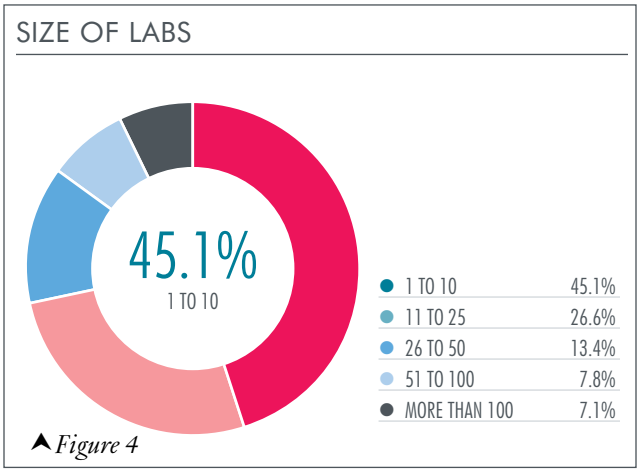

Figure 4

Compared with previous year

The 2012 survey demonstrated that optimism about general business conditions was similar to that in the 2011 end-of-year survey. When asked "How would you assess present general business conditions (Q4 2012) in your lab compared to a year ago (Q4 2011)?" 32% of those surveyed indicated that their labs were better off than at the end of 2011, which was identical to the tally from 2011. Similarly, those assessing the business climate as "worse off" amounted to 21% of respondents in both years. Slightly more respondents (42% in 2011 versus 39% in 2012) believed the situation was essentially the same. It is perhaps significant that the 2010–2011 period was viewed by many respondents as the beginning of economic recovery, at least for laboratory operations.

Looking forward

2012 respondents were generally more optimistic about the future than those surveyed a year earlier.

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When asked "One year from now (Q4 2013), how do you think general business conditions in your lab will be?" 40% anticipated improvements, compared with just 35% the prior year. Interestingly, the "worse off" responses were slightly higher as well, 16% in 2012 versus 15% the year before. The slack was taken up by those who anticipated conditions would remain more or less the same: 34% in 2012 versus 42% in 2011. Some respondents indicated that the economic recovery was progressing more slowly than originally anticipated, hence the pessimism. While no data exists on this, there is good reason to believe that the rosier outlook was predicated on more robust business performance the previous year.

Respondents were then asked about specific areas of confidence or lack thereof. They were asked to rate the following on a scale of 1 to 7, where 1 represented the least confidence and 7 represented the most.

These areas were:

- Business conditions in the market sector
- Company finances
- Adequacy of staffing
- Funding for technology acquisition
- Funding for workspace, environment, and expansion
- Resources devoted to outsourcing
- Organizational commitment to investment

As expected, scores hovered near values of 3 to 5—the modal response—for most questions. Responses of 1 or 7 were generally less than 10% of all answers. Some interesting patterns evolved, however, suggesting a skewing toward more positive or negative outlooks for some factors.

"2012 respondents were generally more optimistic about the future than those surveyed a year earlier."

For example, responses to "organizational commitment to investment" were skewed toward favorable views. The most common response for this question was above average (5 out of 7), and the mean response was 4.3. By contrast, respondents were significantly less optimistic about their companies having or expending sufficient funds for technology acquisition. While responses 4 and 5 were approximately equal in number, the lower-confidence responses predominated. This was reflected in the average response for this question, 3.7, which is below the average response of 4. A similar lower-confidence pattern was observed for responses to the questions on company finances and adequacy of staffing.

2012 responses reflected somewhat greater confidence overall than 2011 survey results. In 2011, confidence was lowest in organizations' ability to staff projects adequately, where those with low confidence (responses 1 or 2) outnumbered highly confident responders (6 or 7) by two-thirds, and the average confidence assessment was 3.7, below average. For 2012 the value was 3.94, reflecting somewhat higher expectations and confidence.

By contrast, in last year's survey the highest average response, 4.02 (the only value above 4.0), was for funding for workspace, environment, and expansion. Confidence in this measure slipped somewhat in the 2012 survey, to an average response of 3.91. Confidence in firms' commitment to acquiring new technology and instrumentation also fell slightly, from an average confidence value of 3.96—essentially "average"—in 2011 to 3.7 in 2012.

Lab budgets

Perhaps the most telling reflection of business confidence was measured by the question "Compared to 2011, how has the 2012 research budget changed for each of the following areas in your lab?" Respondents were asked about the following expense areas, which are grouped below in order of necessity for maintaining existing capabilities and taking on new work. Scores ranged from 1 (decreased significantly) to 7 (increased significantly).

Essentials:

- Commodity consumables
- Existing projects
- Raw materials

Variable priority:

- New lab technology
- Education/training
- New projects

Capital intensive:

- Construction/lab setup
- Facilities
- Adding staff
- Staff compensation
- Outsourcing services

The "essentials" include materials, equipment, and expenses required to keep a lab running. It is not surprising, then, that respondents estimated that budgets for these items remained relatively unchanged from the previous year. Responses for these three items showed a remarkably normal distribution, with 4 being the most frequent score. As with the 2011 survey, responses were skewed slightly positively—in favor of increased spending.

Variable priority items include items and services in which companies flush with business more or less automatically invest. Well-trained workers and new instrumentation can significantly improve the quality and quantity of work—if business dictates.

On that basis, responses in these expense categories were cause for minor celebration. Estimates of investment in new technology were up for 2012. Last year, perhaps still feeling the pangs of the economic downturn, respondents felt that investment in analytical equipment, particularly new and pre-owned technology and laboratory automation, was significantly lower than in the previous year. This was reflected by an average response of 3.6. This trend is evidently reversing. Laboratories seem to be resuming their acquisition of "technology," as the average response for 2012 was 4.0. Prospects for training, however, appeared flat.

"Responses to 'organizational commitment to investment' were skewed toward favorable views."

Interestingly, survey takers believed that their companies placed less emphasis on new projects during 2012 compared with 2011. The average score for this item was a below-average 3.7. It is possible that respondents were confused about the meaning of "new research projects" and thought of these as elective in-house projects instead of attempts to acquire new work.

Unfortunately, the slightly improved optimism did not carry through to capital-intensive expenses. These continued where they left off from the 2011 survey—in the doldrums. Construction, renovation, and lab setup were particularly hard hit, with approximately three times as many respondents in 2011 estimating that investment in facility and infrastructure was significantly lower than the previous year's. For 2012 the "decrease" versus "increase" ratio was a more manageable 2—an improvement but a definite sign that labs are not eager to renovate or acquire new facilities.

Individual lab workers, even managers, may not know their company's finances in great detail, but they are extremely sensitive to compensation and staffing levels—normally seen as surrogates for an organization's financial health. On this front the bad news continues from the previous survey.

In 2011, the number of respondents estimating that staffing and compensation had risen from the previous year was only one-third of those who reported down figures. The trend continued in the 2012 survey. For example, just six responses indicated "increased significantly" for compensation and benefits versus 45 listing "decreased significantly." Similarly, just 17 of 390 individuals stated that their firms hired additional staff, while 63 indicated that staffing had fallen.

The impression from budget-related responses is that laboratories' finances have forced them into a conservative posture with respect to capital-intensive commitments such as facilities, instrumentation, and human resources. Business goes on as usual: Labs continue to stock essential equipment and consumables, but the business climate prevents them from investing in future growth.

Predictions for 2013

We have thus far discussed 2012 from the perspective of 2011. How do laboratory managers and workers see the future unfolding? The final survey question, "In the coming year (2013), how do you think your lab's 2012 research budget for each of the following areas will change?" provides some insights.

As in the previous question, those surveyed were asked for opinions on high-priority, elective, and capital expenditures. Not surprisingly, respondents predicted that outlays for essential equipment/materials and support for existing projects would remain the same or increase slightly during the coming year.

"Investment in facility and infrastructure was significantly lower than the previous year."

Moving on to the variable priority items, respondents estimated that outlays for training in 2013 would remain essentially at 2012 levels. Anticipated expenditures on "new technology" were slightly down from 2012 estimates, 3.9 versus 4.0, but estimates for spending on new projects were slightly higher, 3.8 versus 3.7. The differences are not statistically significant. In other words, respondents do not anticipate meaningful increases or decreases in spending on variable priority items for the coming year.

The outlook remains cloudy, however, for high-cost items. Facility-related expenses are expected to fall in 2013 (average response = 3.6). As with perceptions of 2012 versus 2011, twice as many respondents were pessimistic as were optimistic.

Surprisingly, optimism about the biotechnology industry did not differ from the overall average for questions related to facility construction. For the 44 individuals who answered this question, the average response—3.6—is exactly the same as that of the general survey population. Several counter factors are at work here. The primary factors positively affecting construction of new facilities are the tremendous growth in revenues and approved products, the entry of small biotech companies waiting for their big commercial break, and the emerging biosimilars business. On the negative side, the industry, particularly in biopharmaceuticals, is becoming much more efficient in its production methods. Today's plants require five- to 10-fold less production capacity than the same physical product volume would have demanded 10 years ago.

That being said, respondents in biotechnology were slightly more pessimistic than the consensus about expenses related to lab innovation: just under 3.5 compared with 3.6. This difference is probably not statistically significant, but neither number is encouraging.

The all-industry results do not look promising for hiring-related expenses. Pessimists (responses of 1 or 2) outnumbered optimists (6 or 7) by a factor of three. This was nearly matched by the pessimism/optimism ratio for employee compensation, 2.7. Perceptions for 2013 with respect to technology acquisition deteriorated compared with the 2012 outlook, however. In the most recent survey, those predicting lower spending outnumbered optimists by only about 50%, but overall optimism scores were somewhat lower compared with 2012 (3.8 versus 4.0).

"Responses to 'organizational commitment to investment' were skewed toward favorable views."

On the question of lab automation, respondents from every industry sector predicted significantly lower outlays for 2013. Automation is viewed as a luxury for most labs, even though the return on investment has time and again been demonstrated to be short and the benefits extend long term. The consensus average, a tad below 3.4, indicates lower interest in robotics and other automation tools. Surprisingly, respondents in clinical labs, where automation is an absolute necessity, came in exactly at 3.4.

Summary

Laboratories represent an incredibly broad range of competencies and activities. Despite this, perceptions by managers are remarkably consistent across industries. The 2012 survey clearly indicates consensus on this point: Labs will continue to purchase what they need to maintain current workloads, but managers are waiting until business improves before investing in capital-intensive improvements such as automation, redesign, staffing, and new facilities. Indeed, volunteered comments accompanying the survey results suggest that labs are making do with what they have. While pessimists outnumbered optimists by factors of two or three, not all was doom and gloom. The percentage of optimists was approximately the same as in 2011, which was much improved over the previous year. Survival is not a dirty word in a world recovering from catastrophic financial shenanigans, and toward that end treading water is not such a terrible strategy.

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

THE PROCUREMENT DILEMMA

CREATING A WIN-WIN RELATIONSHIP WITH SUPPLIERS IN ORDER TO OBTAIN THE BEST PRODUCTS AND PRICES

by F. Key Kidder

The Prisoner's Dilemma, a classic game theory scenario, perhaps best illustrates the quandary confronting two parties, wherein cooperation and trust is the high road best taken, and acting in one's own self-interest the low road to doom.

Under the rules of the game, two accomplices are interrogated separately. Should one decide to implicate the other, he or she will go free, while his or her partner in crime is jailed for ten years. If both confess, each gets five years. But if neither talks, both get off lightly. It's a clear win-win, the best possible outcome—yet can they rely on one another to follow suit?

As a model that predicts outcomes of cooperative and competitive behavior, game theory is used to inform decisions about issues such as negotiations between buyers and sellers. And with several million dollars' worth of equipment on hand and a mandate to trim costs, it is lab managers who can find themselves on the horns of their own procurement dilemma.

"Under globalization's regime, outsourcing competition eliminated weak vendors from the supply base."

Their conundrum can be distilled into a basic proposition—when dealing with vendors, is it better to play for keeps and try to beat them at every turn or perhaps wiser to leave a few dollars on the bargaining table and part on friendly terms? As a show of good faith, who dares take the first step and risk sharing information that the other party might exploit to gain advantage in negotiations?

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Whom can you trust, and how far? What's it going to be—win-lose or win-win? Or is there a third option—win some and lose some—a win-balancing arrangement?

Not that long ago, buyers generally called the shots. They decided and vendors executed. If problems arose, one or both were quick to assign blame and apply contractual penalties.

But under globalization's regime, outsourcing competition eliminated weak vendors from the supply base. Instead of vertically integrated companies that do it all internally, "there's one network of companies competing against another network of companies," said Jeff Hynds, director of innovation at Ingersoll Rand's Center for Energy Sufficiency and Sustainability. "And that network includes all the suppliers that the primary company depends on. You're only as good as the worst company in your network."

Suppliers that have survived the shakeout add value by virtue of skills and technologies that make them more attractive—and selective—with regard to buyers. Instead of being expendable, suppliers are a highly critical part of the mix.

In this new paradigm, supplier relationship management has become a necessary skill for the scientific community. But even as SRM conferences and software packages promise some relief for long-term supply chain issues, managers bump up against the more immediate procurement realities of delays and shortages or are excluded from preferred supplier loops.

> "Obtaining the best product, performance, and price depends on making the right moves to strike up robust vendor alliances."

With more geographically distant vendors "hesitant to set up storage on this side of the pond, back orders and Customs hang-ups are more frequent," said consultant Elizabeth Knollmeyer. "Without reagents and supplies to operate equipment, you're dead in the water."

In an Industrial Research Institute study, one hapless manager, adrift in a sea of suppliers, likened his predicament to a fishing expedition.

"Suppliers are like fish in the ocean. We are the fishermen. The key challenge facing us is how to put out the right bait so we can pull up the right suppliers at the right time. … How do we know we're using the right bait … or … that the right kind of fish are in the water? More important, when we catch a fish, do we keep it or throw it back?"

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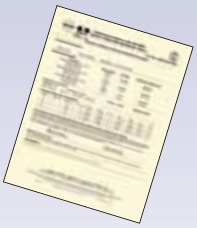

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"Everybody has a relationship with suppliers, [regardless of] whether they want to call it a relationship," said Knollmeyer. "It's up to [managers] what to make of it. [Vendors] can be your ally. You don't want to be adversarial."

And that's particularly true for managers engaged in innovation sourcing— supplier collaborations that drive innovative processes.

Of course, not all vendors have equal value—commodities are typically driven purely by cost, and interactions with these suppliers are presumed to be short to medium term.

"Win-win is far more achievable than it is given credit for."

"In my simplistic engineering view, there are suppliers that supply things you can get from a lot of different places—nuts and bolts and wire and certain integrated circuits," said Hynds. "Then there's a set of suppliers with differentiated capabilities, so there are only a couple you can go to."

Metrics, analytical software, and financial incentives have their defenders as solutions to vendor issues. But more than ever, obtaining the best product, performance, and price depends on making the right moves to strike up robust vendor alliances. It's all about the quality and fit of the relationship and the human element.

Therein lies the rub for lab managers—selecting the right suppliers and developing good relationships.

"The distinction between distributive negotiations and integrative negotiations is important," said Dr. Roger Mayer, professor of management, innovation, and entrepreneurship at N.C. State's Poole College of Management.

"Distributive negotiations, or haggling, is when you're out to get everything you can, just trying to meet your own needs. That can often get the 'best deal,' but it also has a long-term effect on the relationship. It sends a signal to the other party that you don't care about what they need, and in fact, you've demonstrated it."

Cultural and organizational forces, performance appraisals, mandates from higher-ups—there are "lots of things that lead one to believe you have to beat the other party," said Mayer.

When managers enter negotiations believing "both parties' goals are in fundamental and direct conflict, resources for the negotiation are fixed and limited, and each party wants to get all it can," they assume it is a win-lose proposition.

"But do these four conditions really describe the situation? That's what you have to determine if you want to achieve integrated negotiations" that meld the needs of both parties. Win-win "is far more achievable than it is given credit for," said Mayer, adding that a "free flow of information" is critical for identifying "some creative solution where both parties get what they want."

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Strategic considerations also matter. The Industrial Research Institute, an association of more than 200 private sector and federally funded labs concerned with R&D innovation, has studied the impact of supplier relations on technological innovation.

"The technology you're counting on isn't kept in-house anymore," said Edward Hummel, director of business development at Bell Labs, an IRI member. "In many industries, the really core technologies" are becoming increasingly granular. "Companies want to find a way to flow their customer problems down to the supplier community and have them solve lower-tier things. So you pick suppliers that complement you fairly well and share, trusting them not to expose your crown jewels. There's a trade-off between what I don't share and what I put on the table in order to establish trust."

Trust takes time. When the mutual expectation of repeat business exists, strategic relationships can begin to take root through what game theorists call "repeat plays" or interactions, as opposed to the single play that characterizes commodity transactions.

"If companies want to play, they have to move fast," said Hummel. But how can trust be determined before a prospective partner has had time to demonstrate trustworthiness? There's a shortcut, says Mayer. "Check with people in their network about their reputation."

> "When the mutual expectation of repeat business exists, strategic relationships can begin to take root."

"You're not going to get all your value in a single transaction," said Hummel. "It bogs down the process and reduces openness to nickel and dime suppliers over every aspect. Maybe you don't make out really well financially on every piece of the transaction. But it balances out over the course of the project," a win-balancing concept.

"There are times when it's clearly a distributive situation, with portions that are mixed and portions that are integrative," said Mayer. Intellectual property often becomes problematic, "but it's not the only class of information that needs to be protected in negotiations. Find what you can share, and tell them what you can't."

As lab managers and suppliers work together and deliver on what's promised, trust builds and the quality of their information sharing improves, enhancing performance. As the linkage between companies and suppliers moves higher up the value chain—from commodity to custom, collaborative, and strategic—so does the extent of investment in the relationship, perhaps to the point of overdependence.

In some industries where suppliers register most new patents—automotive being one—vendors being wooed are able to choose who receives scarce resources, while competing companies consider how

to make themselves the most attractive potential partner. Only by becoming preferred customers can companies ensure access to supplier innovation processes—a development that completely inverts the traditional buyer-supplier relationship.

Even if managers are empowered and informed regarding company strategy, they may not have the skills to act effectively. "If you look at the personality types of scientists and technologists, they're not naturally communicative," said Hummel. "And they also tend to be risk averse. It's uncomfortable for them."

Since the mandate to reduce procurement dollars can shift the focus from value to cost, Knollmeyer urges managers to "put the top 25 percent of purchased items out for bid every year or two" to drive competition." If a lab belongs to a GPO, compare pricing through the GPO against buying direct. Some vendors can reduce inventory management by ordering items at par value in advance and can advise managers about new products.

Many vendor issues can be avoided through better preparation. A LinkedIn group discussion and poll data on laboratory informatics systems placed the onus on managers to improve their up-front investment. Developing a rigorous hierarchical model of lab workflows "should then be driven by the vendor … through to an actual prototype, as distinguished from a demo. People accept demos at face value [but] inspect prototypes closely." Improved communication also helps. By posing specific goals and problems to vendors, their understanding of lab wants and needs improves, instead of vendors "tediously saying 'yes, the system can do this or that.'"

Suppliers are working to become more responsive and attentive. Before Wayne Collins moved to Agilent Technologies, where he is worldwide manager for energy and chemical products, he was lab manager at Solvay Polymers and had a staff of 60.

"We're not interested in making a sale and getting the money and running. We want a happy customer and a long-term relationship. Agilent spends a lot of money doing customer surveys. Most companies measure customer satisfaction. At Agilent, it's a top corporate goal to improve it each year, and we have processes in place to do that. The thing that really makes customers unhappy is when they feel the vendor isn't listening to them."

"It's good to engage the supply base early," said Hynds. "You have more time to close the gaps between what they have and what you need. It's also critical to assess the supplier's capabilities, their engineering, and their quality control, early on. Probably the best way is to look around their factory and talk to the folks on their line. If you're going to compete down the road, can this supplier advance your product? Do they have the right technology and processes in place, and are they trying to improve them? Because you're better off if you can establish a long-term relationship."

F. Key Kidder *left journalism to pursue a career in government relations, politics, and PR, but he still likes to keep his hand in writing. He can be reached at k2@keykidder.com or by phone at 410-963-4426.*

RESOLVING CONFLICT IN THE WORKPLACE

By Michael Soon Lee

Most managers and employees fear conflict at work because it can reduce productivity, negatively impact teamwork, and consume valuable time that could be better spent elsewhere. Unfortunately, conflict is inevitable, since there are always differences of opinion and interests in the workplace, so we might as well learn to deal with it.

How does conflict arise? There are several common causes of conflict in the workplace: interpersonal relations, organizational issues, change, and external sources. It usually starts out with two or more employees avoiding each other or just harboring negative feelings but can eventually develop into outright hostility and even violence.

Interpersonal conflict is the most obvious source of dissention in the workplace. Differences in work and personality styles commonly clash, increasing miscommunications and anger, which in turn reduce productivity as workers avoid and withhold information from one another. Add to this the fact that more than one-third of all workers come from cultures outside majority Anglo backgrounds, and cross-cultural differences in communications and values are added to the mix.

Organizational conflict can develop whenever there are differing interests, which can be a daily occurrence. Common examples are differences in interests between supervisors and employees, between departments, or between generations.

Change in the workplace brings constant conflicts between those who are more comfortable staying with the status quo and those who embrace change as a sign of progress. If the reason for the change is clearly articulated, more people will be willing to adjust. However, too often change is presented without a clear purpose.

External factors can also lead to conflict in the workplace. Economic pressures are often generated by changing markets, domestic and foreign competition, and governmental intervention. Be constantly on the lookout for changes to relationships with external parties.

Successful organizations embrace conflict as an inevitable product of diverse human beings working together. Smart leaders encourage differences of opinions and work styles as a way to increase creativity. They also have a clear forum for addressing differences before they begin to negatively impact productivity. This forum usually involves asking the manager to mediate disputes without assigning blame or guilt.

Mediation is a systematic process of allowing each of two parties in conflict to state their positions to the manager and the other party without interruption. Then the manager enables the two parties to try to develop their own solution. If no solution can be reached, the manager will impose a solution, with each party recognizing that both are likely to be somewhat dissatisfied with the result. It is for this reason that about 85 percent of the time this process results in two conflicting parties developing and agreeing to a resolution to the conflict that had previously negatively impacted them and the company.

Managers must constantly be on the lookout for interpersonal conflicts through surveys, interviews, and focus groups. Employees must be willing to report disputes that they are unable to resolve. Remember, you can't avoid disputes and dissention, but you can mediate them with or without management getting involved. Once you have a system for handling it, you may even start looking forward to conflict in the workplace!

***Michael Soon Lee**, MBA, is a trained mediator, author, and speaker who teaches companies how to develop an atmosphere that welcomes conflict and differences in the workplace. He also teaches managers a process for mediating disputes between employees and departments and with external organizations.*

LABCAST Be sure to attend Michael Soon Lee's Lab Manager Academy webinar "Resolving Conflict in the Workplace" on Wednesday, April 3 **or afterward at www.labmanager.com/resolvingconflict, to watch the archived video**

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DEFINING THE NEW ART OF "RISK MANAGEMENT"

By Mark Lanfear

Risk management in this economy goes well past the usual definitions of safety and compliance. Risk management is often identified in terms of assessment and prioritization of risks from uncertainty, project failures, legal liabilities, and, most of all, accidents.

What seems to be challenging the scientific working world, and what has influence over all these possible factors, however, are the people who execute critical roles—the people who process and manage our projects in a laboratory, those who conduct research and development, and those who oversee manufacturing environments.

Therefore, a risk management strategy as it relates to talent, succession planning, training, professional development, and, most of all, the acquisition of new talented resources is the largest risk to our business being successful.

There is now a well-documented "war for talent" occurring across the globe. Major consulting firms, academic centers, and institutes are identifying the ability to acquire the right resources as one of the largest risks to our businesses at both tactical and strategic levels. Where every company is asking its workforce to do more while being increasingly efficient, the need for expert talent is increasing right along with that demand.

Companies have spent many of their risk mitigation dollars on talent acquisition, talent retention, and development. Categories of talent have been identified and are engaged with differently. Pivotal, strategic, core, creative, and supporting talent are all essential members of an integrated team.

The risk mitigation methodologies regarding the workforce have been raised to such awareness and importance that new techniques for talent acquisition have been developed.

> "Companies have spent many of their risk mitigation dollars on talent acquisition, talent retention, and development."

And across the science industry we are seeing the leaders in the technology for talent search, such as Monster and CareerBuilder, invest time and dollars in mapping the migration, as well as the up springing of colonies of talent across the globe. Certain methodologies, like "environmental scans," have nothing to do with climate change. But what's heating up is this tool that looks at the framework of the labor market and can balance internal and external factors that affect supply and demand. These scanning tools and business modeling activities are not looking at items from the atmosphere, but are down to specific job categories and roles.

We all execute for customers, either internally or externally. Through the reduction of risk we build up our "customers'" confidence in our ability to do the job, and companies that take up the assumption of risk release the customer from revenue-zapping worry. In the science realm two things we know a lot about are cycle time and supplier relationships. If we don't receive our needed compounds, products, and inert ingredients at all the right times, that can greatly affect our output. If our machinery isn't calibrated correctly or if our cycle types for reactions are not exact, we lose time, revenue, and output. Take the concepts of cycle time and the supply of talent. What happens when it's crunch time and the labor force is low? What happens when you're ready to ramp up for the newest project and everything is ready except for the expertise you need to execute? This is where risk management is at its most critical. Total cycle time as it applies to talent is made up of applicants short-listed, billing rates, duration of assignment, and pivotal and supportive roles, just to name a few.

The application of risk containment methodologies and therefore the responsibilities of risk management

professionals have grown greatly as compliance standards and, most of all, economic thresholds have skyrocketed. Now that the war for talent, the pace of change, and the drive for innovation have taken over our scientific industries, an organization's response to these factors and the mitigation of them are two of the key leading indicators of success. A workforce risk mitigation plan is one that identifies the skills and capabilities needed to execute the organization's strategy and achieve success.

Risk mitigation used to be about litigation and safety, but now I would challenge that the very core of each of our businesses hinges on strategic workforce planning methodology and talent supply chain modeling. Integration of resources and expertise—not always best in breed, but most tightly orchestrated to the overall business goal—will prepare organizations for possible futures, will mitigate future risk, will improve agility and therefore economics, and will give a company an essential capability for success.

> "There is now a well-documented 'war for talent' occurring across the globe."

Building a competitive advantage requires the right workforce strategy, mitigating the risk associated with talent gaps, and knowing that building a solid labor force is foundational.

Ten million expert workers leave the labor force every day. How is your company responding?

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 life science industry conferences and a writer for life science periodicals. He can be reached at MARL773@kellyservices.com or 248-244-4361.*

HARBORING A HOARDER?

MAYBE THAT EXPLAINS WHERE ALL THE LAB SUPPLIES WENT

by Kristina Majsec

In laboratories and research facilities around the world, you will sometimes come across a very peculiar type of person. The first clue that you have met a member of this distinct species comes when you try to borrow a flask or reagent from them. The second is their need for having several dozen full boxes of pipette tips in stock. And the third is that they have more empty flasks, Petri dishes and test tubes in their cabinets than the rest of your coworkers combined. But it won't be until you actually uncover their enormous stash of unused laboratory supplies that you will know for certain that you've met a lab hoarder.

On one hand, having a lab hoarder in your facility can sometimes prove advantageous. They regularly restock shared buffers, for example. And if by some chance a financial crisis wipes out all manufacturers of lab supplies and consumables, your lab will still be able to stay in business thanks to the overwhelming stock in your hoarder's cabinets. That is if, by some miracle, you can coerce them into sharing it.

> "Dealing with a hoarder on an everyday basis can be quite frustrating."

But dealing with a hoarder on an everyday basis can be quite frustrating. They are paranoid and proprietary when it comes to every piece of equipment they are in contact with. They are also very protective of what is "theirs" and give very confusing and meaningless responses when their problem is discovered. But, despite all this, they are actually quite harmless. Especially when compared with the ultra-kleptomaniac type of hoarder. These are the ones who don't act as quirky in the lab, but take lab equipment home with them and make personal stockpiles that no one can access, because no one knows about them.

If you begin to notice small amounts of supplies mysteriously disappearing from the lab early on, you might be able to identify and fix the problem before it escalates. More often however, you don't readily notice the disappearance of small items, such as tweezers and pipettes, as you can always find others. By the time electrophoresis power supplies, small centrifuges and even computers start to vanish, the criminal hoarder has a complete laboratory set up at home, which they are not willing to give up.

Such extreme hoarding cases happen more rarely, but they still happen. And when you hear about such situations you wonder how their colleagues didn't notice what was going on. The truth is, there is no sure-fire system or technique for recognizing hoarders. You can't know what people have going on inside their minds or what sudden change will trigger this behavior. At my facility we had only one case this drastic, but it was enough. Although things started to disappear weeks earlier, we discovered the culprit only by chance. He was a colleague who was about to lose his contract and, out of spite or some inner fears, began to take equipment and supplies home. He didn't seem like the type of person who would react to personal or professional failure so drastically. Spite and anger are normal human emotions, but what on earth was he thinking? When someone came across him late one night carrying out a computer that was usually connected to an epi-fluorescent microscope, he had the most ridiculous and incredible explanations.

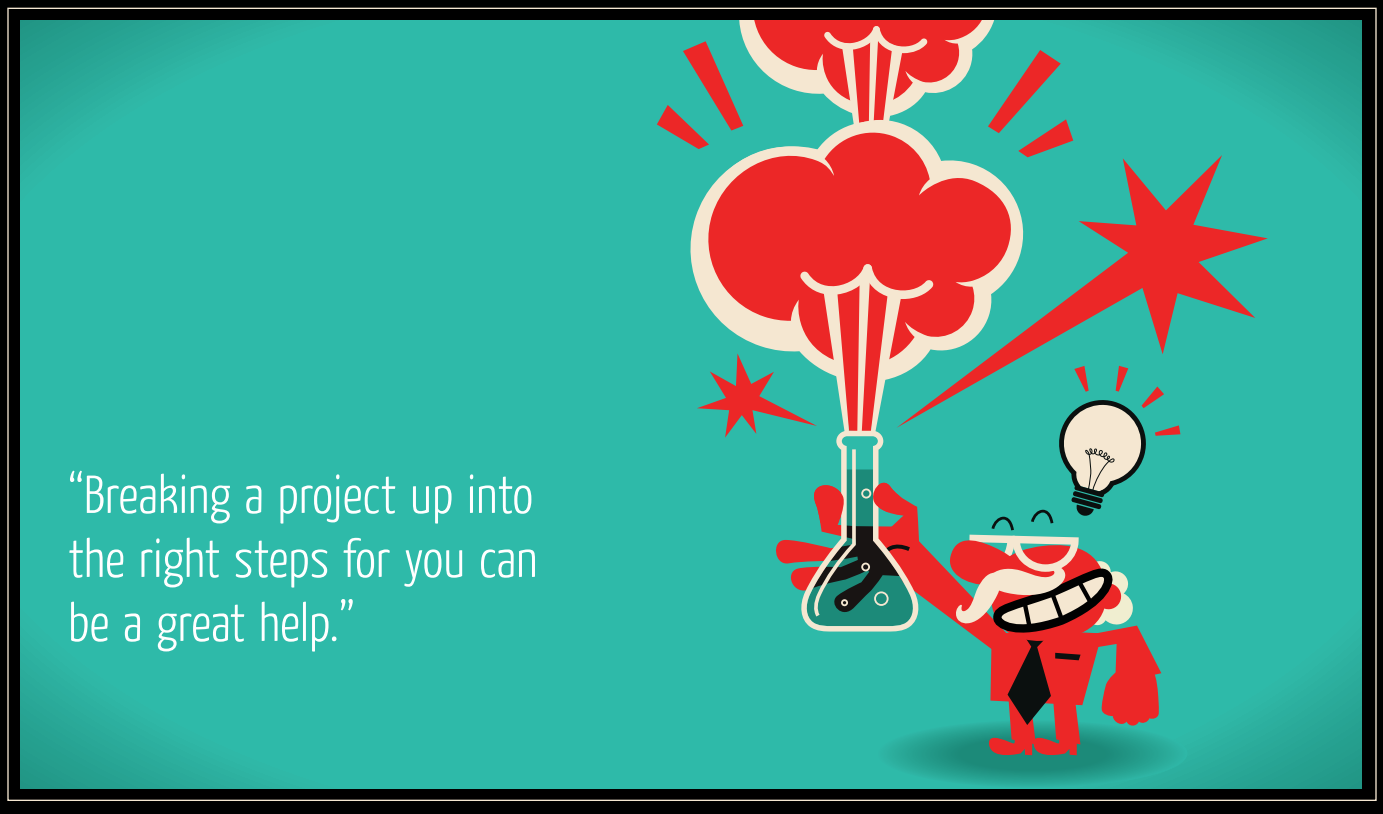
These people are not entirely rational, so these situations embarrassingly end up in court. Since hoarders

often refuse to admit they have a problem, they are unable to settle with their former institution and return the stolen equipment. You can imagine how terrible it feels to see a colleague with whom you'd had a genial and normal working relationship lose their dignity in this way. What appears normal in their outward appearance does not necessarily reflect what's happening beneath the surface.

By knowing how bad things can get, it is easier to cope with the "normal" kind of hoarder. Once you realize that it's more dangerous when people keep the oddness within, you can better tolerate the habits of mild hoarders. As long as they are not a safety or hygiene hazard, you should leave them alone. And if they cross the line into criminal behavior, it becomes a psychologist's and police business. These people are just deeply insecure and use this compulsive behavior to maintain a fragile mental balance. Politeness and firm boundaries can greatly improve the working environment and help in your everyday interactions with compulsive hoarders. You don't have to have a beer with them after work, but at least inside the lab, you can avoid unnecessary confrontations.

Oh—and when things start to disappear—keep your eyes open.

Kristina Majsec *is a Ph.D. candidate in biology in Zagreb, Croatia. This article first appeared as a blog on 1DegreeBio.org and is reprinted here with the author's permission.*



MOTIVATE YOUR LAB

HOW TO RUN AN EFFICIENT AND CREATIVE LAB WITHOUT MICROMANAGING

by Edyta Zielinska

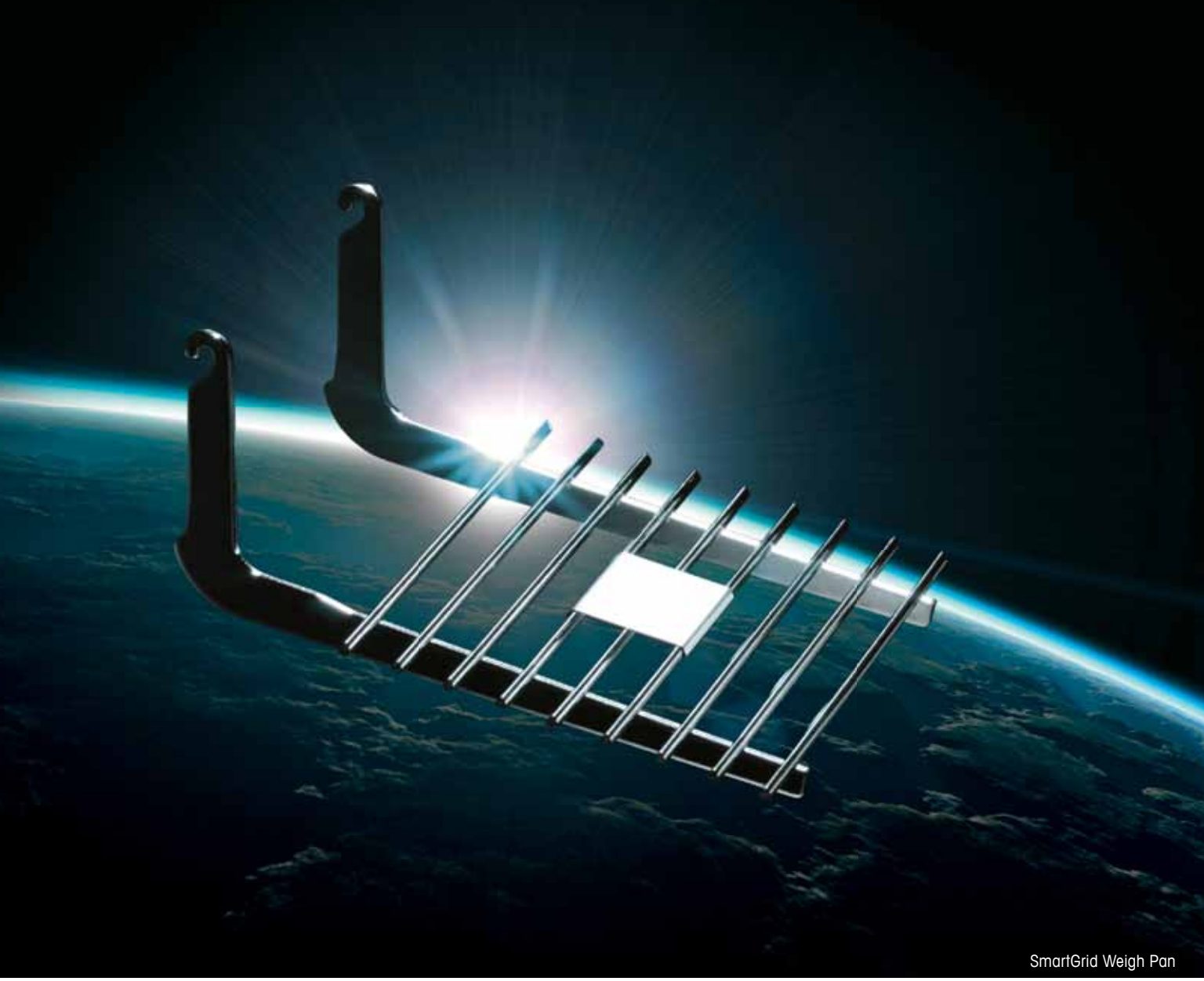
Even though he had just landed a grant for an exciting new project to study why and when people fail to monitor their progress towards a goal, University of Sheffield social psychologist Thomas Webb was a little stressed. "It's only me and the two postdocs, and I knew it would come down to my management style," at least as far as getting the work done. So he set up weekly meetings, in which the group outlined the tasks that needed to be performed and set deadlines for each task.

As with most young investigators, Webb's success in academia relies in large part on the initiative, drive, and creativity of his research team. Webb is one of a number of social psychologists whose research grapples with the question of what motivates people, what makes them adopt new habits or break bad ones. It can be challenging to apply some of the findings to one's own research team, when faced with the same questions that challenge every new manager: how to get the most out of your team without micromanaging them.

Research teams comprise postdocs, graduate students, and research assistants, individuals who each have different career goals and are "highly intelligent and want autonomy," says Vish Krishnan, a management scientist at the University of California, San Diego (UCSD) Rady School of Management. "Managing such teams is like herding a bunch of cats," he says. The good news is that some recent research on keeping people motivated is providing new explanations for some old tenets of good management.

Define their motivation

While a laboratory may have a single overarching goal or research focus, the daily work of science requires the completion of multiple subgoals, some of which may not seem as glorious or as relevant as some team members would like. One way to get everyone working as a team is to discern how best to motivate each of them. "Some people are better at avoidance goals. Some are



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better at approach goals," says David Neal, a social psychologist who works on habit formation and is cofounder of Empirica Research, a market research firm. Most people will know which group they belong to: do you tend to study for an exam because you want the "A," or do you study because you're afraid of failing? "There are individual differences," says Neal. Find them out, and you can frame tasks as either gaining a positive goal or avoiding a negative one.

Get gritty

"Grit" is the word psychologist Angela Duckworth of the University of Pennsylvania came up with to describe the characteristics of top leaders who are passionate about a goal over the long term. People who make it through military boot camp have it, and it's likely that successful scientists have it too. Grit is defined as a characteristic of someone who sustains interest in projects, does not give up despite encountering obstacles, and diligently finds ways to improve his or her work. "Science is so long-term and so uncertain. You have to be in there for decades to see the impact of your work," says Duckworth. While some people seem to come by grit naturally, Duckworth believes that it is a trait that can be developed, and part of it comes from becoming more comfortable with frustration, she says. In a laboratory setting, regularly assessing obstacles that can lead to frustration and delay can help the team get into the habit of solving problems early.

Get uncomfortable

"We prefer to do things correctly rather than incorrectly. We prefer to be praised," says Duckworth. This is in part what makes getting negative feedback so difficult. But when a person can focus at least a part of each day on the uncomfortable things that he or she is not good at, says Duckworth, it usually leads to tremendous improvement over time. But it isn't easy. During one-on-one meetings, managers can ask team members to make a list of areas they want to improve upon—whether it is expertise at a particular protocol or personal skills such as time management or writing—and to make a plan for improving those areas.

> "The daily work of science requires the completion of multiple subgoals."

Encourage mistakes

"Perfectionism can lead to myopia and to not searching widely" for solutions, says Paul Schoemaker, a professor of marketing at the University of Pennsylvania's Wharton School. As a society, "we emphasize perfection too much, at the expense of success," he says. Acquiring and cultivating grit requires making mistakes, Duckworth says. When experiments fail, a careful assessment of all the specific reasons for the failure can make the setback feel more like an opportunity to learn than

a disappointment. At lab meetings, have your team members get in the habit of presenting each setback along with an assessment of why it occurred and a possible solution. "Most entrepreneurs, and the venture capitalists who invest in them, live by a bold mantra: fail fast, often, and cheaply," writes Schoemaker in his book *Brilliant Mistakes: Finding Opportunity in Failure.*

Allow a bit of sloppiness

The discoverer of penicillin, Alexander Fleming, was as playful in his scientific habits as he was in his life. "When he played golf, he wouldn't follow the rules," says Schoemaker, who writes about Fleming in his new book. Nor did he follow today's standards of laboratory hygiene, letting his bacterial cultures be overgrown by the *Penicillin* fungus that ended up killing them—a slip-up that has saved millions of lives. Lab PIs can challenge their team to come up with an experiment that they think is sure to fail, and then perform it to test their assumptions.

Diagnosing lack of motivation

At times managers will perceive a lack of motivation or progress from a particular team member. Here are a number of situations that could explain the apparent loss of interest.

The goal is not valued. In order to motivate, a goal must be both challenging and specific. If the task is deemed too simple, the goal can lose its value to a team member, and thereby lose its ability to motivate.

The goal is perceived as unattainable. The goal may still be valued highly, but a person's confidence that the goal is attainable falters. This can happen when a member of the lab feels as if progress is not being made despite his or her efforts.

Overcorrection feels like underappreciation. Micromanagement—correcting the details of every task—can make people feel as if their work and effort is not valued, which can lead to a loss of motivation. Try limiting a critique to five things, in grading undergraduate dissertations, for example, says Webb. That helps the student focus on the most important problems.

Spur creativity

Although grit and perseverance are important traits, sometimes rigor needs to take a backseat to creativity. "Physical and psychological distance from the workplace seem to affect creativity," says UCSD's Krishnan. While it might help to hold some meetings outside of the lab, Krishnan says the same idea can be implemented with a thought experiment. Have your team members imagine trying to solve a problem under new constraints, says Krishnan. What might a competitor's lab do; what would a lab with few or many resources do? Imagining the problem in a different context can help "people relax their assumptions," he says.

> "You can frame tasks as either gaining a positive goal or avoiding a negative one."

Find the right granularity

Goals, such as getting grant funding, should not be put on your task list. "If my task for today is to write this paper for *Science*," then it'll never get done, says Neal. "Motivationally speaking, breaking a project up into the right steps for you" can be a great help. "Make explicit lists at the right level of granularity,"

suggests Neal. If it looks as though one of your team members is not performing up to par, have them show you how they've broken up the task into manageable chunks that can be assessed individually, and work with them to do so if they haven't.

> "Perfectionism can lead to myopia and to not searching widely for solutions."

Outsource the tough stuff

Keeping on task can require a lot of self-control, which some researchers think people have in limited quantity. One study showed that people who forced themselves to eat radishes rather than chocolates quit faster on a puzzle task than those who did not have to exert self-control (*J Pers Soc Psychol*, 74:1252-65, 1998). A recent study by Gráinne Fitzsimons at Duke University's Fuqua School of Business showed that people may be more effective when they outsource their need for self-control. An example is getting a running partner: having a friend collect you for a run removes the necessity of motivating yourself in isolation. This idea can be applied to a laboratory setting by incorporating a social aspect into the pursuit of goals. Although working in teams does not apply to every task, creating situations where tasks are done in parallel could improve overall motivation.

Try a new kind of meeting

Meetings can trigger motivation by giving goals a social aspect. Here are two styles of meetings that might help bring creativity and focus into your workflow.

THE SHORT AND QUICK

One computer science laboratory described breaking up their hour-long weekly lab meeting, which had focused on presentations, into an abbreviated version consisting of two to three 15-minute lab meetings every week, providing a speed-update on each member's progress, PIs included. Each person would describe what she or he had done since the last meeting; list obstacles; and state the work to be completed before the next meeting. It helped team members feel they had to make progress every day, gave them insight into the lab manager's goals and work process, and created a focused community interaction in which everyone was motivated by each other's progress. It also gave the PI insight into problems as they arose, which allowed the scheduling of "on-demand" meetings to address the issues. (Read the full article or the abbreviated form at *Communications of the ACM*, 53:30-31, 2010.)

EVALUATION MEETINGS

Working to improve your laboratory process and your research output can be time-consuming and feel unnecessary, especially when things are running smoothly. But it's also the best way to institute efficiency by focus-

ing on the process rather than the person. Schoemaker came up with a method to identify the areas in his market research organization that might benefit from employing a new approach. He found that his team always assumed that client requests for a proposal and cost estimate would not pan out, because they indicated a lack of sincere interest. When Schoemaker tested the accuracy of these assumptions, he discovered that, with minimal additional expenditures, he could grow his business by asking younger associates to vet the requests. Here's how to find areas for improvement in your own lab:

1. Have your lab make a list of explicit and implicit assumptions relating to workflow, to lab management, or to a scientific question. For example, "the equipment we need is too expensive" or "we don't have time for weekly meetings."

2. Then score all of the assumptions by how likely each is to be true. In other words, "would you bet your house on it? Your life? Your spouse's life?" says Schoemaker. Then score how big the impact would be if the assumptions were wrong. Plot the results and select those with lower "truth" scores and higher "impact" scores as most likely to be worth testing. Rank the selected assumptions according to how difficult, time-consuming, or costly it would be to test each one by giving it a 1–7 score on each of the five statements listed below (1 = disagree, 7 = strongly agree). The highest-ranking assumption will be the one most ripe for testing.
    1. The possible benefit of finding a better answer outweighs the cost of the test.
    2. This assumption affects decisions we make repeatedly.
    3. The problem is too complex to solve as a thought experiment, without empirical data, and would benefit from experimentation.
    4. We haven't got empirical data because this assumption is not based on much experience.
    5. The lab's experience with the assumption or problem is limited such that the need for innovation is high and promising enough to try.

Edyta Zielinska *is a senior editor for* The Scientist *magazine. She has enjoyed writing and editing Careers articles ever since she started with the magazine six years ago. Edyta can be reached at ezielinska@the-scientist.com or by phone at 215-240-6014.*

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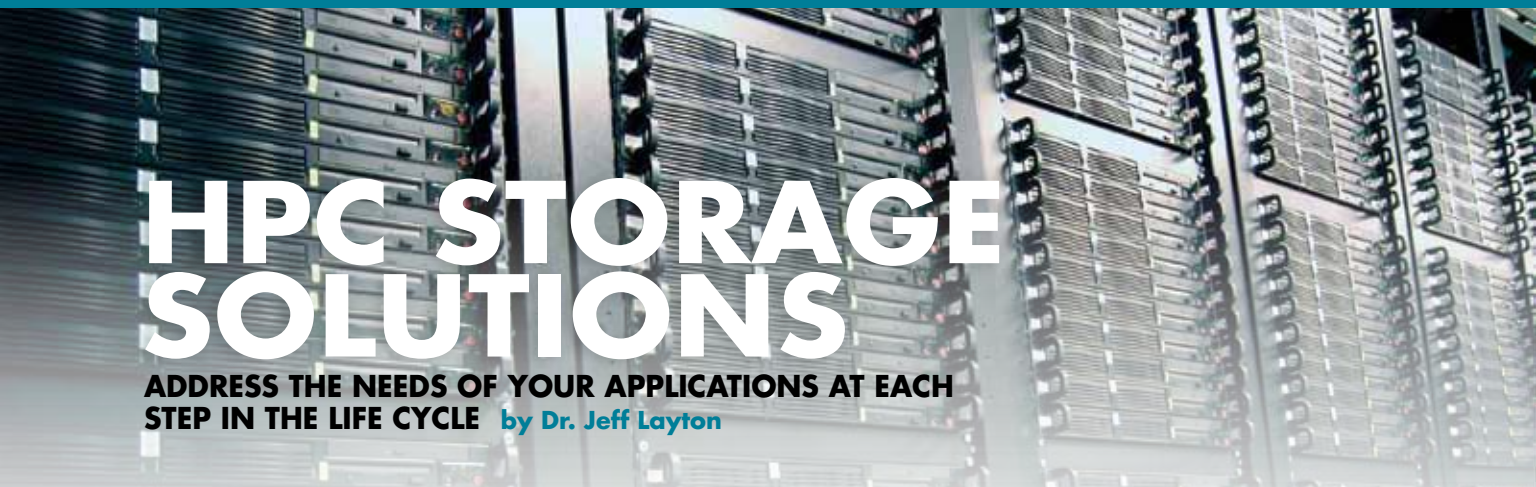

HPC STORAGE SOLUTIONS

ADDRESS THE NEEDS OF YOUR APPLICATIONS AT EACH STEP IN THE LIFE CYCLE

by Dr. Jeff Layton

Do you like Pringles™ potato chips? Do you use skin lotion? Have you noticed all the new planets outside our solar system that have been recently discovered? When you've flown, have you noticed the funny tails that are on the wing tips? Have you seen the new cancer-fighting drugs that are tailored to individuals and their tumors? All these things and many others are made possible by HPC (high performance computing). HPC is quickly becoming an important tool in many companies, research institutes, and universities.

There is no real definition for HPC; generally speaking, HPC is considered to be any form of computation that is faster than your laptop or desktop. But even this traditional definition is changing. Instead of running things faster than your desktop or laptop, HPC now encompasses the need to run the same application, but with 25,000 copies at the same time (kind of difficult to do on your dual-core laptop). Some of the largest systems in the world now have over 1,000,000 cores, such as the Sequoia System at Lawrence Livermore National Labs.

Equally important is the recent trend of using nontraditional computing systems as GPUs (graphical processing units), DSPs (digital signal processors), and specialized processors with over 50 small CPU cores for running applications. Generically, these specialized processors are called "accelerators" because they can accelerate traditional processing. Accelerators offer the potential for very large increases in computational performance for applications that can take advantage of the architecture. You can get performance improvements that are between two and 12 times better than what you can run on a single server today.

The intersection of many CPU cores and accelerators means that we need faster storage to keep up with the larger number of computations, and we need a great deal more storage because we are generating results at a much faster rate. A very conservative assertion in the HPC world is that the size of our models or problems doubles every year and the amount of storage we need also doubles every year. This means that in three years you will need eight times the storage you have today and your models or problems will be eight times larger. Unfortunately, you don't see hard drives doubling in capacity every year and you don't see prices coming down that rapidly either. Furthermore, hard drive speeds are not improving at a pace to keep up with the size of HPC systems and SSDs (solid state drives) are cost prohibitive at the capacities needed. As you can see, HPC storage can be a complex problem with very easy solutions.

In this article, I want to put forth a high-level examination of architecting an HPC storage solution for HPC focusing on two aspects: (1) the applications and (2) the data life cycle.

HPC storage

There are many HPC storage options, but the "best" one really depends on your application (you hear that quite a bit in HPC). It all depends on how your application does I/O (input/output). Does it do lots of small reads and writes? Does it write or read a great deal of data? Is the data access pattern primarily sequential or is it random or is it a combination of the two types? How does the application access data? Knowing these characteristics about your application can help you determine which storage solution is the best in terms of performance, price, price/performance, power, etc. However, measuring these characteristics is not easy and is more of an art than a science. Moreover, you may have hundreds of applications running on your HPC system, which makes the problem even more difficult. If you can't measure these characteristics, what do you do? My recommendation is to focus on what I call the *data life cycle.*

Figure 1 is a basic diagram illustrating the three main aspects of the data life cycle.

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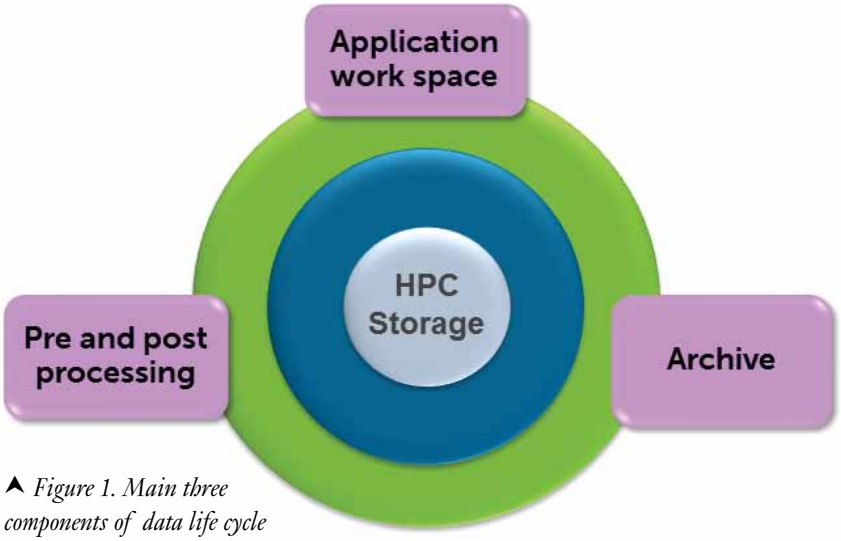

Figure 1. Main three components of data life cycle

The left side of the circle is where the input data for any application is created (called preprocessing). This can involve creating the input data set or getting the lab data ready for processing. This step usually does not require a great deal of performance or a great deal of capacity. However, it does need to be cost-effective and reliable.

Once the preprocessing is done, the next step in the data life cycle is for the application to use the input data to create some output data (i.e., run the analysis). This step in the life cycle is labeled "Application work space." Some applications will require a fair amount of IO performance, some will not, and you might be running tens of thousands of copies of an application, which generates a great deal of IO. The focus of this step is to allow the application(s) to run as fast as possible so that results are obtained as quickly as possible. Consequently, this type of storage should be focused on being fast and relatively inexpensive. But reliability isn't much of an issue because the focus is on running the application as fast as possible.

Once the application is done, post-processing of the data may be needed to interpret the results and perhaps run a different data set. In this step, the data moves back to the "post-processing" step on the left in Figure 1. The storage needs for post-processing are fairly similar to the preprocessing step, so I combined the steps into a single label.

Finally, once the data has been used and is of no further immediate use, the data can be archived. This is labeled on the right-hand side of Figure 1 as "Archive." Data archiving requirements are sort of the antithesis of the application work space. Archive storage requires massive capacity, very good reliability (usually achieved through multiple copies), virtually no performance, and low cost.

Looking at Figure 1 and keeping in mind the storage requirements for each step in the data life cycle, let me ask a simple question: Is there a single solution that can effectively address all three storage aspects? I think the answer is obviously no (if a vendor says they can do everything effectively in a single platform, quickly run from them and don't look back). You will really need to have different solutions that address each of the three sets of requirements and use software tools to combine the solutions into an HPC storage solution. But the good news is that, depending on your application(s), you may be able to combine the requirements for several solutions and even combine them into a single solution, depending on the requirements.

The real key to success is combining these solutions into a single cohesive storage strategy. But don't get lost in the details of each solution and don't feel as though you have to put all three together from the beginning. Rather, focus on your applications first and understand their requirements. Based on this analysis, you can determine which of the three solutions with which to start and which ones can be either deferred or rolled into an existing solution. You can also develop milestones for when you might need one of the other solutions. For example, many people add an archive capability at a later stage once they have a large pool of relatively unused data.

"The real key to success is combining solutions into a single cohesive storage strategy."

Recommendations

The amount of data that can be generated by HPC today is simply astounding. Multiple petabytes are commonplace and that amount still doesn't appear to be enough for some

HPC centers. To keep up with this data deluge, you need HPC storage solutions that may have really great performance but are also very likely to need lots of capacity. It's not possible to create a single storage solution to satisfy all the data needs during the data life cycle, so the best approach is to have solutions that address the needs of your application(s) at each step in the life cycle. To get there, here are my recommendations:

- Understand the IO needs of your major application(s).
- Using the IO requirements from your application(s), develop a modular storage plan and develop milestones or metrics that determine when you need to upgrade or add capability.
- When possible, start with simple storage solutions that are manageable and cost-effective. An example of this is to start with an NFS (network file system) or clustered NFS solutions. For many applications, NFS works well for all steps in the data life cycle.
- Add faster solutions if your applications require them. But be sure to measure the impact of faster solutions because they are usually more expensive.
- Don't forget that data goes cold after a while. There are tools that can help you measure the last time data has been accessed so you can determine if it's being used. Seriously consider an archive solution for storing cold data that has not been used in a while.
- Measure, measure, and measure the IO needs of your application, as this is the key to effective HPC storage solutions.

This is just a brief introduction to HPC storage. But I hope it has piqued your interest into how some of these recommendations can be accomplished and it impacts the research performed on the HPC system, how you can adjust your applications to better utilize HPC storage, and how the storage solution can be architected.

Dr. Jeff Layton, *HPC enterprise technologist, Dell | Research Computing, can be reached at jeffrey_layton@dell.com or by phone at 678-427-5819.*

PREPARED FOR POWER FAILURE?

CHECKLISTS AND ADVANCED MANAGEMENT PLANNING CAN KEEP YOUR LAB UP AND RUNNING

by Raymond L. Hecker

Although the concept of a checklist has been regarded as a foundation of standardization and operational safety in government and industry services for some time, such techniques have generally escaped the scrutiny of the human factor industry. Most laboratory operators budgeting for and installing new equipment tend to overlook key elements of their projects. This oversight results in missing the full scope of the required tasks, which usually lands the laboratory or project manager on the short side of funding, time, materials, and human resources when contemplating and/or installing a capital improvement project. Additionally, in day-to-day operations, the improper use, or nonuse, of a standard operating procedures checklist or approved prescriptive-testing protocols by laboratory operators is often cited as a contributing factor to unnecessary rework/retesting, release of quality control errors,

> "Complying with [checklists] is an ongoing battle in laboratory management."

delays, increased cost, and, worst of all, accidents. The origin of the modern checklist and operational guidelines we use today had its roots in a loss-of-life accident and the complete destruction of a key frontline military strategic weapon system prototype on October 30, 1935. Checklists are not new; however, complying with them is an ongoing battle in laboratory management.

There are many types of checklists. The one for this discussion is associated with the acquisition and installation of new laboratory equipment, namely the site preparation or preinstallation guide/checklist available from all major instrument OEMs. Our interest is to examine this seemingly mundane, yet critical management instrument, including its functions, usage, and human limitations when preparing the lab to accept new equipment.

Whether the laboratory adopts an instrument OEM's checklist or develops its own project checklist for new equipment, certain sociotechnical factors, such as the laboratory's culture, internal operations/resource management, experimental design or production pressures, and other time constraints, influence the design and usage of the checklist. While the focus of this article is on the laboratory industry, most checklist concepts are universal and apply equally well to other high-risk industries such as maritime, air-carrier and rail transportation, power production, mining, refinery operations, weapons systems, space flight, continuous-process manufacturing, human factor, and veterinary health care/science.

What is a preinstallation checklist?

The major function of the site preparation or preinstallation guide/checklist is to ensure that the various laboratory staff, facilities management, external contractors, and executive/financial management understand the scope of the program and properly configure the laboratory to accept the new instrumentation system. The preinstallation guide forms the basis of installation and operation standardization in the laboratory before, during, and after the start-up of the instrumentation system. Only when the instrument is properly installed and deemed functional and staff training is conducted can benchmarking begin. Once benchmarking criteria have been satisfied, full production operations can initiate. There are many types of checklists that the laboratory manager should make available to her or his team in order to successfully and efficiently run the laboratory. This article's focus is on the installation and start-up of the new instrumentation system, with particular emphasis on electrical facility improvements required for the lab.

An industry consultant and probably a seasoned laboratorian with extensive experience in new equipment acquisition and laboratory redesign will immediately recognize there is a void in most lab managers' skills tool bags when it comes to knowing all there is to know to get a new system

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specified, budgeted, acquired, installed, benchmarked, and finally declared approved for production. Most lab managers do not have the experience required to smoothly manage a major revision to a lab's facility infrastructure, often required to support a new capital instrumentation system. This is where developing the skills to manage the experts in each respective area of the project becomes very important. Most laboratory managers are generally not interested in learning the fine details of how infrastructure improvements are made. This initial decision to abdicate understanding of infrastructure is profound at the foundational level. It affects all other decision-making steps that are required in effecting a major capital improvement, such as a state-of-the-art instrumentation system.

Electrical infrastructure improvements are an area that consistently tax laboratory managers for three reasons:

1. The language of the electrical industry is regulatory and industry specific—arcane at best and only understood by few in an almost mysterious or secret way.
2. Understandably, most laboratory managers focus on their science and lab operations. They have not taken the time to understand what electricity is, how it is delivered, distribution impacts, that it is a common and unreliable utility, and whether the new instrumentation system should have its electrical power mitigated or even be connected to an emergency generator system.
3. Electrical infrastructure improvements require design-build engineering, a bidding process, long lead-time scheduling, facilities management, licensing, permits, multi-trade contractor interfaces, municipal inspections, and, for a large project, an authorization-to-occupy, aka an occupancy permit indicating that the premises (laboratory) is "suitable to occupy" from health and safety points of view.

Reviewing the details: The electrical section of the preinstallation guide

Unless your laboratory staff has extensive and frequent experience with electrical installations for complex instrumentation applications, consider consulting with laboratory construction specialists, laboratory design/build contractors, and suppliers of certified instrument power protection systems. As you review the electrical requirements sections of the site installation/preparation guides below, you will note specific requirements for the instrumentation types.

Select site preparation/installation guide excerpts (Figures 1 - 5)

Figures 1 - 5 illustrate excerpts from various capital intensive and high-performance instrumentation systems. The key electrical terms and elements that are not common or not specifically defined in these reference documents, but must be understood, are listed below.

POWER CONSUMPTION:	
Maximum Volt Amperes (total)	3270VA
Maximum Continuous Current	20A
VOLTAGE AMPLITUDE SPECIFICATION:	
Operating Voltage	200 - 240
Allowable Voltage Variance	±10%
Maximum Allowable Percent Sag	5%
Maximum Allowable Percent Swell	5%
Phase (single or three)	Single phase or three phase
FREQUENCY SPECIFICATION:	
Operating Frequency	50/60 Hz
Allowable Frequency Variance	±W1 Hz
WAVEFORM SPECIFICATION:	
Maximum Supply Voltage Total Distortion	5%
Maximum Supply Voltage Distortion by Single Harmonic	3%

▲ *Figure 1. Source: PerkinElmer*

CONDITION	REQUIREMENTS
Output voltage	200–240 AC True on line (double conversion)
Frequency	50/60 Hz
Waveform	Pure sine wave
Minimum peak current	3 x nominal current
Output voltage distortion	<3%
Output protection	Circuit breaker
Minimum power requirement	4000 VA

▲ *Figure 2. Source: AB SCIEX*

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POWER REQUIREMENTS

Clarus MS	All electrical supplies must be smooth, clean, and free of line transients greater than 40 V peak to peak, and must meet and remain within the following tolerances: 120 VAC ±10% @ 50/60 Hz ±1% 1000 VA maximum 230 VAC ±10% @ 50/60 Hz ±1% 1000 VA maximum Add 100 VA for the computer and 108 VA for a printer.
Clarus GC	All electrical supplies must be smooth, clean, and free of line transients greater than 40 V peak to peak, and must meet and remain within the following tolerances: For GC with slow heating rate as standard; 120 VAC ±10% @ 50/60 Hz ±1% @ 20 Amps, 2400 VA maximum 230 VAC ±10% @ 50/60 Hz ±1% @ 10 Amps, 2400 VA maximum For GC with optional oven heater for fast heating rate; 220 VAC ±5% @ 50/60 Hz ±1% @ 15 Amps, 3120 VA maximum 230 VAC ±5% @ 50/60 Hz ±1% @ 16 Amps, 3120 VA maximum 240 VAC ±5% @ 50/60 Hz ±1% @ 13 or 16 Amps, 3120 VA maximum Instruments and peripherals must not be connected to circuits with large inductive or large and frequent loads (for example, large motors, discharge lamps, photocopy systems, radio transmitters, etc.).

Figure 3. Source: PerkinElmer

ELECTRICAL REQUIREMENTS

Disconnecting Power

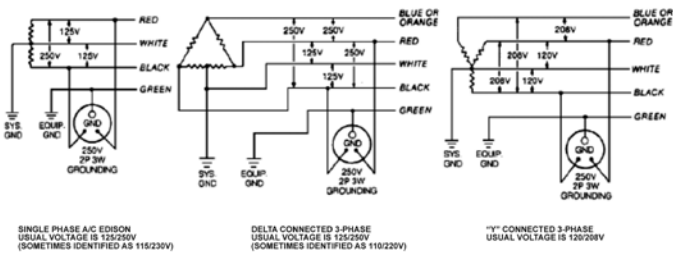
In case of emergency, you must be able to immediately disconnect the main power supply to the instrument.

Power Connectors and Receptacles

The instrument and the separate roughing pump are shipped to customers in the North America with NEMA 5-20P power connectors. These connectors require NEMA 5-20R electrical receptacles (standard 20 A wall receptacles) with proper grounding. Do not use extension cords or power strips.

Figure 5. Source: AB SCIEX

TYPICAL VOLTAGE CONFIGURATION *US* VOLTAGE SUPPLIES



Receptacle terminal identifications are according to NEMA standards 5/18/64

If the customer has a 208 Volt Line Voltage Supply

1. The Fast heating performance will probably be degraded.
2. Request that the customer have his electrician rewire the Line to 240 Volts.
3. The Chromatograph Heater must be matched to the appropriate supply voltage.
4. The Supply voltage is not typically guaranteed by the Power Supplier.
5. The Supplier only expects the Line Frequency to be within their specifications.

Figure 4. Source: PerkinElmer

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To truly understand the intricacies of instrument electrical power, the key electrical areas to focus on include:

- ☐ Voltage Amplitude Specification
- ☐ Maximum allowable percent sag (5%)
- ☐ Maximum allowable percent swell (5%)
- ☐ Phase (single or three/triple Ø) (1-Ø or 3-Ø)
- ☐ Supply voltage is not guaranteed by the utility
- ☐ Voltage waveform type (pure sine wave)
- ☐ Supply Voltage for various instrumentation elements
- ☐ Matched voltages for main system elements, accessories and peripherals
- ☐ Safety Standards, i.e. national and local
- ☐ North American examples (cUL, UL)
- ☐ International examples (CE Marked, EN, IEC)
- ☐ Check local codes and country specific requirements
- ☐ Frequency Specification
- ☐ Operating frequency (50 / 60 Hz)
- ☐ Allowable frequency variance (± 1 Hz)
- ☐ Waveform Specification
- ☐ Maximum supply voltage total distortion (3%)
- ☐ Maximum supply voltage distortion by a single harmonic (≤ 3%)
- ☐ Current and Power specification
- ☐ Typical peak current (3 x nominal)
- ☐ Crest Factor (current) (3:1 minimum)
- ☐ Minimum power (apparent power) rating in Volt – Amperes (xxxx VA)
- ☐ Circuit breaker protection (MCB) types (slow-blow, et al)
- ☐ Power Quality Description and Connection Limitations
- ☐ Appropriate branch circuits and power delivery
- ☐ Smooth, clean and free of transients – not exceeding x% distortion
- ☐ Circuit type limitations
- ☐ Not connected to other devices with large, frequent loads or inductive loads
- ☐ Dedicated vs. isolated branch circuits
- ☐ Galvanic isolation
- ☐ Bonded neutral circuits (National Electrical Code / Local Codes)
- ☐ Common ground requirements for instrumentation elements and computers
- ☐ Patient/personnel contact approved, or not approved (usually not)
- ☐ Personnel safety
- ☐ Electrical connection devices (receptacles and plugs) types and ratings
- ☐ Emergency Power Off (EPO) (local code)
- ☐ Direct disconnect capability (remote controlled if possible)
- ☐ Software / remote or local controlled capability
- ☐ Peripheral device connectivity limitations
- ☐ cUL, UL, EN, IEC or CE Mark approved and safety labeled
- ☐ No extension cords
- ☐ No power strips – especially surge protected devices for use with a UPS or IPPS
- ☐ Step down (transformer) types and consistent facility supply voltages
- ☐ "Delta" vs. "Y" (aka "Star") transformer designs and supply voltage to instrument sections
- ☐ 208/120 Vac, 60 Hz, single-phase (1-Ø) is the standard in the USA
- ☐ Note limitation for your specific instrumentation type
- ☐ Consider higher voltages and appropriate combinations for your specific application
- ☐ Autonomy Time Requirements
- ☐ Required backup / running time required for completion of testing protocols?
- ☐ Provisions for Emergency Generator (Gen-Set) connections to an Automatic Transfer Switch (ATS)
- ☐ Provisions for mitigating Gen-Set power distortions
- ☐ Transient Voltage Surge Suppression (TVSS)
- ☐ Alternate planning and Risk Management if Gen-Set capability is not available
- ☐ Critical Power Quality and Mitigation Devices
- ☐ Which type of UPS or instrumentation power protection system (IPPS) should be specified to protect this investment, production time, productivity, results integrity and—most of—all the reputation of the laboratory?
- ☐ Commercial-Off-The-Shelf (COTS)?
- ☐ Computer (IT) grade?
- ☐ Lowest cost possible?
- ☐ Certified and purpose built for the specific instrumentation application?
- ☐ Instrument power protection system (IPPS)
- ☐ What is the lab's economic risk for downtime and loss of reputation?
- ☐ The electrical industry power delivery standard (goal) is 99.99% uptime delivery
- ☐ Electrical power is regulated to frequency delivery standards
- ☐ Not voltage delivery
- ☐ Not waveform delivery (free of harmonic distortion)

The electric utility's (power generating company's and/or independent system operator's) goal is to provide reliable power 99.99% of the time. While 99.99% sounds impressive, it results in a minimum power delivery void of 53 or more minutes of productivity loss, which can occur at any instant day or night. This is a risk management checklist item. This statistical delivery goal can repeat itself thousands of times per year, resulting in significant downtime and severe instrumentation damage, loss of data, and, worst of all, loss of customers due to on-time deliverables failures.

As you develop your new equipment acquisition and installation budget, avoid "management blind sidedness" by thoroughly reviewing the OEM's checklist and your own unique situation's checklist in order to install and properly operate your intended instrumentation system. Spend time consulting with industry experts and colleagues who have installed identical instrumentation for similar applications and discuss their operational experiences. Evaluate whether your facility is sufficiently equivalent to your reference standard to accept a "same as" approach for a plug-n-play installation. Investigate with your facilities engineering department the other types of electrical loads that may be on the intended circuit of your new equipment. Conduct a thorough analysis of the contingencies that are reasonable for your specific laboratory operation. A helpful starting point for a lab's "Preparing for a Power Failure in the Lab" checklist was developed by Precision Power International, based on its over 35 years of instrumentation power protection experience. The checklist is available at http://precisionpowerinternational.com/wp-content/uploads/2012/12/PPI_Checklist.pdf.

> "Thoroughly review the OEM's checklist and your own unique situation's checklist in order to install and properly operate your intended instrumentation system."

Checklists help labs learn from the past and look toward the future

To be truly successful, laboratory managers need to develop an understanding and mastery of contingency management planning, daily operational efficiency goals, human resource management, and, even, electricity, which completely dominates our modern society.

Superstorm Sandy's impact on the eastern seaboard of the U.S. in October 2012 will have lingering infrastructure effects well into 2013. During Sandy—the largest physical Atlantic hurricane on record with a wind field of nearly 1,000 miles in diameter—some laboratories were well prepared with appropriate electrical infrastructures, while others suffered devastating losses. One well-prepared facility in the midst of the devastation on New York State's Long Island was Cold Spring Harbor Laboratory (CSHL), a major research center. As reported by various journals, CSHL's success was attributed to advance planning, appropriate infrastructure development, emergency generator capacity, "smart monitoring and reporting" technology, and sufficient food supplies for up to five days. This laboratory is not only an exception in the proper use of checklists and advanced management planning, but also a hallmark of experience in laboratory operations learned from major storm events of the past.

While CSHL followed its institutional checklists, many laboratories did not and therefore suffered costly consequences, including laboratory instrumentation damage, sample loss, and significant lost production time. Looking beyond Sandy, following checklists and contingency plans enables a laboratory manager to keep the operation running in stride with very limited downtime and few, if any, unplanned expenses for repairs due to the occurrence of a planned exceptional event. This is a clear case for checklists allowing management to focus on exceptions, since the operation is now under the control of experienced staff using approved protocols.

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Matthew Sullivan

ASK THE EXPERT

LATEST IN FIELD INSTRUMENTS: APPLICATIONS FOR WATER TESTING

by Tanuja Koppal, Ph.D.

Matthew Sullivan, an environmental specialist in the Field Operations section of the Bureau of Environmental Services for the city of Portland, Oregon, talks to contributing editor Tanuja Koppal, Ph.D., about how field testing, particularly for water analysis, has changed over the years. The testing equipment is now better suited for field analysis, in terms of its size, compactness, and robustness. The newer instruments have also allowed for sampling and testing to be done remotely and in an automated fashion. Overall, field instrumentation is striving to provide faster, cheaper, more robust, and more real-time measurements for routine analysis.

Q: Can you describe your team and the types of field testing they do?

A: We have a team of nine people with backgrounds in chemistry, biology, environmental sciences, and engineering. Our bureau is in charge of the wastewater collection and treatment for the city of Portland, and we are responsible for sampling and monitoring the streams and rivers. We perform a broad variety of field sampling and testing of streams, rivers, and the groundwater. We also collect samples and monitor industries that discharge waste into the city's sewage treatment plants and collection systems.

We do a lot of long-term in *situ* monitoring with field instruments, where the field meters are left to collect data on various parameters for months at a time. For temperature readings, the meters are sometimes left for a year. In *situ* testing is ideal for most parameters and used whenever possible, because parameters such as pH, temperature, dissolved oxygen, conductivity, turbidity, and oxidation-reduction potential start to change dramatically over time. Metals, on the other hand, do not disintegrate, so we collect the sample and bring it back to the laboratory and have it analyzed. However, if we are interested in the portion that is dissolved versus in the solid phase, we do field filtering to test the dissolved portion.

Q: How do you carry out the testing?

A: We have a few different types of vehicles and each one is geared for a specific type of monitoring. We work off of a boat outfitted with equipment to collect samples from large rivers. We have mobile vans for testing industrial discharges that are being released into the city's sewage treatment plants and we make sure that they stay within their permitted limits. We have vehicles to collect samples from confined spaces, such as sewer lines or from the storm water collection system, for source tracing of contaminants.

Q: What has changed in field testing in recent years?

A: I have been doing field testing for just under 20 years now, and within the last five years there have been a number of technological advances in testing. There is a new optical technology for measuring dissolved oxygen. Previously we used a galvanic cell with a fragile membrane that required frequent changing. The new optical method is more durable and less prone to biofouling. We have installed these units for continuous monitoring of dissolved oxygen and doing so has enabled us to go from weeks between maintenance cycles to about a month. There are also new ion selective electrodes that are installed on long-term monitoring devices to test nutrients like nitrates and ammonia; metals like copper, silver, and lead; and other elements like chloride, fluoride, and new electrodes that continue to be introduced every day.

▲ *An optical dissolved oxygen sensor on a multi-parameter water quality meter that is configured for logging dissolved oxygen, pH, conductivity, and temperature.* (Source: Matthew Sullivan)

We also now have a lot more remote access to field equipment. Instead of having to drive out to check a piece of equipment, you can use cell phone technology to dial in and communicate with the equipment. You can set certain thresholds, prompting the device to call you or send a text or e-mail if the parameter being tested drops below a set level. We do a lot of automated sampling, where we remotely set conditions to have a flow or level meter collect samples once a certain water level is reached. You don't have to go out there in the middle of the night to collect the samples.

Matthew Sullivan is an environmental specialist in the Field Operations section of the Bureau of Environmental Services in lovely but rainy Portland, Oregon. He has spent the past 17 years utilizing a variety of field instrumentation and specialized sample collection techniques to gather environmental and water-quality data. This data is used to fulfill regulatory requirements associated with Portland's storm water and wastewater collection and treatment, and to support the objectives of improving the water quality in Portland's rivers and streams, reducing storm water runoff and its associated pollution, and improving the habitat for fish and wildlife. He has witnessed an increased range of analytes that can be measured using field instruments, as well as continual improvements in the ease of use, durability, and water-resistance of such instruments. Matthew has a B.S. in biology from Colby College in Waterville, Maine.

Q: Is the equipment also getting faster, cheaper, and smaller?

A: Yes, of course. Temperature loggers are now less than $100 apiece and we have them located in streams throughout the city. They are robust and can withstand floods and rocks. As long as you can find them, you can always pull the data from them. They also use so little power that they can last a whole year without any input from us. One interesting piece of equipment that we have just started to use is the laser particle analyzer. It's identical to the one being used in the lab, but now we have one designed specifically for rugged field use. Previously we would collect the water sample and submit it to the lab for particle size analysis and get the data back two weeks later. Now, with this instrument in the field, within a few seconds we have data on what the particle size distribution is within a given volume of water. We are currently renting the laser particle analyzers, since they are so expensive, but we hope to own a few some day.

▲ *A laser particle analyzer to determine the concentration and particle size distribution suspended in water*
(Source: Matthew Sullivan)

Today equipment manufacturers are definitely making instruments that are designed specifically for field use. Previously, the instrument for measuring dissolved oxygen in the field was identical to the one being used in the lab, except it had a handle on it. We now have ones that are small, handheld, waterproof, and well suited for field use.

Q: Do you have to undergo any specialized training for carrying out the types of testing you do?

A: We all need to have an understanding of general chemical and biological principles to be able to interpret the data obtained in the field and to make decisions on the fly. Knowing what the accepted values are for the parameters you are looking at is critical, especially to know if the instrument is malfunctioning or if there is a problem. We are trained in the operation of each piece of equipment and have learned to use the software program associated with each device. Some of the places where we collect samples can be hazardous. So we have to undergo safety training for working on a boat or in confined places such as in a storm water pipe or at tricky locations at an industrial site.

Q: What challenges do you face and what improvements can you recommend?

A: It rains a lot in Portland and it is unavoidable in fieldwork for equipment to get wet or dropped in the water. Hence, we are always purchasing equipment that is as waterproof as possible. Another challenge, especially in long-term field monitoring, is biofouling caused by algal or bacterial growth on the equipment sensor. That can throw off the readings and we have to look out for that, since the problem is not always obvious. We have made improvements in technology, such as with the dissolved oxygen meter, where instead of the fragile membrane, there is now a robust optical sensor with wipers integrated into it so it goes much longer before it gets fouled. Copper components that have antimicrobial properties are also being used in monitoring equipment to prevent bacteria or algae from growing. It's still a challenge knowing how long you can expect to record the data before you have to go out and clean and recalibrate the device.

Q: Do you see any radical changes taking place in field testing going forward?

A: It does seem like every year there are more and more types of analyses that can be done with field meters and without the need for lab analysis. We can collect so much data, so fast. We can watch how a creek responds to a storm event with a laser particle analyzer logging data over the course of the storm. We can record all the particle sizes without having anyone on-site in the storm, waiting all night to collect samples to turn in to the lab. So there is a lot of labor savings.

More and more things can be done remotely and in an automated fashion.

MICROSCOPES

MOST EXCITING TIME SINCE ABBE

by Angelo DePalma, Ph.D.

Microscopy is evolving toward greater functionality and capabilities. The Auriga FIB SEM platform from Carl Zeiss (Thornwood, NY) has been around for 11 years yet undergoes constant improvement. The system combines two distinct technologies: scanning electron microscopy (SEM) and focused ion beam (FIB). SEM's capability of providing very high-resolution surface analysis is well known in the life sciences, materials, and semiconductor industries. SEM provides detail significantly beyond the diffraction limit of light microscopy, illuminating structures and events down to about 1nm.

combined through appropriate analysis software into a complete 3-D image of the sample.

Markus Wiederspahn, communications manager at Zeiss, emphasizes that unlike using a sharp knife or scissors, where material is theoretically preserved, FIB removes extremely small volumes of sample material. "It's more like milling than cutting," he says. "It can even cut steel, but it is not meant to remove a huge block of material." FIB channels are just a few microns wide.

Wiederspahn notes several interesting applications of FIB-SEM. In brain research, the technique can provide 3-D maps of lesions common in neurological structures, which may help in research

> "The only drawback of SEM is its limitation to surfaces. This is where FIB enters the picture."

The only drawback of SEM is its limitation to surfaces. This is where FIB enters the picture. FIB is a type of very-small-domain milling technology that uses ionized gallium to generate cross sections perpendicular to the plane of SEM observation, exposing them to SEM analysis. Like some advanced medical imaging technologies, the combination of FIB and SEM creates as many cross sections as the sample size will allow. Images generated in this way may be

on Parkinson's or Alzheimer's. Another example involves analyzing semiconductor chips for fabrication characteristics or even failure. "FIB-SEM can provide the most detailed view of isolation or insulation structures within microchips," Wiederspahn notes. Successful deployment of—and the ability to analyze—these structures are in part responsible for the geometric increase in storage density (and price drops) for pen drives and other chip-based storage systems. In addition, some systems are capable of mapping elemental doping within chips—an important quality check that fabrication is proceeding as intended.

Fluorescence

Fluorescence microscopy allows, among other capabilities, simultaneous detection of multiple events at the cellular level and live-cell imaging. In *Archives of Pathology and Laboratory Medicine* in early 2011, University of Massachusetts pathologist Andrew Fischer, M.D., wrote that live-cell imaging has transformed microscopy from relying on static events to interpreting dynamic cellular process. "New techniques have bypassed by about 100-fold what had long been believed to be a limit to the resolution of light microscopy" and allows visualization of "events in living or fixed cells that are immeasurable by other molecular techniques."

Meanwhile, Prof. Gabriel Popescu and coworkers at the University of Illinois' Beckman Institute have developed a novel fluorescence microscopy technique that for the first time examines critical cellular transport events at multiple spatial and temporal scales to study diffusive and directed motion transport in living cells.

The technique, dispersion-relation fluorescence spectroscopy (DFS), attaches fluorophores to molecules whose motion produces spontaneous fluorescence intensity fluctuations

that when analyzed provide information on mass transport dynamics—what is moving, where, and when—within the cell. Says graduate student Ru Wang, "The beauty of this method is that you can use a commercial fluorescent microscope that is found everywhere to collect and analyze data in a very simple way. You don't need complicated expertise. Everyone can use it."

Renaissance in visible microscopy

"This is the most exciting time in microscopy since Abbe," says Paul Goodwin, science director at Applied Precision (Issaqua, WA), a GE Healthcare company. He is referring to Ernst Karl Abbe (1840–1905), an optics pioneer who, with Karl Zeiss and Otto Schott, practically invented the microscope industry.

According to Goodwin, microscope optics have not changed much since Abbe's day. "Improvements to optics have been evolutionary, not revolutionary." What have spawned the new age in microscopy have been the confluence of optics, camera technology, and mechanical systems and the emergence of cheap, powerful computing.

Several decades ago the idea of attaching cameras and computers to microscopes was the stuff of science fiction. Digital photography was in its infancy, and data storage was prohibitively expensive. "Today this setup is standard for any organization doing serious biology," Goodwin says.

GE has been committed to high-content cell analysis and screening for some time. Its IN Cell Analyzer HCA imaging systems allow simultaneous analysis of morphology and multiple markers within the same cell. GE's acquisition of Applied Precision in 2011 expanded its portfolio with additional high-end optical, computational, and machine control technologies.

The ability to study cells in three dimensions with a time element has revolutionized biology and greatly expanded the utility of cells in pharmaceuticals, industrial toxicology, fermentation, and basic science.

Early optics pioneers recognized that the wavelength of light introduced a diffraction limit—a fundamental boundary of what was observable under a microscope. Since many cellular details of interest fell just below the magnification capability under visible illumination, diffraction limits were like a thorn in the side of microscopists. Mitochondria, for example, are approximately 0.25 micron in diameter.

Recently the combination of computation, optics, and computer control has pushed resolution well beyond this value. "Instead of being limited to 0.25 micron laterally and 0.6 micron between section planes, we're now looking at 100nm laterally and 300nm axially," Goodwin tells *Lab Manager Magazine*. The additional resolution enables not just visualizing mitochondria but also looking inside them.

"And in the past year we've demonstrated this capability not only in fixed cells but also in living cells." Applied precision is working on other super-resolution methods that currently obtain resolution on the order of a few tens of nanometers, but only on fixed samples.

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LABORATORY POWER

MORE THAN JUST POWER SUPPLIES

by Angelo DePalma, Ph.D.

Since standard laboratory equipment contains its own individually designed power supplies that plug into standard electrical outlets, many labs rarely use external power supplies—mostly for specialty applications, instrument testing, and design.

OEM power supplies operate steadily and predictably at one output inside equipment, instruments, and computers. By contrast, low- and medium-voltage programmable supplies are designed for applications—particularly in testing, measurement, and instrument design—where users might require 12V one day and 5V the next, says Mel Berman, product marketing manager at TDK-Lambda (San Diego, CA). "When designing battery-operated equipment or products, programmable power supplies allow you to change the voltage to simulate battery behavior over time."

In November 2012, TDK expanded its line of Z+ series programmable power supplies. The new units, operating at 200 watts, complement the older 400-watt models. These high-density 2U-format ("U" refers to a rack-height equivalent, or 1.75 inches) benchtop and rack-mountable power supplies are designed for automatic test equipment, laboratory and OEM applications in test and measurement, semiconductors, component testing, LEDs/lasers, amplifiers, electromagnetics, and electrochemistry. All Z+ models operate in a constant-current or constant-voltage mode from a wide 85VAC to 265VAC input.

Like most laboratory equipment, power supplies have become more compact and feature-rich over the years. TDK has incorporated many improvements in the Z+. "More bells and whistles in a smaller box," Berman tells *Lab Manager Magazine*. Another trend is the expansion of serial computer interfaces, which allows programming power sequences on the fly via either a connected or remote computer. "Remote control is useful in situations where you're operating or testing equipment in hazardous locations."

The high end

The most familiar lab power supplies drive electrophoresis equipment and electroplating at low to medium power. High voltages are more applicable to "core" sciences such as physical chemistry, physics, metallurgy, materials science, and some life science applications. High-voltage power supplies also power ion and electron beams that drive a unique set of high-power applications in chemistry, materials, and life sciences.

James Morrison, CEO and cofounder of UltraVolt (Ronkonkoma, NY), explains that high-voltage power supplies can electrostatically remove particles from fluids, based on molecular weights or electrical charge. These applications amount to electrostatic precipitation or electrophoresis capable of purifying both the fluid and the low-concentration component. High-voltage supplies also help purify DNA and introduce it into cells for biomedical work such as gene therapy.

Ion beams have wide applicability in concentration, milling, welding, cutting, imaging, and polishing materials, plus in electrodeposition and electroplating. "Most of these instruments come with power supplies, but some researchers like to build their own or modify commercial instruments. This is where stand-alone high-voltage power supplies come in," Morrison says.

Electron and ion beams—made possible by high-voltage power supplies—are increasingly used to manipulate materials at ultra-nano domains. Ion beams carry materials through time-of-flight mass spectrometers. They also can cut into integrated circuits to analyze and repair them or deposit minute quantities of materials into semiconductor wafers at 0.1-micron resolution. Beams are assisting in the creation of safer materials by removing lead from solder and cadmium and hexavalent chromium from platings.

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Beyond the supply

The quality and accessibility of electrical services are as important to labs as is the power source itself. Surge protectors and uninterruptable power supplies have for decades been staples of industrial and even home computing. Protecting expensive non-computer equipment from the vagaries of the electrical grid is beginning to catch on as well.

"Programmable power supplies allow you to change the voltage to simulate battery behavior over time."

Dr. Sue Weintraub, who directs The University of Texas at San Antonio's core mass spectrometry laboratory, often slept poorly during thunderstorms because her facility's instrumentation was vulnerable to "bumps" caused by frequent power outages. The core lab's Thermo Fisher LTQ MS® linear ion trap mass spectrometer was particularly susceptible to loss of data that could have taken days to replace. Weintraub got in touch with Franek Technologies (Tustin, CA), which specializes in certified, battery backup power protection. Franek custom-designed a power protection system that guaranteed flawless 24/7 operation of the ion trap system regardless of the quality of electricity entering the facility from the grid. Weintraub reports that the protected instrumentation has worked smoothly since October 2008. "I wouldn't order another mass spectrometer without including supplemental power protection," Weintraub stated.

Although it does not manufacture power supplies, Universal Electric (Canonsburg, PA) provides products and services related to electrical distribution and accessibility. The company began in the 1930s as an electrical contractor; then became involved in industrial and mobile electrification; and finally entered markets for powering equipment, data centers, and laboratories. After working on a project for the National Institutes of Health, the company noted the need for flexibility in delivering electricity within labs. Reconfiguring electrical systems without incurring high costs or delays is useful as labs grow, acquire new equipment, or are repurposed.

Universal's solution was the STARLINE Plug-In Raceway® product, a wall-mounted bank of replaceable, reconfigurable electrical outlets that meet all the electrical requirements a lab is likely to encounter. Users can add or relocate plug-in modules anywhere on the unit quickly, eliminating the time and cost of reconfiguring circuits, receptacles, and wiring or even opening up the circuit box.

"We offer any combination of receptacle types, ranging from regular duplex outlets you would find in homes to 208-volt for a heated centrifuge, all the way up to three-phase receptacles for driving electrical motors," says Mark Swift, business development manager.

This level of flexibility is useful in labs that frequently bring equipment in on skids and remove it to storage after use; that add large, power-consuming instruments to existing space; or that take over space that was previously occupied by a different group. In the past, these events triggered a call to electrical trades to reconfigure the local grid or install new power lines. "The ability to reconfigure workspace by popping receptacles off the wall and positioning them where needed provides labs with options to handle anything coming down the road," Swift adds.

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GLOVE BOXES

SPECIFIC APPLICATIONS REQUIRE PARTICULAR FEATURES

by Mike May, Ph.D.

A glove box consists of a sealed box with the inside accessible only by gloves. "Although their use is getting broader all the time," says Laura Geenen, product manager at Bel-Arts Products (Wayne, NJ), "they are really used for two basic ideas: Protect what you work on from the environment, such as an analytic balance on a production floor, or protect you from what you work on, such as a virus."

Despite the fact that most glove boxes provide a relatively simple process, different applications require different boxes. "There are dozens of kinds of glove boxes," says Bob Applequist, product manager at Labconco Corporation (Kansas City, MO). "A chemist might be interested in an inert nitrogen or argon glove box that controls the oxygen and moisture levels, because of work involving reactive chemicals." He adds, "A microbiologist might want an anaerobic glove box for anaerobic bacterial cultures." The list goes on and on. For example, a virologist who works at Biosafety Level 4 (BSL-4) might need a Class III biological safety cabinet, a glove box that provides total containment. A drug researcher needs a glove box that can be sterilized between uses. Applequist adds, "Very few people are aware of the complex spectrum of glove boxes."

For example, HEPA-filtered negative pressure glove boxes can be built to enclose ultracentrifuges or continuous-flow centrifuges for large-scale manufacturing in BSL-3 facilities. In discussing such glove boxes, Marian Downing, biological safety project manager at Alliance Biosciences (Richmond, VA), says, "The gloves themselves did not fit all users, especially those with small hands." She adds, "So dexterity could be a problem." That's no small issue for BSL-3. She also points out that the thickness of the gloves made it difficult to use some instruments and "the placement of the gloves was not ideal for all users." She says, "Some people had to crouch to fit the holes, and some had to stand on step stools, which was bad ergonomics."

> "Despite the fact that most glove boxes provide a relatively simple process, different applications require different boxes."

Building smaller boxes

When it comes to glove box trends, Geenen says, "They keep getting smaller" and, "There are glove boxes that can be moved." For example, Bel-Arts Products offers a portable glove box with gas ports. "This creates an inert-gas environment that you can carry to where you want to use it," Geenen explains. "You don't need a flue with this. It just protects what you're doing from the environment."

Beyond size, some other features also change in glove boxes over time. As an example, Geenen points out polycarbonate glove boxes. "They provide a clear view from all around, so they are great for teaching."

Much of the cost depends on the materials. For instance, the Precise Glove Box from Labconco is made of polyethylene. "It's one molded piece," Applequist explains, "and it comes in two versions: controlled atmosphere and HEPA-filtered." He adds, "It offers most of what you get from bigger glove boxes in the $20,000 to $30,000 range, but these are less than $10,000."

In the end, which is the best glove box depends on how it will be used.

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

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SHAKERS

CUSTOMIZATION, SHRINKING SIZE, AND OTHER FEATURES OPEN NEW APPLICATIONS

Mike May, Ph.D.

Assays from academics to industry require shakers. In the life sciences, for example, Ira Augenzucker, product line manager at Labnet International, a Corning Life Sciences company in Edison, NJ, says, "The new uses of shakers basically mimic what you see in the industry, which is an increase in the use of genomics." He adds, "Shakers are used in almost every application in some fashion." For example, he points out the wide use of shakers in cell culture work.

For years scientists have used shakers when growing bacteria such as *E. coli* to keep food and oxygen flowing to the cells. "For the past 10 years," says Charlie Villano, product manager for shakers and CO_2 incubators at Eppendorf North America (Hauppauge, NY), "shakers have moved into new technologies, including using cells to grow final products, such as growing algae for biofuels."

Furthermore, an increasing number of scientists work with cells in suspensions, which requires the addition of CO_2 to maintain the pH. "It can be easier to grow the cells in a shaking flask," says Villano. "In the past, you placed a shaker inside a CO_2 incubator, but some CO_2 incubators now have built-in shakers."

Seeking savings

Labs from academic institutions to multinational manufacturers always look for savings. "Almost every lab is crowded for space and running on a tight budget," says Augenzucker. "That makes it useful when instruments provide more than one function."

For example, a laboratory might use a variety of tube sizes and want to shake them in different motions. "In some cases, you might want tumbling—like turning the tube end over end—that provides agitation, and other times you might want gentle rolling," Augenzucker says. "We offer a platform that does either and anything in between."

> "The new uses of shakers basically mimic what you see in the industry, which is an increase in the use of genomics."

At Virginia Tech in Blacksburg, Deborah J. Good, Ph.D., associate professor in the Department of Human Nutrition, Foods, and Exercise, uses shakers in a wide variety of ways. She says, "My lab and I use shakers in just about every aspect of our lab work." She adds, "The types of shakers we use vary from very fast shakers, which—with the help of metal beads—disrupt cells or tissue for RNA/DNA processing, to slow shakers for washing immunohistochemistry slides." In addition, Good points out, "We use rockers, which rock just back and forth, or rollers, which roll the tubes, for fixing tissues. We also use both dry and wet shakers, heated and unheated shakers."

Given this broad range of shaking applications, Good appreciates the variety available within the devices. When asked what she likes about the technology, she says, "There are a lot of different shaker units available for many different applications, and all seem to do the job that they were designed for."

Still, Good can think of some things that she'd like to see developed. "In general, and given the current lab/grant financial situations," she says, "it would be great if there were a heated or unheated shaker that could rock back and forth, roll, turn, and do orbital motions, all with the flip of a switch, depending on the

application. I think this would be especially great for a lab with small amounts of lab space or labs just starting out, which have limited funds and need to buy an all-purpose shaker." Beyond that, she'd like more control in some cases. For example, she says, "Another thought for improvement is better heat control with dry-heat shakers, which usually lose heat when the cover is lifted or from the top of the tube if there is no cover." A smaller shaker would also help in some cases, Good believes. She'd like to see "a personal-size shaker—similar to the personal-size tube spinners—that could substitute for vortex units but do even more: shake, rock, roll, turn, heat."

Creating custom devices

In thinking of trends in the applications of shakers, Stuart Gibb, director of sales for laboratory and analytical equipment at IKA Works (Wilmington, NC), immediately thought of customization. "This usually means taking an existing product and customizing it for a specific application," he says. "This might include specific speeds or specific orbital or horizontal forces."

Developing a custom shaker requires teamwork. As Gibb explains the process, he says, "We work out the details with the customer and the scientists and then build the system for them." Although customized shakers often go to clinical, biotechnology, biopharmaceutical, and industrial applications, Gibb points out that his company "has developed some very specific products for academics."

In terms of customizing shakers, sometimes it involves making just one, but it can be orders of tens or hundreds. "When a customer is looking for multiple units," Gibb says, "they want a global supplier that can provide service locally."

Selecting a shaker

To get started in shopping for a new shaker, Augenzucker says, "The very first question is, what is your application?" He adds, "Most customers have a primary application, and they often have a secondary application, which makes a multipurpose shaker come in handy."

The catalogs show the various available features, such as the basic motions: orbital, reciprocal, nutating, and so on. In addition, different shakers provide various ranges of shaking speeds.

> "Increased warranty time is becoming more of an industry standard [for shakers]."

Beyond shaker features, Augenzucker points out the importance of a guarantee. He notes, "I would say that increased warranty time is becoming more of an industry standard." He adds, "Because of the price of a shaker, people would not want to send them off for repair but would just buy a replacement, unless it's under warranty and they can just ship it back for repair or replacement."

So from customization to longer warranties, shakers keep providing scientists with more possibilities and reliability—just what research requires.

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BLOOD, SWEAT, & FEARS

BLOOD-BORNE PATHOGENS, PART I

by Vince McLeod

A significant concern for scientists in biohazard labs is preventing contact with potentially contaminated human body fluids, whether it is during collection of samples or during evaluation and analysis in the laboratory. Inadvertent exposure to human immunodeficiency virus (HIV), hepatitis B virus (HBV), or other human pathogens is a potential occupational risk that should never be overlooked. Even so, needlesticks, cuts, splashes, and other events contribute to an alarming number of exposures each year. This month the Safety Guys aim to raise awareness and discuss the prevention of blood-borne pathogen (BBP) exposures, beginning with an overview of the OSHA standard and a discussion of the Centers for Disease Control and Prevention's universal precautions.[1]

As an example, though an extreme one, at the State Research Center of Virology and Biotechnology, known as Vector, a former Soviet biological weapons laboratory in Siberia, a Russian scientist died after accidentally sticking herself with a needle laced with Ebola, the deadly virus for which there is no vaccine or treatment.[2] Since Vector did not report it to the World Health Organization (WHO) for three weeks, the delay meant that scientists at the health agency could not provide prompt advice on treatment that might have saved her life. WHO scientists said that although Vector had isolated the scientist to contain any potential spread of the disease, there was no requirement that accidents involving Ebola be reported. What this points out is that poor BBP practices combined with a nonexistent preventive program can be deadly, which prompted this column.

Preventing exposures to blood-borne pathogens begins with strong implementation of OSHA's BBP standard 40 CFR 1910.1030.[3] This standard applies to all occupational exposures to blood or other potentially infectious materials (OPIM). Blood means human blood, components thereof, or products made from human blood. OPIM is defined as human body fluids such as semen, vaginal secretions, cerebrospinal fluid, synovial fluid, pleural fluid, pericardial fluid, peritoneal fluid, amniotic fluid, or any body fluid that is visibly contaminated with blood. OPIM also includes any unfixed tissue or organ (other than intact skin) from a human (living or dead) and HIV-containing cell cultures or tissues.

Applying the OSHA BBP standard starts with developing an exposure control plan (ECP), a mandated, written document designed to eliminate or minimize employee exposures. The ECP must be reviewed and updated annually and include documented consideration or implementation of new technology or safer medical devices to achieve its purpose. The main elements of the ECP are 1) exposure determinations, 2) communication about hazards to employees, 3) methods of compliance, and 4) recordkeeping. Exposure determination is simply a list of employee classifications, tasks, and procedures in which occupational exposures occur, and it is made without regard to personal protective equipment (PPE). Compliance methods include universal precautions; engineering and work practice controls; PPE; and housekeeping issues, especially waste handling. Other ECP elements address Hepatitis B vaccination and postexposure evaluation and HIV/HBV research laboratories.

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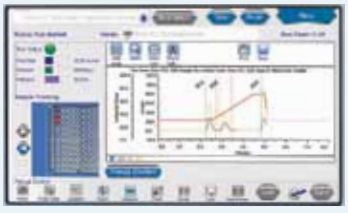

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SAFETY TIP

ORGANIZE A SAFETY COMMITTEE

By James. A. Kaufman

Your department should have a safety committee. Academic institutions and companies should all have safety committees. The committees should consist of employees, supervisors, faculty, staff, administration, and students.

The committees should meet regularly to discuss safety, health and environmental concerns/problems and to seek solutions to them. The committee should help to see that the safety policy is implemented. The committee can help to promote an interest and concern for health and safety issues. They might be the group responsible for conducting regular inspections, reviewing accident reports, and developing recommended safety procedures. Better is to be a coordinating group that engages all the other employees in the organization in these activities.

One type of safety committee is the central safety committee. It is chaired by the highest ranking onsite official. The members of the committee are his or her direct reports. In this way senior management/administration is involved and providing leadership in the safety program.

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

Although the heart of OSHA's BBP standard lies in the Methods of Compliance section, the Safety Guys prefer to begin with training, or communicating the hazards. It is paramount that every employee has a solid understanding of which fluids present infection hazards and which do not. Be concerned with blood and OPIM, which have been defined above. Other fluids typically encountered that are not covered by the BBP standard include vomitus, feces, urine, sweat, tears, sputum, and nasal secretions UNLESS these are visibly contaminated with blood. However, one would obviously still want to avoid direct skin contact with these fluids. So make sure everyone knows which fluids present the greatest risks.

The next piece of the puzzle is to learn the avenues of potential exposure. These are 1) through the skin; 2) through mucous membranes, which are the nose, mouth, and eyes; and 3) parenteral, a medical term for injection or breaking the skin barrier. The last exposure route results from needlesticks, cuts, abrasions, and other such injuries.

The final piece of the training puzzle is to know how to protect against potential exposures, and that leads us back to methods of compliance.

The Golden Rule of preventing exposures is one of the universal precautions. Most scientists who work with biohazards and are reading this have the universal precautions tattooed on the backs of their eyeballs. Refreshing your memory never hurts, so here goes. First and foremost, all blood and OPIM are always considered infectious; therefore, you must prevent contact through the use of appropriate PPE that will create barriers between the fluids of concern and the routes of exposure. PPE is considered "appropriate" only if it does not permit blood or other potentially infectious materials to pass through or reach the employee's clothes, skin, eyes, mouth, or other mucous membranes during normal conditions of use. Under the OSHA standard, when there is occupational exposure the employer must provide all employees at risk, at no cost to the employees, with appropriate PPE, which includes but is not limited to gloves, gowns, laboratory coats, face shields or masks and eye protection, pocket masks, or other ventilation devices.

> "It is paramount that every employee has a solid understanding of which fluids present infection hazards and which do not."

For most lab scientists, normal activities always entail the use of gloves as the primary means of preventing contact with blood and OPIM. Gloves are worn when it can be reasonably anticipated that the employee may have hand contact with blood, other potentially infectious materials, mucous membranes, or non-intact skin. Gloves are also worn for handling items or surfaces soiled with blood or body fluids. Recommendations for the use of gloves are presented in detail in the *Morbidity and Mortality Weekly Report* dated June 24, 1988.[4] Our advice is to buy good-quality, powder-free, non-latex gloves, and plenty of them.

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The next most common piece of PPE used is eye protection. Protective eyewear or face shields are worn to prevent exposure of the mucous membranes of the mouth, nose, and eyes during activities or procedures that are likely to generate droplets of blood or body fluids. These types of activities are commonly encountered in the laboratory when preparing and analyzing specimens. So carry all types—eyeglasses, goggles, and face shields—just in case.

After the Golden Rule of always assuming that fluids are infectious and preventing exposure with appropriate quality barriers, the final part of the universal precautions is avoiding injuries and accidents caused by needles, scalpels, and other sharp instruments or devices. Be extremely careful whenever handling these "sharps." Never recap needles, and always have sharps disposal containers available.

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***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.*

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ARE YOU IN THE MARKET FOR AN... HPLC SYSTEM?

High-performance/pressure liquid chromatography (HPLC) is, for many scientists, an essential chromatographic technique. HPLC systems used for the separation, identification, purification and quantification of various chemical and biochemical solutions are composed of a pump, a sample injector, a separation column, a detection unit, and a data-processor.

Top 6 Questions You Should Ask When Buying an HPLC System

1. How flexible is the system? Can the system be optimized to meet your laboratory requirements?
2. What tubes, vessels, and vials can it accommodate? Can components (such as additional detectors, valves, etc.) be upgraded in the future?
3. Is the software easy to use and operate? Can a demo version be put in place to get a feel for how the software functions for your laboratory's workflow?
4. How is the system (not just components) qualified during installation to meet manufacturer performance expectations?
5. Who provides the support and service for the product? Is it the manufacturer or a third party service group? If it is a third party service group, are they factory-trained?
6. Finally, ask about the total cost of the purchase—not just the price of the product being installed—but the total cost of ownership, which includes price, service expectations, warranty, etc.

HPLC separation mode(s) being utilized by respondents

Reverse Phase	76%
Normal Phase	47%
Ion exchange	30%
Size Exclusion (SEC)	21%
Ultra-high performance (UHPLC)	20%
Ion chromatography	17%
Gel permeation (GPC)	12%
Gel filtration (GFC)	12%
Affinity	11%
Hydrophilic Interaction (HILIC)	9%
Chiral	9%
Ion exclusion	9%

Types of detector(s) being used by respondents

UV-Vis	72%
Fluorescent	36%
Ultraviolet (UV)	34%
Mass Spectroscopy (MS)	33%
Refractive Index (RI)	32%
Conductivity	26%
Light Scattering (LS)	16%
Electrochemical	9%
Other	11%

Top ten features/factors survey respondents look for when buying an HPLC system

Accuracy	100%
Precise and accurate flow rates	100%
Quality of data	100%
Resolution	100%
Maintenance	98%
Sensitivity	98%
Availability of supplies and accessories	96%
Price	94%
Ease-of-use	93%
Service and support	91%

Additional HPLC system components being used by respondents

Autosampler	82%
Degasser	75%
Column heater	72%
Data system	70%
Automated valve	30%
Fraction collector	21%
Solvent recycler	9%

Services & schedules being used by respondents' labs for their HPLC instruments

As needed depending upon the condition of the instrument	54%
Routine instrument service	47%
Instrument repair	39%
Planned/scheduled according to time/date of last service	32%
Non-warranted instrument services	18%
Planned/scheduled according to the SOP	11%
Planned/scheduled according to usage/number of analyses	3%

For more information on HPLC systems, including useful articles and a list of manufacturers, visit www.labmanager.com/hplc-systems

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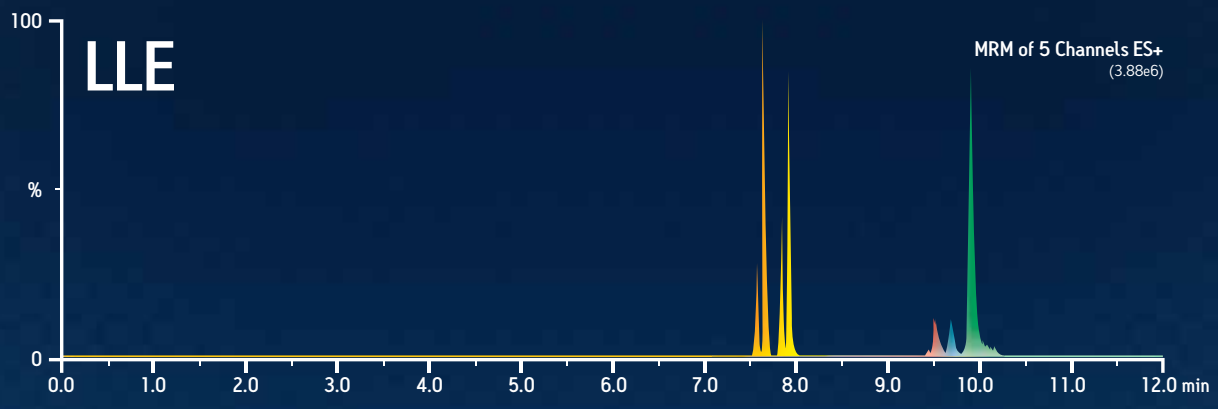

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ARE YOU IN THE MARKET FOR A... LAB OVEN?

While nobody gets excited about lab ovens, they are definitely essential lab components—drying glassware, controlling crucial temperature experiments, drying reagents and desiccants, annealing and curing materials and much more. The past couple of decades have brought big changes in lab ovens.

Top 5 Questions You Should Ask When Buying a Lab Oven

1. What temperature range do you require? (Does the product have reserve temperature capacity)?
2. What accuracy and uniformity does the product have? (Will my sample be damaged or will my experiment only function in one "sweet spot")?
3. Are the interior chamber space/weight of my sample and the floor space in the lab a match to the oven application and lab?
4. Do I need any computer interfaces, alarms or safety devices on my oven?
5. Are accessories that suit my specific needs like data loggers, viewing windows or modifications like access ports available from the manufacturer?

Types of lab ovens currently being used in respondents' labs

General Purpose Oven	64%
Mechanical Convection Oven	31%
Microwave Oven	22%
Gravity Convection Oven	20%
Vacuum Oven	16%
Safety Oven	5%
Other	5%

The heating sources being used for respondents' lab ovens

Electric	90%
RF / Microwave	8%
Infrared / radiant	3%
Other	11%

The primary purpose for lab ovens in respondents' labs

Research	44%
Quality Control	28%
Production	9%
Clinical	8%
Other	11%

Top ten features/factors the influence respondents when buying a lab oven

1 - Price
2 - Ease of use
3 - Low maintenance / operating costs
4 - Safety
5 - Temperature ranges ambient +40C to 200°C / 250°C
6 - Power requirements
7 - Service and support
8 - Warranty
9 - Smallest footprint possible with a large interior
10 - Controlled airflow to provide uniform temperature heat distribution

Lab Ovens are being used in respondents' labs for the following functions:

Heating and drying	55%
Temperature-linked experiments	21%
Evaporating	9%
Baking	5%
Sterilization	5%
Other	6%

Lab oven components that are being used by respondents

Temperature Monitoring	50%
Shelving / Racks / Carts	47%
Controllers/Programmers	35%
Over-Temperature Protection	31%
Data Logger	10%
Chart Recorders/DAQ	6%
Cooling System	5%
Air Filtration	5%
Other	1%

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

ARE YOU IN THE MARKET FOR A... MICROSCOPE?

While the technology & fundamental operation behind visible light microscopes has not changed much in 200 years, the wider field of microscopy has continued to greatly evolve. The confluence of advances in imaging, computing, microscopy, and reagent technologies mean live cell imaging has become one of the most exciting subcategories of biological microscopy.

Top 6 Questions You Should Ask When Buying an Optical Microscope

1. What type of specimens will you be looking at? (i.e. Is an upright or inverted frame type best? Inverted frame types are best for thick specimens, for example).
2. What applications are you using your microscope for? (Is a polarizing or nonpolarizing, basic or advanced model required)?
3. Are accuracy and ease of use critical for your applications? If so, you may want to check out the motorized options available.
4. What is the cost? With a limited budget, the basic model is usually the cheapest option.
5. What service and support options are available?
6. How long will staff be working at the microscope? Long periods of use should mean considering the ergonomics of the instrument.

Top 7 Questions You Should Ask When Buying a SEM microscope

1. What type of samples will you be looking at? Technical experts can guide you to the appropriate type of SEM, X-ray spectrometer and accessories.
2. What is the max magnification at which you want to view the samples & what accelerating voltages do you want to use? (i.e. Will it be a tabletop SEM, W SEM, or Field Emission SEM)?
3. Will experts or non-experts be using the instrument the most?
4. What is your budget and the expected total cost of ownership?
5. How many of the SEMs you are considering are currently in use? Get a complete list.
6. Will you receive application support/instrument training? How many service engineers are in your area and what is the average "on-site" response time?
7. Can the applications/support staff be contacted directly for help & what is their experience?

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

Performance of product	97%
Easy to maintain	94%
Price of microscope	93%
Ease of use	90%
Availability of supplies and accessories	84%
Low operating costs	83%
Warranties	82%
Total cost of ownership	81%
Service and support	73%
Ergonomics	65%

Microscopy techniques currently used by survey respondents

Fluorescence microscopy	45%
Live-cell imaging	45%
Whole slide or "virtual" microscopy	17%
Scanning electron microscopy	15%
Through-focus scanning optical microscopy	6%
Atomic force microscopy	5%
Other	17%

The typical ways labs are training staff in microscopy and imaging

On-the-job training by fellow worker	85%
Vendors	5%
Videos, books, etc.	3%
Off site imaging courses	2%
Online imaging courses or tutorials	2%
Other	3%

Types of microscopes currently in use in respondents' labs

Compound Microscope (Upright)	82%
Stereo Microscope (Dissecting Microscope)	45%
Compound Microscope (Inverted)	34%
Confocal Laser Scanning Microscope	15%
Scanning Electron Microscopy	14%
Transmission Electron Microscopy (TEM)	8%
Other	12%

Completed Surveys: 252

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

TESTING, TESTING, TESTING

BIOFUEL LABS ARE NERVE CENTERS FOR QUALITY AND COST EFFECTIVENESS IN BIOFUEL PLANTS

by Bernard Tulsi

Analytical laboratories are prominent—they are veritable nerve centers—in biofuel production facilities because of their crucial role in assuring quality, in guiding efficient and economic feedstock processing, and in driving research on next-generation products and enhanced processing technologies.

"Incoming sample protocol ... and knowing how a sample will move through the laboratory are key."

A typical biofuel facility will have laboratories with instrumentation to determine the key quality parameters of incoming raw materials—vegetable oil, animal fat, greases, and grains, among others—that will be modified into biofuel, according to Rachel Burton, formerly of biodiesel producer Piedmont Biofuels (Pittsboro, North Carolina), where, in addition to being one of the founders, she served as research director, designed and oversaw construction of the laboratory facilities, and implemented the QA/QC and National Biodiesel Accreditation Commission (NBAC) BQ-9000 quality assurance programs. In general, the labs will have analytical capabilities for determining moisture content, conducting basic acid-base titrations, and measuring the free fatty-acid content of feedstocks. Many facilities will also have a gas chromatograph (GC) for determining product quality after the process, notes Burton.

In her area of expertise, biodiesel, Burton says that the key chemical process in production is transesterification (TE). This involves the conversion of one type of ester—a vegetable oil, for example—during a reaction with an alcohol, generally methanol, into another type of ester—a methyl ester or biodiesel, say. A coproduct is glycerol; manufacturers must ensure that any free glycerin remaining in the system is kept below .02 percent by mass, in accordance with American Standards Testing Materials (ASTM) standards. Burton notes that glycerin can cause damage to diesel engines.

She says that the process typically starts with feedstocks arriving in an incoming rail car or tank wagon. Depending on the protocol, samples may be taken directly from the whole shipment or from the top, middle, or bottom. "Sometimes the bottom sample may just be the worst, so technicians take the bottom sample to see the worst-case

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scenario of water and sediment contamination, to estimate how that may impact the process yield."

Burton says that in a typical biodiesel production process, one goal is to limit the amount of water and moisture that comes in with the raw materials. Typically, the production process uses chemical catalysts like sodium or potassium hydroxide. When those react with a vegetable oil, they can create soap, which inhibits high yield in biodiesel production.

She says, "Incoming sample protocol—including proper labeling—and knowing how a sample will move through the laboratory are key. In many biodiesel facilities, a sample is taken and run directly though the lab to generate an immediate status report on the specifications of the incoming sample. This helps with decisions about whether the sample shipment is of usable quality or not."

Currently, two agencies, the American Oil Chemists Society (AOCS) and ASTM International, provide key information on required methods, standards, and equipment for the testing and quality verification of incoming raw materials and final outgoing biofuel products.

Glenn Green, director of technology at Lake Erie Biofuels, LLC, which does business as HERO BX, identifies important roles for in-house biofuel labs at three key stages of the production process: incoming feedstock quality testing, in-process testing, and finished-product quality testing.

The lab analyzes incoming feedstocks to ensure that they meet the specifications required by the production process. Green notes that too-high concentrations of free fatty acids in the starting raw materials, for example, may slow down production, reduce overall efficiency, and drive up production costs. At key points during production, especially in pretreatment and TE, the lab conducts tests to ensure that all processes are optimal via specific analytical testing; this ensures that the reaction between the initial ester and the methanol has occurred, that free and total glycerol are at acceptably low levels, and that the methanol concentration is within the appropriate range.

HERO BX 45 million gallon per year biodiesel production facility located on the shores of Lake Erie in Erie, Pennsylvania.

▲ *Glenn Green, HERO BX director of technology, showing the visual clarity and purity of the HBX high quality biodiesel.*

"For finished-product quality testing, we have to abide by ASTM's D6751 biodiesel-blend stock specifications," says Green. He adds, "We have incorporated the NBAC BQ-9000 quality control program, which dictates critical and noncritical tests—those that must be run after every production lot and those that can be run every three or six months or annually," he says. Finished-product quality tests include flash point to make sure that the methanol is consumed in the TE reaction, GC for product quality, and acid number and density tests, among others. Finished products are not allowed to leave their holding tanks without a green light (certification) from the laboratory.

> "The lab conducts tests to ensure that all processes are optimal via specific analytical testing."

▼ *The HERO BX laboratory houses many automatic physical property testing instruments such as cloud point, flash point, viscosity, and cold filter plugging point.*

In-process testing and validation with automatic potentiometric titration, Karl Fisher titration, and manual titration.

Green explains that, in the initial stages of a biofuel production facilities BQ-9000 accreditation there is a requirement to perform seven lots of complete, full-slate quality-conformance testing to ensure that the deployed processes are yielding quality product. Upon satisfactory completion of this battery of tests, manufacturers may be able to scale down to just critical testing.

Burton says that there is a combination of in-house and service labs available to the biofuel industry today. Some producers may not have an extensive lab and may outsource their testing. A number of facilities offer outside testing on a fee-per-service basis. Intertek, for example, operates in about 100 countries across the globe and offers quality testing to biofuel manufacturers, refiners, distributors, end users, and researchers, among others.

Some state laboratories, many of the same facilities that provide QC for agricultural products, and other operations that provide service laboratory work for the petroleum product stream also provide service-based testing for biofuels, according to Burton. "There are a number of labs in the US and around the world that provide biodiesel testing. It is usually a matter of how much testing is needed and how cost-effective it is to use a particular type of facility—your own or outside service," Burton notes.

"Finished products are not allowed to leave their holding tanks without a green light (certification) from the laboratory."

Turning to the issue of in-house versus outsourced testing in third-party labs, Green notes that it is necessary to run certain tests on every lot, "depending on the process, on how fast we plan to run the process, and on how we plan to use our infrastructure." He points out, "If we are doing lot certifications every day, we need to have everything in house to run the certification, as opposed to waiting for about three days for a result from a third-party laboratory."

To be sure, HERO BX does make use of third-party labs. "You have to. There is a need to do round-robin inter-laboratory testing to have third-party verification of your results. In addition, there is a lot of ongoing research work, so we definitely use third-party labs quite often."

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EQUIPMENT IN THE BIODIESEL LAB

HERO BX's director of technology, Glenn Green, says that its biodiesel production facility has a larger, more extensive and hence more state-of-the-art analytical laboratory than about 90 percent of the production plants in the biodiesel industry. The laboratory currently consists of:

- Three Perkin Elmer GCs—Clarus 500, Clarus 600, and an AutoSystem XL with headspace
- One Antec Model 9000 Sulfur Analyzer with auto sampler
- Desktop centrifuges
- Large Metrohm titration system with four Titrando automatic titrators for volumetric moisture and a number of acid-base titrations
- Two Karl Fischer colorimetric titration systems for low-level water concentration measurements, one of which has a headspace
- One analytical balance that is connected, along with the Metrohm titrators, to a personal computer that runs Metrohm's Tiamo software—an integrated process that reduces human error
- Programmable chilling water bath
- Herzog automatic flash point instrument from PAC
- Automatic CFPT cloud point instrument from PAC
- Specific gravity and density instruments

Wish list: *"Would like to see the implementation of a good laboratory information management system, although that is quite expensive."*

He says that HERO BX's current research activities focus on new potential feedstocks, process advancements—such as determining the current concentration of excess methanol in the TE process and how this can be reduced for efficiency reasons—and on approaches that will enhance process improvements and efficiencies. "We also conduct laboratory testing for other biodiesel companies to help them with any process problems, inter laboratory verification, research and finished product testing," says Green.

Burton says that one key area of her research focused on the use of enzymes (biological catalysts) in the production of biodiesel. The idea was to explore the use of enzymes to replace traditional chemical catalysts that inhibit yield or create process wastes such as soap, sulfuric acid, or acidic methanol, the necessary neutralizing of which adds to overall production costs. "Enzymes (lipases) do not produce soap; they increase production efficiency and improve product quality and value. So, the idea was to investigate how to improve process efficiency without making the cost of production significantly higher," she says.

"There is a combination of in-house and service labs available to the biofuel industry today."

Furthermore, Burton notes, "The enzymes we were working with could be reused multiple times, whereas the traditional chemical catalysts could be used only once. When you use sodium hydroxide in biodiesel production, you can use it only once; you can't reclaim it and use it again."

Despite reduced or eliminated incentives, both fair and misguided attacks from environmental and hunger (food security) watchdogs, surging interest in hydraulic fracturing (fracking) to tap the promise of natural gas lands like the Marcellus Shale—North America's richest reserve, with 500 trillion cubic feet and running 600 miles north to south—as well as the revival in oil exploration in boom areas like western North Dakota, the attractiveness of biofuel energy remains quite strong.

Compared with petroleum-based fuels, the production of biofuels requires lower energy usage and emits considerably lower levels of the harmful pollutants and greenhouse gases (GHG) implicated in extreme climate change. Environmental Protection Agency data indicate that corn ethanol may be associated with as much as 20 percent

lower GHG emissions than fossil fuels. Furthermore, biofuel producers face much less uncertainty around feedstock supplies, which are free from the global price fluctuations associated with nonrenewable crude oil.

Currently, there is considerable interest in novel biofuel feedstocks such as algae, switchgrass, and other cellulose-rich sources, including the stalks of sugar cane plants and tree trimmings. Still, the predominant feedstocks for the most common biofuels continue to be corn and sugar cane in the case of fuel-grade ethanol, and soya bean, palm, waste cooking oil, and animal fats and grease for biodiesel.

> "The attractiveness of biofuel energy remains quite strong."

The beauty of biodiesel, no matter what feedstock it originally comes from, is that it allows many producers to take advantage of a second use of feedstocks in the form of used cooking oils, tallow, animal fats, and yellow grease, according to Burton.

She notes that biodiesel producers also use virgin vegetable oils such as soya bean oil, which is a byproduct of soya bean meal production. "People don't grow soya bean for biodiesel production, so most of the feedstocks for biodiesel are sustainable and don't have any impact directly on the food consumption side," she says. Currently, soya bean oil is the starting material for more than one half of the biodiesel produced in the US; the rest is manufactured from waste animal fats and used cooking oil.

Green says that HERO BX, which currently produces around 45 million gallons of biodiesel annually, started production at the end of November 2007. He says that the facility, which runs about 145,000 gallons of feedstocks per day, intended at its outset to use about 80 percent vegetable oil and 20 percent animal fats. "We are actually running in the exact opposite of that today because of the economics of the market, with more animal fats from poultry, pork, beef tallow, and used cooking oil, and only a small portion of virgin vegetable oils. We actually run a blend of these feedstocks to meet the requirements of our marketed commodities, which are based on different specification parameters."

To underscore the point about certainty and predictability of feedstock availability, Green says that HERO BX does not engage in any direct feedstock collection. "We purchase raw materials in railcar (25,000 gallons) and truck (6,000 to 7,000 gallons) loads from a number of feedstock brokers operating in our geographic region."

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.*

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The World's Largest Gas to Liquids Facility Runs on Thermo Scientific SampleManager LIMS

By Colin Thurston
Thermo Fisher Scientific

Pearl GTL has no shortage of world records: Established by Shell and Qatar Petroleum in 2006, the facility is the largest gas to liquids (GTL) plant on earth. GTL technology enables Qatar–in partnership with Shell–to open up new opportunities in new markets, monetizing its enormous natural gas resources through the creation of high-quality, easy-to-export liquid fuels. The facility processes 1.6 billion cubic feet of wellhead gas per day, using the proprietary Shell Middle Distillate Synthesis process to convert gas field output into fuels, lubricants and other high-quality products that Shell ships to markets around the world.

It was clear from the beginning that Pearl GTL would need a highly sophisticated software solution to manage the data coming out of a quality control system that receives a constant stream of 34,000 transmitted measurements. These tests gauge well content, volume, emissions, equipment condition and hundreds of other issues integral to the plant's operation. In addition to collection and storage, the data also needed to be organized, integrated and analyzed to ensure product quality, plant and customer safety, environmental protection and production efficiency.

"A project of Pearl GTL's magnitude hasn't been attempted before," said Ajith Kumar, senior business analyst for Qatar Shell GTL. "With billions of investor dollars and tens of thousands of jobs at stake, data management was a major priority. To maximize production with quick decisions, we needed condensed, accurate information at our fingertips at all times."

With so many prerequisites for success, Pearl GTL needed a proven solution. The right laboratory information management system (LIMS) would allow Pearl GTL's sampling program to meet its designers' sophisticated ambitions. It would present accurate, unbiased information that enabled Shell to maintain the highest standards of safety, regulatory compliance and environmental commitment without sacrificing financial performance. In fact, a LIMS would enhance Pearl GTL's bottom line by collating testing data, which allows managers to make impactful business decisions quickly.

In addition to organizing sample results, Pearl GTL's LIMS would need to be fully integrated and communicate with a variety of other systems or a venture the size and scale of Pearl GTL would be nearly impossible. Shell chose Thermo Scientific SampleManager LIMS for its state-of-the-art testing laboratories, because the solution offered unparalleled support for each of its stringent requirements.

One of Shell's principal reasons for choosing the LIMS was its ability to work with

other systems. At Pearl GTL, the LIMS is integrated with an operations management system (known as OTTER), process historian (PI), the oil movement and batch tracking system, laboratory instruments and other production systems. The way the LIMS integrates with PI is a particular source of efficiency. Where some labs manually send test results to operations, technologists and process engineers, among other users, at Pearl GTL results become available to all relevant parties within the PI system as soon as they are authorized in SampleManager. This means that the many employees whose work hinges on quality sampling are receiving the information they need in real time.

> "Field operators can do their jobs faster and also more accurately, since they're not recording readings by hand. And ultimately, it's SampleManager that enables the real-time aspect of the OTTER system to be possible."
>
> **— Mansoor Al-Shamri, Laboratory Manager, Qatar Shell GTL**

Another critical consumer of lab data is Pearl GTL's oil movement and batch tracking system. Again, the LIMS creates efficiencies by eliminating wait times. When panel operators need to move oil to new tanks in preparation for shipping, for example, they do not have to wait to be notified of test results, minimizing demurrage charges for loading delays that can cost as much as $35,000 per day. As soon as the results have been issued in the lab, SampleManager notifies operators through the oil movement system, with which it is seamlessly integrated. Since Pearl GTL opened, the facility has incurred no demurrage charges, an incredible feat for an operation so large.

A LIMS also helps Pearl GTL operators more efficiently collect data from the field for analysis in the lab. Using the OTTER system, all sample points in the field are marked with radio frequency identification tags. When field operators perform sample rounds, a handheld computer guides them to each sample point and then automatically records the required information, whether the sampling task is routine or non-routine. The data are then instantly transferred to SampleManager from the field, saving Pearl GTL an estimated 2,400 hours worked per year.

"It's amazing how much overhead we were able to eliminate with the OTTER system," said Mansoor Al-Shamri, laboratory manager for Qatar Shell GTL. "Field operators can do their jobs faster and also more accurately, since they're not recording readings by hand. And ultimately, it's SampleManager that enables the real-time aspect of the OTTER system to be possible."

Pearl GTL is unique as an integrated upstream/downstream facility that entails

the full value chain of gas extraction and processing from offshore development through onshore refining. Shell and Qatar Petroleum used a LIMS to help their ambitious vision excel by managing a highly sophisticated sample program. Pearl GTL's testing program enables the world's largest gas to liquids facility to operate efficiently and safely while adhering to regulations and maintaining profitability, and Thermo Scientific SampleManager is the lynchpin that makes it all possible.

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For more information, please visit www.thermoscientific.com/informatics or email us at marketing.informatics@thermofisher.com.

MICROPLATE READERS

NEED FOR NEW ABILITIES DRIVES UPGRADES AND NEW PURCHASES

by Rachel Muenz

The need for new capabilities—for new experiments and assays—is the major reason end-users need to either upgrade their current microplate readers or buy a new instrument.

Edward Dell, Ph.D., BMG LABTECH international marketing director, adds that microplate readers often have multiple users, meaning there is lots of wear and tear on these instruments. Filters are also known to degrade over time and moving parts such as motors and belts can become misaligned.

If maintenance can't fix these problems, the reader will likely need to be replaced.

"One of the ways to keep a microplate reader going is to have an annual QCPM (quality control preventive maintenance) check," Dr. Dell said of how users can avoid problems like this. He added the lifecycle for most microplate readers tends to be three to five years, though BMG recently had a customer whose microplate reader served for 18 years before needing replacement.

"They finally put it to bed because the computer operating system was out of date and we couldn't find the computer operating system to run that software version anymore," Dr. Dell said. "So the instrument didn't actually break down but the computer running the instrument broke down."

The decision on whether or not to add new features to a current reader, or purchase a new system with the latest and greatest technology mostly comes down to budget.

"It's simply an issue when enough money is available," said Dr. Michael Fejtl, detection market manager at TECAN Austria.

If the budget is large enough and a user needs many capabilities or expects to need them down the road, it's probably a good idea to invest in a fully-loaded, future-proof instrument, Dr. Fejtl said.

➤ TECAN Freedom EVO 75 with integrated Infinite 200 PRO plate reader. This is just one option for users who want to upgrade their current reader.

➤ Another feature users can add to their TECAN Infinite 200 PRO, or other TECAN reader, is the Reagent Injector Box.

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For example, TECAN's M1000 PRO microplate reader, has temperature correction for AlphaScreen assays, and a QUAD4 monochromator for free wavelength selection and adjustable bandwidth, meaning that users wouldn't need to upgrade in the future..

However, if money is tight, microplate reader companies offer a variety of features—such as chemical injectors for faster, more complex assays—that can be added to users' current readers.

"If a user starts with absorbance and fluorescence, an upgrade of the plate reader with luminescence detection and injectors allows them to read flash luminescence based assays." Dr. Fejtl explained.

Software upgrades can also add new capabilities to your current reader, Dr. Dell said.

"Software updates allow functionality in the reader that may not have existed two years ago," he said. "Not just software updates to the data, but software updates to run the instrumentation."

Drawbacks to upgrading a current reader, especially if it's an older model, mean that users won't have the absolute best technology available. Newer technology has more features, greater sensitivity, flexibility, and (usually) speed. Adding features to a current reader also takes time.

"It takes some time and additional money, but it is generally accepted that the benefit of an upgrade option is always an advantage," Dr. Fejtl said.

Both experts said users need to be sure to ask about future upgradeability when making an initial purchase of a microplate reader, especially if they know they will need to add features later.

"It always depends on the application customers want to run and biological questions they would like to address," Dr. Fejtl said.

OTHER THINGS TO CONSIDER WHEN DECIDING WHETHER OR NOT TO BUY NEW:

- Do you really need all the bells and whistles a new reader offers?
- Could adding features or upgrading the software on your current reader meet your needs?
- What kind of sensitivity do you need for your assays? Will your older reader be sensitive enough, even if you upgrade it?
- What kinds of options for improving your workflow are available for your current reader or a new one?

◀ BMG's POLARstar—released in 1997—was the first fluorescence polarization microplate reader.

◀ The fourth generation of BMG's POLARstar line, the Omega, was released in 2008.

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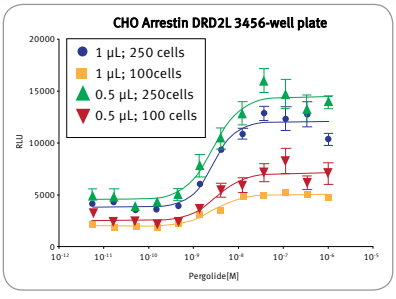

PathHunter® CHO cells with the GPCR DRD2L were plated at 100 and 250 cells/well in 0.5 and 1.0 µLs in AURORA 3456-well plates via the Echo® dispenser, followed by stimulation with Peroglide.

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TECHNOLOGYNEWS

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ANALYTICAL

FT-NIR Analyzer

Booth 3119

TALYS ASP500

- Designed for in-line monitoring and control of batch or continuous processes
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ABB Analytical Measurements — www.abb.com/analytical

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Booth 4008 and 4009

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- Provides the analyst with the capability to capture reference-quality full spectral information at traditional SIM detection limits
- Offers identification and measurement of both target compounds and unknowns in highly complex matrices and at the lowest possible levels
- Rugged and robust in routine operation
- Combines selectivity, stability and speed with full spectral sensitivity

ALMSCO — www.almsco.com

UV-NIR Mini Spectrometer

Booth 1208

AvaSpec-Mini

- Offers performance and reliability in a petite footprint, making it a good fit for OEM applications
- Provides a wide versatility for use in ultraviolent (from 200 nm), and near-infrared (up to 1100nm) applications
- About the size of a deck of cards but features an optical resolution of up to 0.2 nm

AVANTES — www.avantes.com

Handheld Raman Spectrometer

Booth 3349

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- Allows rapid development of standardized and validated methods to facilitate inspection for purity and quality
- Features a temperature controlled detector, providing excellent data quality and unprecedented system stability
- First rate signal reduces the need for further testing, therefore decreasing production costs and escalating productivity

B&W Tek — www.bwtek.com

Dual Light Scattering Particle Size Analyzer

Booth 1106

Nano DS

- Combines Dynamic Light Scattering and Static Light Scattering measurement in one single optical system, making it more effective at analyzing nanoparticles
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- Provides excellent accuracy and repeatability across the entire 0.3 nm to 10 μm size range
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Cilas Particle Size — www.particle-size.com

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Booth 2011

FROG-4000™

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- Uses micro fabricated components to achieve a light-weight and robust form factor
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Defiant Technologies — www.defiant-tech.com

Raman and Luminescent Spectrometry Solutions

Booth 3616

- Raman-luminescent Microscope RamMics provides high sensitivity (resolution: 5-6 cm-1, spectral range: 140-4000cm-1) and high resolution for obtaining spectral images
- Micro Kit turns a regular microscope into a Raman-luminescent tool
- Raman Analyzer EnSpectr R532 recognizes substances with high speed and accuracy
- The EnSpectr Water controls concentration of PHMG on a predetermined level with an accuracy of $<$10% across the range 0,01 - 10 ppm

Enhanced Spectrometry — www.enspectr.com

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Fluid Imaging Technologies — www.fluidimaging.com

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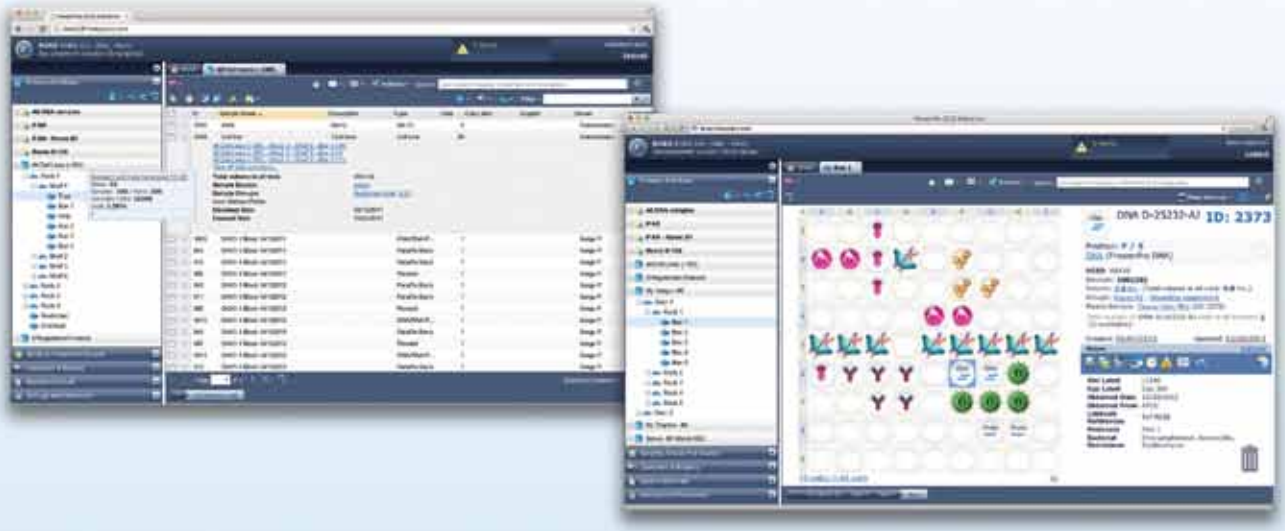

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Section 508 Accessibility Guidelines
HIPAA Accountability Act of 1996
HIPAA Patient Safety and Quality Improvement Act of 2005 (Patient Safety Act)

Compatibility:

- PC/MAC
- Tablet
- Smartphone
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Emulsion and Suspension Stability Analyzers

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- Allows researchers to characterize product stability based on particle size change (flocculation or coalescence) and/or particle migration (sedimentation or creaming)
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Fortis www.fortis-technologies.com

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HORIBA Scientific www.horiba.com/scientific

Raman Microscope

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LabRAM HR Evolution

- Offers a fully automated, extended wavelength range capability and excellent achromatic optical design with a high focal length
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Eastern Applied Research www.easternapplied.com

Optical Spectrometer

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SEDERE www.sedere.com

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Tec5USA www.tec5usa.com

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Thermo Fisher Scientific www.thermoscientific.com

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Anton Paar www.anton-paar.com

Rheometer Options

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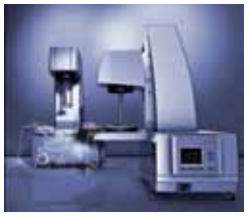

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ATAGO USA www.atago-usa.com

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Bel-Art Products www.belart.com

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Booth 2513

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Biocomponents www.inversina.com

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VIAFLO 384

- Enables labs to process samples simply and productively
- Offers all the benefits of increased sample throughput as well as lower sample and reagent use without the expense of having to invest in a robotic liquid handling system
- Comes with a choice of two 384-channel pipetting heads covering the volume ranges of 0.5 -12.5 µl and 5 - 125 µl

INTEGRA www.integra-biosciences.com

Digital Pulse Mixer

Booth 1004

- These mixers are affordable and can be automated or customized for any vessel
- Perform high or low speed orbital mixing with repeatable mixing results
- Well suited to applications that include solution phase synthesis
- Also a good fit for cell culture and the QuEChERS procedure as the mixer is easily adapted for the various vials associated with QuEChERS

Glas-Col www.glascol.com

Modular Gas Standards Generating System

Booth 340

FlexStream

- Now includes an automated humidity control option which allows simulation of real sample streams
- Dilutes the emission from permeation or diffusion tubes with an inert gas, typically nitrogen or zero air, to create trace concentration ppm, ppb and pptr gas mixtures
- Can also be controlled remotely by a PC or process computer using Modbus® connectivity

KIN-TEK www.kin-tek.com

3D Digital Microscope

Booth 3324

KH-8700

- Delivers fast operation and faster processor speeds
- User friendly software makes this microscope very easy to operate
- Images saved and taken with the KH-8700 are delivered with ultra-fine detail
- Includes a full HD monitor, auto focus, a high intensity LED light source, roughness measurements, and more

Hirox-USA www.hirox-usa.com

High-Specification, Single Frequency Laser

Booth 510

Torus

- Patented cavity of the torus ensures that it operates inherently at single-frequency
- Active mode locking mechanism and intelligent electronics also ensures there is no mode drift or hop, even over wide temperature ranges
- Available at 532nm, with powers up to 750mW and 660nm up to 200mW
- A good fit for a variety of applications

Laser Quantum www.laserquantum.com

Flow Chemistry Starter Set

Booth 3408

- For professional education and laboratory synthesis
- Easy to use, scalable, and extendable
- Features plug and play operation, 4 Mr. lab reactors and 2 single syringe pumps
- Includes framework, tube and fittings, and instructions for 13 reactions e.g. Iodine clock reaction, Hippuric acid from glycine and benzoyl

Little Things Factory www.ltf-gmbh.com

Moisture Analyzers

Booth 4033

Excellence

- Hanging weighing pan provides best measurement performance with highly reliable results in the shortest time possible
- One Click™ Moisture graphical user interface enables smooth and fast operation
- Rugged design and the new easy-cleaning concept ensure a long service life and disruption-free operation
- Feature advanced halogen technology, the key to fast heating and precise temperature control

METTLER TOLEDO www.mt.com

Micro Balances

Booth 4033

Excellence Plus XP

- Especially qualified for micro-dosing directly into large tare containers
- Features SmartGrid micro, SmartSens and SmartScreen—three innovations combined in one balance—ensuring comprehensive weighing security
- Provide optimal user protection, excellent measurement performance, full data security and seamless traceability
- Include built-in warning systems that visually and audibly alert the user

METTLER TOLEDO www.mt.com

Wood Laboratory Furniture

Booth 737

- FSC certified and sustainable materials offered
- No added urea-formaldehyde (NAUF), California Air Resources Board (CARB) compliant and a LEED AP is on staff ready to assist with LEED® registered projects
- All furniture components are tested to the SEFA 8 Recommended Practices and are built to AWI standards to ensure many years of intensive use in a demanding environment

Mott Manufacturing www.mott.ca

Optical Microscopes

Booth 3315

- OPTIKA is continuously working on the development of new models, on production, on quality control, on sales and after-sales service
- Offer quality, innovation, competitive prices, and customer assistance
- Reach end users through a wide network of national and international distributors

OPTIKA Microscopes www.optikamicroscopes.com

Hydrogen Generators

Booth 2035

H2-PEMPD Series

- Produces up to 1,300 cc/minute of 99.99999+% pure hydrogen
- Eliminates the need for dangerous and expensive cylinders of hydrogen fuel gases and helium carrier gases
- Includes output pressure to 175 psig; a maintenance-free self-regenerative palladium membrane; an advanced PEM electrochemical cell protection system with microprocessor controls and a unique water hydration circulation system, along with a variety of other special features

Parker Balston www.parker.com

Karl Fischer Coulometric Moisture Titration System

Booth 1521

Aquatest 1010

- Compact, low-cost unit provides quick and accurate analysis with maximum isolation of solutions from atmospheric moisture
- Uses constant current polarization detection and offers automatic electrolysis current control with a microprocessor controlled maximum titration rate of 1920 μg H20/min
- Now available with regular or diaphramless generator cells at the same price

Photovolt Instruments www.photovolt.com

Universal Homogenizers

Booth 3327

PRO

- Hand-held homogenizers, post-mounted homogenizers and programmable homogenizers with the ability to homogenize various volumes (.03ML to 20L) at speeds of up to 30,000 RPM offered
- New preselected economic packages help users choose the homogenizer that best suits their needs
- Packages include options for a variety of volumes and sample types

PRO Scientific www.proscientific.com

Nitrogen Gas Generators

Booth 2713

- New line of generators is designed to meet a variety of laboratory budgets, sizes and demands
- Simple design helps reduce time spent on maintenance, while delivering a reliable and constant stream of nitrogen gas
- Four of the new generators create nitrogen using membrane technology, producing 34, 60 or 120 liters/minute without an internal compressor, and 36 liters/minute with a compressor

Proton OnSite www.protononsite.com

Cryogenic Mill

Booth 1410/1411

CryoMill

- Oscillating frequency of 30 Hz allows for 50 % increase in grinding energy
- Now includes reinforced housing and optimized liquid nitrogen duct
- Autofill System provides liquid nitrogen in the required amount so that the user avoids direct contact with the LN_2
- Achieves improved grind sizes thanks to the increased oscillating frequency of 30 Hz

RETSCH www.retsch.com

BOOTH 3533 **PRODUCT SPOTLIGHT**

LOW MAINTENANCE MEASUREMENTS

NEW PH METER REQUIRES NO CALIBRATION

Users can look forward to the launch of the world's first calibration-free pH meter at this year's Pittcon conference and expo in Philadelphia—Senova System's pHit Scanner.

The meter's new technology platform incorporates an advanced sensor and electronics into a novel product design, eliminating glass electrodes and enhancing usability compared to traditional pH meters, the company said.

"Senova System's pHit sensor platform represents the most significant technology breakthrough in pH measurement in over 70 years," said Lee Leonard, CEO of Senova Systems. "With its strong usability and cost-of-ownership advantages, the pHit Scanner resolves many longstanding problems and we expect that it will be a 'game-changer' in pH measurement."

pH is one of the most widely measured properties in a range of industries including food and beverage, pharmaceutical, medical, chemical, soil and water testing and academic research.

As well as being calibration free, the new pH meter is also nearly maintenance-free as it can be stored dry and its glass-free design eliminates the threat of broken pH electrodes. The solid-state sensor also reduces signal drift for more accurate and reliable measurement.

Measurement data from the pHit Scanner can be transmitted via USB or Bluetooth and viewed, manipulated, and exported using Senova System's pHit Reports software. The pHit Scanner can also be operated using a single button and features an easy-to-read LCD screen.

Though Senova Systems began shipping the pHit Scanner to Early Access Program customers in December, it will be available for purchase and shipment to most North American customers during the first quarter of 2013.

For more information, please visit www.senovasystems.com

pH, ORP, TDS, & EC Controllers

Booth 3311

SCT Mini and Maxi Series

- Mini-series with 45x91 mm (1.771 x 3.582 inches) and Maxi series with 92x92 mm (3.622 x 3.622 inches) , face opening dimensions respectively, are both panel mounted types
- All the controllers have clear LED digital display for easy viewing
- Provide accurate and precise measurements for good results
- Feature a 4-20 mA current output

Scientific Chemical Technologies www.scichemtech.com

Pilot Scale Supercritical Extractor

Booth 613

SFT-NPX-10

- Designed to perform supercritical fluid extractions in either single or dual 10 Liter sample vessels with single or dual separators, resulting in maximum efficiency
- Coriolis mass flow meter guarantees precise mass flow measurement
- Pneumatic CO_2 pump with an integral waterless pre-chiller (patent pending) is used to maximize pumping efficiency

Supercritical Fluid Technologies www.supercriticalfluids.com

Syringe Pump

Booth 3636

Symax

- High resolution of 25,600 steps per revolution means the motion of the individual steps is virtually undetectable
- Delivery range lies between 2 nano litres and 44 ml per minute, depending on the size and diameter of the syringe used
- Available with a dual stroke option
- Can be used autonomously with a foot switch or integrated into a system

Spetec www.spetec.de

Compact Split Tube Furnace

Booth 2114

eXPRESS-LINE Protégé

- Comes with a 2" ID heated chamber that has a 12" heated length in a single zone configuration for process tubes up to 1-1/4"
- Designed for temperatures up to 1100°C (2012°F)
- Produces uniform heat around the full 360° of the heated chamber and is insulated for maximum thermal efficiency
- Features an integrated single set point controller

Thermcraft www.thermcraftinc.com

Fume Cupboards, Ductless Fume Hoods and PCR Cabinets

Booth 3432

- Variety of polypropylene clean air solutions
- High-quality non-corrosive polypropylene with high level of chemical resistance
- Products protect lab staff from fumes, acids, dangerous gas and organic solutions
- Quality filtering system
- Components from leading companies—AAF USA & EBM Germany
- Compliance with international standards, such as ASHRAE, EN, CE and ISO

TopAir Systems www.topairsystems.com

Air Jet Sieve

Booth 7104

Hosokawa ALPINE e200 LS

- Jet sieving is a very efficient process that uses air flow as the only force that moves the material being analyzed
- Standard unit is available with a choice of three different software packages, from quick individual analysis to special traceability analysis, such as for pharmaceuticals
- Includes special sieve adapter that permits the use of other ASTM Standard, ISO Standard, and traditional air jet sieves

W.S. Tyler www.wstyler.com

CELL CULTURE

37°C Warming Plate

Booth 3825

Scienceware® CultureTemp™

- Helps increase cell viability during cell passaging by keeping cells at an optimal 37°C (+/-1°C) outside of the incubator
- Reduces cell stress and allows enzymes like trypsin to work efficiently
- Minimizes the need to repeatedly enter a CO_2 incubator
- Features a small footprint of 25.4D x 24.9W x 5.7cmH (10 x 9¾ x 2¼")

Bel-Art Products www.belart.com

CHEMICALS, KITS & REAGENTS

Standard Reference Materials

Booth 1528 – 1529

- Over 1300 Standard Reference Materials with well-characterized composition or properties, or both available
- Used to perform instrument calibrations as part of overall quality assurance programs, verify the accuracy of specific measurements and support the development of new measurement methods
- Standard Reference Data Group provided well-documented numeric data to scientists and engineers
- Calibration Services are designed to help the makers and users of precision instruments achieve high levels of measurement quality and productivity

NIST www.nist.gov/srm

QuEChERS Kits

Booth 1231

roQ™

- For the cleanup of multiple pesticide residues in food prior to HPLC or GC analysis
- Rigorously tested tubes and superior tube caps ensure leak-free performance
- Low-extractable tubes ensure the cleanest possible extracts
- Designed to stand upright so they can be easily placed on a scale for sample weighing
- Salt packets have a unique, easy-pour design that minimizes spills

Phenomenex
www.phenomenex.com

'Ready- to- Use' Buffer Packs

Booth 257

- Provide a convenient way of accurately preparing the necessary reagents, at the proper pH and concentration, for solid phase extraction methods
- Eliminate time and more importantly, any potential error in the buffer preparation, ensuring the highest efficiency in the extraction method
- Prepared to same high quality standards as the entire line of SPE products

UCT www.unitedchem.com

LAB AUTOMATION

Automated Powder and Liquid Dispensing

Quantos

- USP's recent changes to General Chapter <841> Specific Gravity and proposed changes to Chapter <1251> Weighing on an Analytical Balance will have a positive impact of the quality of sample and standard preparation
- Using gravimetric techniques (weighing the substance and the solvent) eliminates many potential sources of error in manual and volumetric steps

METTLER TOLEDO www.mt.com

Blending Stations

Booth 2017

BLENDA

- Used in industry to speed up the development of new lubricants for any application
- Blenda 1 is designed for medium size blends of oils and additives up to 500ml
- Blenda 2 is designed for complex formulations with inline viscosity adjustment
- Both systems can produce up to 40 blends per day

Zinsser NA www.zinsserna.com

LIFE SCIENCE

Microwave Reactor

Booth 1131

Monowave 300

- Includes an intuitive software interface and features such as 850W power, *in-situ* temperature measurement, and robust re-usable vials and caps
- Offers a capable platform for microwave synthesis that enables you to focus on the chemistry, not the instrument
- Easy to use

Anton Paar www.anton-paar.com

Rapid Enzyme Digestion System

Booth 3515

- Offers low cost solutions for easy, fast and safe enzyme reactions
- Increases the temperature of the reaction samples as well as the water in the jar evenly and instantly
- Reduces the overall reaction time drastically
- Covers not only a single sample but 96 samples in the 96-well plate at one time for large scale protein digestion or biomarker research

Hudson Surface Technology www.maldiplate.com

Microfluidic Toolbox

Booth 2506

- Contain generic modules for a large number of principal functionalities
- Modules have a standardized footprint and fluidic interfaces in order to combine them in a "lego-like" fashion as well as to interface them easily with existing lab equipment

- Components as well as fitting accessories are available off-the-shelf through microfluidic ChipShop's Lab-on-a-Chip catalogue

microfluidic ChipShop www.microfluidic-chipshop.com

Microplate Heat Sealer

Booth 2854

MiniSeal II

- Offers excellent reproducibility in sealing microplates of all types and sizes
- Operating with a very high force ensures high integrity sealing of deep well or even irregularly shaped microplates
- Only requires plugging into a single electrical outlet to operate
- Does not require a compressed air supply to operate

Porvair Sciences www.porvair-sciences.com

Microplate Evaporator

Booth 2854

UltraVap Mistral

- Robot-compatible automatic dry down station is optimized for Tecan, Hamilton and Beckman robots
- A new version of Porvair's most popular sample concentrator
- Makes it even easier to integrate an automatic dry down step into your automated liquid handling protocol

Porvair Sciences www.porvair-sciences.com

Microwave Digestion System

Booth 3537

TOPEX

- Dual magnetron staggered resonance arrangement maintains non-pulsed continuous microwave output throughout the power range (0-1800W)
- Two kinds of safety mechanisms include positive safety and passive safety
- Includes high frequency closed loop feedback microwave control mode
- Features larger 56L volume of cavity, 316-L stainless steel, which is compatible with different rotors and a variety of other benefits

PreeKem www.preekem.com

LIMS & SOFTWARE

Compound Identification Software Package

Booth 4008 and 4009

TargetView™

- Capable of detecting and identifying both targeted 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 www.almsco.com

LIMS

Booth 1813

Matrix Gemini

- Includes a powerful suite of configuration tools and a desktop/web-browser user interface
- Quick and easy to set up
- Autoscribe Informatics will also be showcasing Stability Management options for pharmaceutical and food applications, the Environmental Monitoring system and Matrix Express, Autoscribe's low cost entry level LIMS for smaller organizations as well as the Quality Management Suite

Autoscribe www.autoscribe.co.uk

Software Suite for Analytical Data

Booth 2009

Seahorse Scientific Workbench 2.0

- Vendor-independent software suite captures, analyzes and shares analytical data
- Consolidates raw and result data from many instruments and techniques in a single tool, based on the emerging ASTM AnIML data standard
- Now includes an intuitive navigation mode, allowing scientists to explore experiments and samples, independent of the original vendor software and a variety of other new features

BSSN Software www.bssn-software.com

LIMS

Booth 1802

HORIZON Data Exchange

- Quickly installed and easy to use
- Reduces instrument interface configuration time from weeks or days to hours or minutes—average time to interface a chromatography instrument with a HORIZON LIMS is 90 minutes
- Makes selecting an applicable parser from a centralized library and operating in either manual or automatic mode easy

ChemWare www.chemware.com

SUPPLIES & CONSUMABLES

Pistons and Ball & Seat Valves

- Made out of advanced ceramics and sapphire
- Surface finish quality is highly polished to better than 1 micro-inch
- Company also manufacturers pistons/cylinders and other custom-made parts for high-pressure pumps, pipettes, metering pumps and other precision dispensers
- Parts are made 100% in-house to guarantee the quality of the material at all stages of the manufacturing process

Ceramaret www.ceramaret.ch

Silica Gel

Booth 636

DAISOGEL

- Analytical and preparative grades are made by the same production method under carefully controlled conditions in order to assure consistent selectivity from lot to lot and between different particle size, which is essential for scale-up work
- Manufactured under ISO 9001 controlled conditions with the advanced sol-gel method
- DAISOGEL bonded phases are manufactured in an industry-leading GMP compliant way

DAISO www.daisogel.com

Manual Inflating Sample Bags

Booth 614

VeriAir Flex™

- Offers a new patented design that allows a grab sample to be collected directly without any need for pumps
- Simple, intrinsically safe, and made of durable multi-layer foil, VeriAir Flex™ bags are both reusable and can be air shipped for overnight delivery

Nextteq www.nextteq.com

PTFE 96-Well Plate Sealing Tape

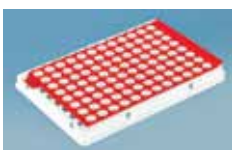
Booth 2313

- Features a pattern adhesive suitable for many applications including PCR, qPCR, auto-sampling, and storage
- Adhesive is applied in a patented pattern that provides adhesive-free target areas that won't clog auto-samplers
- PTFE offers superior chemical compatibility and is optically clear with virtually no autofluorescence
- Easily punctured with as little as 0.5 lb force with no coring or tearing

Sarstedt www.sarstedt.com

Silicone Plate-Sealing Mat

Booth 2313



- Adhesive is applied in a patented pattern for secure adhesion to well rims and is tinted red to aid in correct alignment
- Manufactured from medical grade silicone, the 30 mil thick flat mat is dimple-free for quick, easy application and eliminates well volume loss associated with dimple space
- Offer a wide temperature usage range of -70°C – 120°C

Sarstedt www.sarstedt.com

Dual Purpose Electrodes

Booth 1258

Duro™

- Threaded adaptor (1/2", 3/4" (M) NPT) allows these lab electrodes to be easily converted into industrial ones
- With a special adaptor, it also easily replaces electrodes with a PG13.5 (S8) connector
- Sealed with *ElectroJelly*™, a semi-solid material with a high salt concentration that can effectively hold electrolytes in the electrode and prevent contamination from sample back-flow

Weiss Research www.WeissResearch.com

REGISTER NOW!
www.labmanager.com/chemexpert

Lab Manager MAGAZINE®

EXPERT: Dr. Michael Cournoyer

Dr. Michael Cournoyer is a scientist with Los Alamos National Laboratories (LANL). He has more than 35 years' experience in organic chemistry combined with deep knowledge of federal, state and local regulations that address lab chemical and hazardous material management. He has been the recipient of several awards and published more than 60 papers on topics that range from fire suppression systems to glovebox safety to hazardous material operations.

ASK THE EXPERT WebinarSeries

Five Checklists You Need to Verify Compliance with Lab Chemical Management Requirements

TUESDAY, MARCH 12, 2013, 12:30-1:30 PM ET

Large organizations involved in research and production typically handle large volumes of chemical inventory that require different types of storage and tracking. When a laboratory environment is part of the mix, managing the chemical inventory used by the lab presents a challenge to lab managers and Environment, Health & Safety (EHS) professionals who must submit regulatory reports that accurately reflect the chemicals on site. Ensuring that the chemical inventory data is accurate is challenging; providing that information in regulatory reports–from Tier II to SARA–can be a time-consuming and frustrating task if it is not automated.

During this webinar, Dr. Michael Cournoyer will discuss the system of checklists he developed to effectively address different regulatory standards and thereby ensure that his organization manages chemicals in compliance with those regulations, from accurately reporting quantity to ensuring safe storage practices.

Attendees will learn how to:

- Address regulations that frequently overlap and sometimes conflict
- Prove that your organization is managing chemicals in compliance
- Bring lab chemical inventory management under control
- Manage and mitigate the amount of chemicals on site, and
- How to create site-specific checklists for chemical management and reporting

SPONSORED BY
ChemSW®

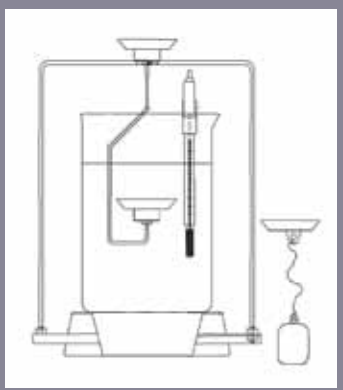
REGISTER NOW! www.labmanager.com/chemexpert

TUNE INTO OUR LIVE WEBINAR to hear Dr. Cournoyer discuss how he developed comprehensive checklists for managing chemical inventory, explain why and how he created the five types of checklists that have proved most effective, and offer insights into ensuring compliance.

26 Commerce Drive,
Danbury CT 06810 USA
Phone: 203-790-4774
Fax: 203-792-3406
www.adamequipment.com

Most manufacturers know that accurately determining the density of raw materials is a critical part of the production process. Why is it so important? It can help control the quality of the final product, and it can help control materials for production and processing. In some industries, it can mean the difference between profit and loss.

Adam Equipment's density kit is a valuable tool to help manufacturers accurately determine the density of their materials. Combine the density kit with the Adam PW analytical balance and the process becomes even more reliable and precise.



Adam Equipment's Density Kit a Winner for Quality Control in Manufacturing and Production

Traditionally, density determination has required measuring the sample material: figuring out the volume, weighing the sample, dividing the volume by the mass, and finally coming up with the density. The process is not only complicated and tedious; it is far less accurate, especially when the shape of the raw material is irregular.

Testing of both solids and liquids is possible using the density kit. That means that even samples with densities greater or less than that of water can be determined. The balance software will calculate density using water, ethanol or paraffin as selectable references. The software also allows the user to enter the density of any reference liquid directly.

The density kit is installed on the floor of the PW's enclosed weighing chamber. The kit's beaker holds the reference liquid and may be reused to test as many samples as needed. The user simply selects the density application from the built-in menu options. If a reference liquid is used other than what is already programmed into the balance, the user can enter the density for that reference liquid. The application prompts the user through the process: weigh the sample in air using the sample cup on top of the stand, then in the reference liquid using the sample cup suspended on the wire. The balance software calculates the density automatically.

Shown with Adam Equipment's PW analytical balance, the density kit consists of a glass beaker, a suspended weighing cradle to replace the standard pan, independent support for the beaker of fluid, thermometer with clip for suspension in the fluid and glass sinker of known volume for determination of fluid density.

Adam's PW analytical balances offer a quick and easy way to measure to 0.1mg. The PW provides 16 weighing units, including a custom unit and features durable metal construction, standard internal motorized calibration and a large backlit dual display that shows text prompts to help the user set up the balance quickly. Highlighted tare keys stand out for accessibility, while other buttons operate set-up functions, turn the balance on or off, send data to a printer, calibrate and change modes and weighing units.

The bi-directional RS-232 interface enables data transfer from the balance to printers or computers. This allows foolproof data recording and traceability, letting the operator focus on data analysis. Other useful features include built-in applications for density, percentage, comparison and check weighing, plus counting and dynamic or animal weighing.

About Adam Equipment

Adam Equipment manufactures and distributes a full selection of precision balances and scales for the lab, education, industrial, retail, health/fitness, animal/veterinary and jewelry markets. The company is headquartered in England and has offices in the United States, South Africa, Australia and China. Founded in 1972, Adam is proudly celebrating its 40th anniversary in 2012. Since its inception, Adam has provided its customers with the winning combination of speed, performance and value. For more information about the company and its products, go to www.adamequipment.com.

Synergy™ Neo HTS Multi-Mode Microplate Reader: A Smart Alternative for Today's Smart HTS Assays.

High throughput screening (HTS) methods have evolved significantly since their inception. Instead of the traditional approach where millions of compounds are tested to look for a hit, today's HTS assays use focused libraries with known target pharmacophores. Additionally, cell-based HTS assays are becoming more popular than biochemical HTS assays because they offer a more holistic view of potential drug target effects and interactions.

BioTek
Get a Better Reaction.

P.O. Box 998, Highland Park
Winooski VT 05404 USA
Phone: 888-451-5171
Fax: 802-655-7941
Email: customercare@biotek.com
www.biotek.com

Like assays, HTS instruments such as BioTek's Synergy™ Neo HTS Multi-Mode Microplate Reader (Figure 1), are also evolving to meet the demands of today's screening and core laboratories. Synergy Neo has all the attributes of typical HTS readers like multiple parallel detectors for ultra-fast measurements, yet is well-suited for smaller, efficient, cell-based screening assays in 96-, 384-, and 384LV-microplates.

SPEED FROM ALL ANGLES

Four photomultiplier tube (PMT) detectors including a dual PMT read head, a high Xenon flash rate, and a plate read time of 6 seconds for 96-well plates, and 11 seconds for 384-well plates, all combine to offer rapid ratiometric results with excellent performance. Additionally, Synergy Neo's optional plate stacker provides a load/unload plate transfer time of about 6 seconds per plate, thus allowing walk-away automation of short- or long-term assays.

PATENTED OPTICS AND ALPHA DETECTION

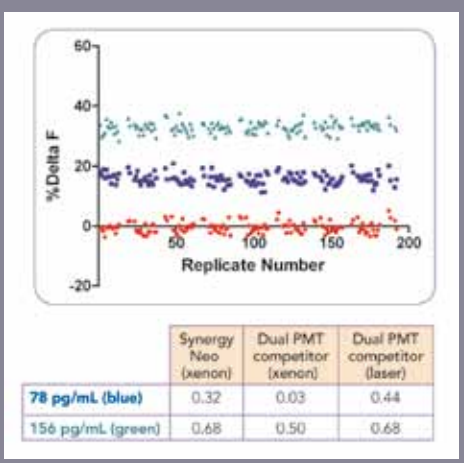
Synergy Neo's patented* Hybrid Technology™ combines high-performance filter-based optics with quadruple monochromator-based optics for a unique blend of power and flexibility. In fact, Synergy Neo was benchmarked by third-party laboratories against reference instrumentation and was found to perform better than leading competitors (Figure 2). Both optical systems may be read from the top or bottom of a microplate for enhanced assay versatility, and a dedicated filter-based system is optimized for sensitive, high-performance live cell assays. The filter systems feature direct, fiber-free light paths for less light loss and maximum light delivery to the sample and detector. For added application flexibility, a high-energy 100 mW laser-based Alpha detection module is available in select Synergy Neo models, providing speed and sensitivity for cell-based Alpha assays, even those with low signals.

UNIQUE FEATURES FOR SMARTER SCREENS

Synergy Neo is uniquely suited for today's diverse assay requirements by incorporating additional features such as advanced 4-Zone™ temperature control to 65 °C, orbital and linear shaking, and barcoded filter cubes for positive filter identification. Additionally, a camera-based barcode can scan both 1D and 2D barcode labeled microplates for streamlined workflows and reduced operator error. An optional Take3™ Micro-Volume Plate allows Synergy Neo to quantify ultra-low volume samples down to 2 µL without dilution. Integrated Gen5™ Data Analysis Software controls every aspect of Synergy Neo, with an uncomplicated, intuitive workflow interface, powerful data analysis and easy data export options.

**Hybrid Technology is protected under US Patent 8,128,141.*

Figure 1. Synergy Neo HTS Multi-Mode Microplate Reader from BioTek Instruments.



	Synergy Neo (xenon)	Dual PMT competitor (xenon)	Dual PMT competitor (laser)
78 pg/mL (blue)	0.32	0.03	0.44
156 pg/mL (green)	0.68	0.50	0.68

Figure 2. Z'-factor calculation illustrating Synergy Neo's superior optical design. Synergy Neo outperforms a dual PMT competitor using a xenon flash lamp, and performs similar to a competitor using laser-based excitation.

Many industries, from pharmaceuticals to food, are seeing a demand for increasingly lower detection limits and improved elemental analysis results. As spectrometers have improved, so too have sample preparation techniques, with microwave digestion becoming the method of choice for many analysts. CEM offers two different platforms for microwave sample preparation that provide fast, accurate results and are available with a range of options, vessels, and accessories. The Discover® SP-D Pressurized Microwave Digestion System efficiently digests a variety of sample types in as little as 10 minutes, including cool down. The MARS 6™ High-Throughput Microwave Sample Preparation System can process up to 40 samples simultaneously in easy-to-use 3-part vessels. Both systems feature the latest technology for safe, efficient, rapid results every time.

CEM

www.cem.com

Closed vessel microwave sample preparation is ideal for a large variety of applications. It is the safest, most rapid technique in use today for acid digestion or solvent extraction and advances in technology have made it increasingly easy to use.

The Discover SP-D is a sequential system that allows individual sample programming, so that samples with different parameters and methodologies can be run in any sequence. In addition, the software allows interruption of a pre-programmed run for a priority sample and will resume processing the original sequence at the point of interruption. The system features temperature and pressure control, as well as CEM's patent-pending ActiVent® Technology, which manages and vents pressure build-up without loss of analytes. The SP-D was designed for safe digestions, with unique circular cavity that completely encapsulates the vessel in rugged, durable solid steel and focuses energy efficiently on the sample, drastically reducing reaction times.

The SP-D is available with automated sample decks in three different sizes, which can be set to run overnight. CEM offers a choice of 10-, 35-, or the new 80-mL Pyrex® or quartz vessels with simple, disposable snap-on caps. The system is compact and can be placed on a benchtop or in a fume hood.

Available in three different configurations, the MARS 6 offers an impressive array of capabilities. CEM's One Touch™ software and sensor technologies enable the MARS to recognize the vessel type, count the vessels and determine the best parameters for a fast complete reaction. All you do is choose your sample type with a One Touch Method and MARS does the rest.

Whereas most microwave systems cycle the magnetron on and off in order to control the temperature, MARS utilizes CEM's PowerMAX™ Technology to ensure the magnetron stays on longer and maximum power is delivered to the sample. The system's industry-leading 1800 W of power allows the MARS to completely digest even difficult sample matrices with ease. Temperature is controlled based on the most reactive sample and the system can automatically choose the control vessel using DuoTemp™ All Vessel Temperature Control.

Chemists can easily operate the system using the large, high-resolution, built-in, color touch screen interface. The MARS 6 also features video tutorials for vessel assembly, system operation and maintenance, and sample preparation.

CEM chemists helped pioneer the field of microwave chemistry and we have endeavored to build that knowledge into our systems, making them the easiest-to-use, most innovative microwave sample preparation instruments available.

PIPETMAX – Protocol Automation

Manual sample preparation can be inefficient, complex and time consuming. This leads to increased training requirements, preparation time, procedural errors and operational costs. The Gilson PIPETMAX® is an easy-to-use, automated liquid handling platform that can mitigate these problems with automated sample preparation solutions. Unlike traditional automation platforms, PIPETMAX comes at a size and price that is accessible to any lab.

Gilson, Inc.
P.O. Box 620027
Middleton, WI 53562-0027
800-445-7661
www.gilson.com

Taking PIPETMAN® to the MAX

The PIPETMAX has been developed to automate sample prep processes that are commonly done by hand using manual pipettes. Used in combination with an intuitive software package developed by Gilson for this product, PIPETMAX can be fully customized to suit your application, creating complete, easy-to-use, turn-key solutions that are simple enough for any operator. The PIPETMAX is ideal for PCR/qPCR, cell-based assays, NGS prep, ELISA prep, and tip-based sample prep.

Designed and engineered to cross over the gap between manual liquid handling and high-throughput automated liquid handling, the PIPETMAX 9-position automated pipetting system represents a synergistic fusion of both of Gilson's liquid handling product lines (manual pipettes and automated liquid handling platforms).

PIPETMAX IS A PIPETMAN

A hands-free PIPETMAN designed to accommodate a multitude of applications through an uncommonly simple and flexible touch-screen solution! Researchers using PIPETMAX will instantly recognize the liquid handling component inside the platform and will notice that it functions identically to PIPETMAN, our legendary manual liquid handling pipette. The pipette heads can be easily removed in order to be recalibrated to ISO standards, just like a manual pipette.

Because it is a PIPETMAN, PIPETMAX can fit into current laboratory SOPs and GLP standards, and will match the legendary performance criteria of a Gilson PIPETMAN. The system is designed to be intuitive, easy-to-use, and tailored to specific applications. Priced to be considered for simple liquid handling tasks, PIPETMAX relieves you of mundane repetitive tasks and allows you to focus on more important aspects of your science.

It's as easy as PIPETMAN!

To learn more about the new PIPETMAX, please visit us at gilson.com or email Tristan Berto at tberto@gilson.com.

Hamilton's Microlab 300 Redefines Hand-Held Pipetting

Hamilton puts the accuracy and precision of its automated liquid handling systems in the hands of laboratory technicians

Reno, Nevada (December 4, 2012) -- Hamilton Company's Laboratory and Sensor Products Division introduces the Microlab® 300 Series Pipettor, the industry's first guided pipetting system. The product is designed to bring the assurance of an automated liquid handling system into the hands of the laboratory technician at a low cost and without complex programming. This lightweight, hand-held device enables laboratories to achieve unsurpassed quality assurance through reproducible and traceable methods, and to reduce sample preparation time by eliminating inefficient steps.

HAMILTON®

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"The innovative design of the Microlab 300 Pipettor replaces three to four manual or electronic pipettes with one device. Users can dispense between 0.5–1000 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."

The Microlab 300 meets GLP/GMP, RoHS, 21 CFR Part 11, and ISO-8655 regulations. The system also exceeds accuracy benchmarks set by the industry by allowing users to fine-tune pipetting parameters for each liquid.

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

The Microlab 300 is also unique because of its user-friendly software. The system goes beyond pre-programmed pipetting operations for common techniques, like reverse pipetting and aliquoting, and allows technicians to easily create, save, and execute pipetting applications from start to finish. Users also benefit from a range of software advancements:

- Linked Methods serve as electronic standard operating procedures and eliminate process errors by guiding the technician through the pipetting steps in a graphical and auditable manner.
- Volumes are automatically set by the system, eliminating manual adjustment errors.
- Log files of all pipetting activities are generated and stored for traceability.
- User accounts and password protection provide system security and accountability.

The Microlab 300 is currently available in North and South America, Australia and the Pacific Rim.

www.hamiltoncompany.com/microlab300.

Hamilton Company is a global leader in the design and manufacture of liquid handling, process measurement, robotics and storage solutions, serving customers in academic and private research laboratories, pharmaceutical and clinical diagnostic companies and government institutions. Hamilton maintains headquarters in Reno, Nevada; Hopkinton, Massachusetts; and Bonaduz, Switzerland, along with subsidiary offices throughout the world. For over 50 years, the company has maintained its commitment to building precision and quality into every product. Hamilton is a privately held company with ISO 9001 certification. For more information, **visit www.hamiltoncompany.com.**

Hamilton's MICROLAB® STARlet for REM e Integration

HAMILTON®
www.hamiltoncompany.com

Hamilton's MICROLAB® STARlet for REM e Integration (Figure 1) provides an automated solution for emPCR enrichment and sequencing primer hybridization. Designed to support the Roche/454 Genome Sequencer FLX Titanium Series System, the STARlet for REM e Integration features 8 independent 1ml pipetting channels, associated labware racks/carriers. Figure 2 shows the integration of REM e module (sources separately from Roche/454). The turn-key solution includes five performance-verified protocols for large, medium and small volume samples, providing convenient walk-away automation for streamlined workflows, desired throughput and reproducibility when compared to manual processing.

The Roche/454 Genome Sequencer FLX System is a versatile sequencing platform suitable for a wide range or research applications, including de novo sequencing and assembly of genomic DNA, transcriptome sequencing, small RNA analysis and amplicon sequencing.

The Genome Sequencer FLX workflow consists of three primary processes: library preparation, emPCR amplification and sequencing. The REM e module is a self-contained, multi-functional liquid handling accessory capable of vortexing, vacuum filtration (no centrifugation required), magnetic bead capture and heating to 65°C. The device is designed to automate the enrichment and sequence primer annealing steps of the GS FLX Titanium emPCR process. When integrated to the purpose-built MICROLAB STARlet pipetting workstation, the system dramatically simplifies the emPCR workflow by replacing 5 hours of dedicated manual lab work with an automated walk-away procedure. (Figure 3)

Data from various sample types and formats processed on the STARlet workstation demonstrate achievement of sequencing results comparable to those of manual emPCR enrichment. (Figure 3) The enrichment data along with the sequencing data (not shown) confirms that the system is capable of performing emPCR enrichment with results that are consistent with expectations. The MICROLAB STARlet for REM e integration significantly decreases the amount of hands-on time necessary to perform sequencing, and minimizes errors attributed to manual mispipetting.

Now available on the Microlab® NIMBUS workstation!

INTEGRA Handheld Multichannel Electronic Pipettes

INTEGRA's VIAFLO 96 and VIAFLO 384 Handheld Electronic Pipettes offer an efficient way to increase sample throughput without the cost and complexity of a robot. They are handheld benchtop pipettes, capable of 96- and 384-well pipetting with a choice of various pipetting heads.

INTEGRA

INTEGRA Biosciences Corp.
2 Wentworth Drive
Hudson, NH 03051, USA
Phone: 603 578 5800
Website: www.integra-biosciences.com

VIAFLO 96 offers an affordable solution to increase productivity when working with microplates. It closes the gap between traditional manual pipettes and robotic systems, allowing for accurate and reproducible 96-channel pipetting.

VIAFLO 384 is a more advanced system, which can work with both 96- and 384-channel pipetting heads to maximize productivity. It features the same footprint and intuitive user concept as VIAFLO 96.

The unique user concept resembles traditional manual pipetting. VIAFLO 96/384 is hand-guided but movements are assisted by motors. This enables an effortless and precise workflow. Pushing in one direction steers the pipetting head that way, making VIAFLO 96/384 incredibly intuitive to operate. Everyone in the laboratory is able to use the instrument without special training.

- VIAFLO 96/384 is used like a handheld pipette and has an intuitive user interface, freeing staff from training time.
- Benchtop sized, it requires little space and fits into laminar flow hoods.
- Interchangeable pipetting heads: Pipetting heads can quickly be changed to adapt VIAFLO 96/384 to application's volume range, guaranteeing best pipetting performance at all times.
- Up to 10 predefined pipetting modes are available to minimize set up time. Alternatively, personalized custom programs can be created to suit diverse application needs.
- GripTips together with the new tip fitting interface form an integral system, effectively preventing tips from falling off and guaranteeing a perfect sealing to achieve best pipeting results.

Download product brochure -
www.integra-biosciences.com/sites/pdf/flyer/125954_V00_Flyer_VIAFLO_96_384_EN.pdf

ADA Compatible Undercounter Refrigeration

Helmer has released new undercounter refrigerators and freezers that offer secure storage and consistent temperatures to provide safe storage of products while fitting under counters that meet the requirements for ADA (Americans with Disabilities Act) compliant counters.

Helmer
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Noblesville IN 46060 USA
1.800.743.5637 or 1.317.773.9073
Email: sales@helmerinc.com
www.helmerinc.com

ADA requires that all new construction and remodeling projects meet ADA requirements for counter heights. ADA Undercounter Refrigerators and Freezers offer the same high-quality storage solution found in all Helmer Scientific products. They feature superior chamber temperature uniformity and quick recovery with a heavy-duty, air-cooled refrigeration system that promotes exceptional airflow throughout the entire chamber without restricting storage space. The bacteria-resistant powder coated exterior and interior provides security against contaminants and is easy to clean. In addition, products are stored safely with a key lock or with optional integrated access control.

ADA undercounter models have been designed for convenience and performance. The field-reversible door is also self-closing. Front ventilation eliminates the need for top or side clearance so that the unit will easily fit beneath your counter and next to other cabinetry or products. The front drop-down panel offers access to components for easy serviceability.

ADA refrigerators and freezers are available in i.Series®, Horizon Series™, and Scientific Series™ models. i.Series models include the i.C3® User Interface which features an icon driven full-color touchscreen. The i.C3 includes multiple information logs, on-screen corrective action, and downloading capabilities putting valuable information at your fingertips and providing documentation for record keeping.

Custom storage options are available for all models and include drawers, roll out baskets, and fixed shelves. LED lighting, swivel casters, glass doors, integrated access control, and stainless steel are also available to create a custom storage solution for your facility.

For more information on ADA undercounter refrigerators and freezers contact: www.helmerinc.com.

ProCyte Dx® Hematology Analyzer for Research

With the ProCyte Dx®, IDEXX BioResearch is delivering the next generation of research hematology analysis for laboratory animals. The small benchtop hematology analyzer is specifically designed to help laboratory animal researchers generate accurate, reliable, quality results. The analyzer is validated for 13 common laboratory animal species, including mouse, rat, nonhuman primate, dog, rabbit, mini pig and more. The analyzer also measures 31 different blood parameters and delivers an advanced five-part white blood cell differential and absolute reticulocyte count in 2 minutes using only 30 µl of sample. The ProCyte Dx® analyzer delivers the same high-precision results seen in many core labs, but with better sensitivity and specificity for laboratory animal species.

IDEXX BioResearch,
a division of IDEXX Laboratories, Inc.
One IDEXX Drive
Westbrook, ME 04092
Phone: 1-855-425-5215
idexxbioresearch.com

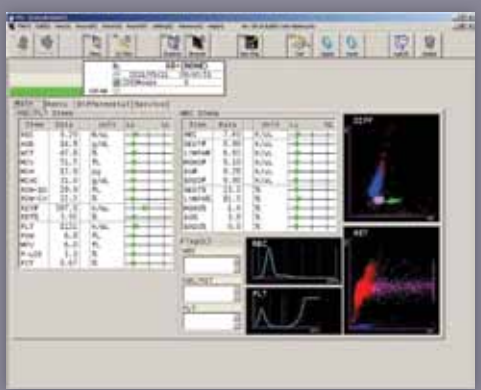
Employing three cutting-edge technologies, the ProCyte Dx analyzer provides the most comprehensive CBC available; matching or exceeding the capabilities of reference laboratory hematology analyzers.

- The ProCyte Dx Hematology Analyzer uses laser flow cytometry to perform a full analysis of multiple characteristics of each white blood cell and to deliver an advanced five-part white blood cell differential–the most accurate interpretation of all five white blood cell types.
- Using specific fluorescent stains, the ProCyte Dx analyzer provides a highly sensitive and accurate reticulocyte count via optical fluorescence. Platelets are analyzed to ensure superior separation when delineating them from red blood cells of similar size. Only the ProCyte Dx analyzer offers this superior capability for highly sensitive and accurate analysis.
- With its advanced Laminar Flow Impedance™ technology, which lines up cells one by one to ensure each is characterized individually, the ProCyte Dx analyzer performs the fastest and most precise count of red blood cells for quick and accurate analysis.

These technologies combine to deliver unprecedented accuracy, efficiency, speed and precision. The ProCyte Dx analyzer provides testing for multiple species, including mouse, rat, nonhuman primate, rabbit, gerbil, guinea pig, mini pig, dog, cat, ferret, cow, pig and horse and validated results on 31 different blood parameters including WBC, RBC, HGB, HCT, MCV, MCH, MCHC, PLT (PLT-I or PLT-O), NEUT (%, #), LYMPH (%, #), MONO (%, #), EO (%, #), BASO (%, #) RDW-SD, RDW-CV, MPV, P-LCR, PDW, PCT, RET (%, #), LFR, MFR, HFR and IRF. Flags help identify abnormal cells indicating conditions such as a left shift or the presence of nRBCs.

With the ProCyte Dx analyzer, running a sample is quick and easy–even maintenance is a simple push of the button. The system stores data for 3,000 samples (including graphics) and presents the data in a clean, intuitive format that provides additional data screens for analyzing difficult samples. The data can also be readily exported for further analysis in your preferred data analysis software.

Studies comparing the ProCyte Dx analyzer to the Advia® 120 and the Sysmex® XT-2000iV show unparalleled red blood cell count, hematocrit, reticulocyte count, platelet count and white blood cell count correlation.[1]



▲ *The ProCyte Dx® Hematology Analyzer generates scattergrams providing a snapshot of cellular morphology. Scattergrams provide a visual representation of the cell counts; each dot represents a single cell.*

Reference:

1. The Advia 120 Hematology System and the Sysmex XT-2000iV Automated Hematology Analyzer are reference laboratory diagnostic instruments that analyze whole blood to provide complete blood count (CBC) results, including white blood cell differential and reticulocytes. A paper with an independent comprehensive review of all parameters can be obtained from your IDEXX sales representative.

CentriVap® micro IR Vacuum Concentrator increases yields in DNA analysis

by Jenny Sprung, Product Manager, Labconco Corporation

Labconco Corporation makes a full line of centrifugal vacuum concentrators that use a combination of centrifugal force, vacuum and heat to speed evaporation of multiple small samples. They offer maximum throughput required by biology, microbiology, biochemistry, pharmaceutical research and analytical chemistry laboratories.

Protecting your laboratory environment
LABCONCO®
Jenny Sprung, *Product Manager*
Labconco Corporation
email: jennys@labconco.com
ph: 816-822-3723
web: www.labconco.com

Getting DNA samples ready for analysis can be the most time consuming and critical step for DNA technicians in the Forensic lab. Often in order to produce reliable results, the yield of the DNA needs to be increased. If low yields are a problem, Labconco's CentriVap micro IR can very easily help you increase the yields in one easy step.

Many DNA extraction kits or techniques have sample volume limitations. To get your DNA samples ready for these applications, large sample volumes can be reduced or concentrated in the micro IR effectively without the addition of excessive heat or without introducing inert gases over the samples. The CentriVap micro IR spins samples at a relatively low rpm that applies centrifugal force to contain samples in the tubes while a vacuum is being applied to the chamber, increasing evaporation rates.

Ethanol precipitation is a commonly used technique for concentrating and de-salting DNA preparations in aqueous solutions. In order to increase yields when doing an ethanol precipitation, a final ethanol rinse is recommended followed by drying the DNA pellet in a centrifugal concentrator. The convenient strobe light that is included with the CentriVap micro IR saves time and frustration by making it possible to view the samples and determine sample dryness while they are still spinning and under vacuum. Without the strobe light, the end user would need to check for sample dryness by stopping the concentrator, releasing the vacuum, check the samples, and then restart the concentrator and vacuum if the samples are not yet dry. With the strobe light, sample dryness can be determined with a quick view.

Labconco's CentriVap micro IR is an all-in-one evaporator that includes the concentrator, pump, rotor and strobe light. Even though it is compact and small, it is able to accommodate 24 samples within the same run, to help you keep up with your lab's backlog. The CentriVap micro IR is so small that it can be stored when not in use freeing up valuable bench space, or, can be carried from one location to another.

For further information, visit www.labconco.com where you will find details on each system and instructional videos, or call 800-821-5525.

875 KF Gas Analyzer: Fully automated water analysis in permanent and liquefied gases

With its new 875 Karl Fischer Gas Analyzer, Metrohm combines decades of experience in moisture analysis and sample handling. The KF Gas Analyzer is designed to handle nearly any gas sample – compressed, liquefied or native. It is fully equipped to measure the absolute moisture content of LPG, petrochemical intermediates, natural gas or other compressed or liquefied gases.

Metrohm
USA Inc.
6555 Pelican Creek Circle
Riverview, FL 33578
866-METROHM (638-7646)
www.metrohmusa.com

Metrohm's easy-to-use gas analyzer features a complete and integrated sample introduction and treatment system. The integrated sample heater guarantees uniform temperature and evaporation of a sample regardless of its original state while a precision flow control valve ensures a constant and even flow of the sample. A series of automatically controlled magnetic valves connect the sample to a rugged mass flow controller, which carefully meters the exact amount of gas specified for each analysis. The analyzer's coulometric cell is powered by one of Metrohm's lab favorites - the KF Titrando. The system's strict separation of gas-carrying system and electronic area ensure safe operation. Gasses are prevented from ever coming into contact with sparks, which eliminates the risk of gas explosion.

These key features and the KF Gas Analyzer's robust design make it an ideal candidate for routine analysis in the laboratory. The system is controlled by Metrohm's easy-to-use *tiamo™* software and consists of a control unit and an analysis module.

Highlights:

- Complete system with durable components for high flexibility
- Separation of the gas handling system from the electronics and power supply for added safety
- Sample inlet filter to keep out particulate matter
- Venting bypass to release the pressure when swapping gases
- Built-in evaporator for gasses in all states – native, compressed and liquid
- Oil filter with flushing port to remove residual oil
- Precise gas measurement with a mass flow controller (MFC)
- Automated analysis sequence using magnetic valves
- Predefined analytical methods with gas feed and pre- and post-flushing phase
- All components integrated in one system

The 875 KF Gas Analyzer is supplied with predefined software methods, so measurement can begin immediately after installation.

Analysis of a wide range of liquefied or compressed gases, such as:

- propane, propene, LPG, butane, butene, butadiene
- dimethyl ether, ethylene oxide
- chlorinated hydrocarbons: methyl chloride, ethyl chloride, vinyl chloride
- refrigerants: various CFC, HFC, CFC
- New and contaminated refrigerants containing refrigeration oils

Nor-Lake® Scientific -86°C Select™ Ultra-Low Upright Freezers

Designed to meet the demanding requirements for scientific and laboratory research. Advanced engineered design incorporates the latest in cabinet, refrigeration, temperature control and monitoring features. Provides energy efficient, convenient, safe and reliable performance for optimal storage temperature environments necessary for a wide range of life science, pharmacy, biological, medical, clinical, and industrial applications.

Nor-Lake Scientific
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Hudson, WI 54016
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CONSTRUCTION

- CFC free polyurethane cabinet and door foam insulation.
- High-impact, smooth scratch and corrosion resistant painted exterior and smooth white painted interior, provides attractive appearance and easy to clean surfaces.
- Interior and exterior of the freezer cabinet are white painted galvanized steel.
- Combination cabinet mounted multi-bulb and door perimeter gaskets provide multiple points of door sealing. Ensures reliable frost resistant performance and enhances energy efficient cold performance for long term sample security and storage.
- Interior doors (5) independent hinged steel inner doors are constructed of insulating material with magnetic catch and easy pull handles. Reduces cold loss during door openings and sample retrieval.
- Five internal storage compartments with four heavy duty reinforced stainless steel shelves. Shelves are adjustable in 1 inch increments. Compatible with optional stainless steel storage racks, fiberboard boxes and dividers for multiple storage needs.
- Multi-feed patent pending cold wall evaporator design provides superior refrigerant flow and maximizes cooling power by ensuring that the evaporator is always 100% in contact with the freezer wall, maximizing cold transfer into the freezer and heat removal from the chamber.

SELECT™ CONTROL SYSTEM

- Advanced PLC (programmable logic) microprocessor controller (door mounted eye level display and interface) includes real time clock, event logging alarm history, advanced alarms, alarm-test, and memory functions.
- Password protection (2 levels, setpoints and parameters) security for power, temperature and alarm settings.
- Key pad, multifunction, menu driven, LCD display for trouble free access on monitoring of all control features.
- Temperature adjustable in 0.1°C increments. Temperature display to 0.1°C increments.
- Control probe located in rear wall bottom left corner for optimal and accurate temperature measurement and control.

SELECT™ REFRIGERATION SYSTEM

- Nor-Lake Scientific's Select™ Refrigeration system ispowered by an advanced low noise high performance cascade refrigeration system using two next generation 1 HP hermetically-sealed compressors.
- Exclusive engineered super capacity (tri-tube) capillary tube system delivers refrigerant on demand matching with advanced heat exchangerdesign providing optimal heat removal and superior low temperature performance.
- Evaporator design enhances refrigerant flow increasing the overall efficiency, temperature uniformity and recovery performance.
- Air cooled condenser, high capacity with large surface area. Washable condenser filter maintains optimal efficiency and performance.

In-VitroCell ES (Energy Saver) CO2 Incubators

Best Products | Best Performance | Best Protection
NuAire, Inc.
2100 Fernbrook Lane, Plymouth, MN 55447, U.S.A.
ph: 763.553.1270
www.nuaire.com

NuAire's new In-VitroCell ES (Energy Saver) Microbiological CO2 Incubators feature seven (7) direct heat models with varying Humidity, Oxygen and Fuel Cell controls. The In-VitroCell CO2 incubators are designed with the NuTouch Intelligent Interface, a user-friendly color touch screen which is offered in English, Spanish, German, and French.

The NuTouch easily controls the Chamber parameters by the touch of a finger. A historical monitor records chamber performance that can be viewed onscreen or downloaded via USB. Programmable maintenance reminders, descriptions and instructions appear onscreen. All In-VitroCell models utilize a single source dual wave infrared (IR) sensor to maintain accurate CO2 gas levels in the growth chamber. The wavelengths used are absorbed by only CO2 making the measurement insensitive to other components such as water vapor. Dual temperature sensor probes maintain precise temperature uniformity while an individual door heater minimizes condensation build up on the inner glass door. The inner chamber is constructed of 16 gauge, type 304L, polished stainless steel using crevice-free construction, providing an easily cleanable inert surface that does NOT promote biological growth. All shelves, supports, and guide rails are easily removable and can be autoclaved separately.

Models NU-5810 and higher offer two heated sterilization cycles that can be selected to eradicate contaminating agents at 95°C humidified decontamination or 145°C dry sterilization providing the ability to leave shelves, supports, guides, and water pan in the chamber. HEPA filters do NOT have to be removed. As an optional feature, customers may add CuVerro® Antimicrobial Copper Surfaces to the incubator growth chamber and/or shelving to kill bacteria* and minimize potential incubator contamination. CuVerro® is laboratory tested and EPA registered. CuVerro® Antimicrobial Copper Surfaces kill more than 99.9% of bacteria* within 2 hours, and continues to kill 99% of bacteria* even after repeated contamination, when cleaned regularly.

A Closed Loop HEPA Filtration system offers ISO Class 5 Conditions similar to a cleanroom. The chamber is maintained at positive pressure to prevent contaminated room air from entering the chamber. The chamber air is continuously HEPA filtered and sampled to maintain a clean and uniform chamber lowering airflow to a single air change every 20 minutes to minimize cell desiccation. The NuAire In-VitroCell ES line of CO2 incubators provide constant contamination control (C3) against potential contaminates that may disrupt your research.

* Laboratory testing shows that, when cleaned regularly, CuVerro® antimicrobial copper surfaces kill greater than 99.9% of the following bacteria within 2 hours of exposure: MRSA, Staphylococcus aureus, Enterobacter aerogenes, Pseudomonas aeruginosa, and E. coli 0157:H7. CuVerro® antimicrobial copper surfaces are a supplement to and not a substitute for standard infection control practices and have been shown to reduce microbial contamination, but do not necessarily prevent cross contamination; users must continue to follow all current infection control practices, including those practices related to cleaning and disinfection of environmental surfaces. EPA Reg No 85353-5, EPA Est No 088257-MN-001. CuVerro is a registered trademark of GBC Metals, LLC and is used with permission (NA-0005-1208).

PolyScience

For 50 years, PolyScience has been the market leader in liquid temperature control equipment. From un-stirred and circulating baths to industrial-sized chillers, PolyScience has the perfect, precise and reliable solution for your needs.

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+1(847)647-0611
US TOLL-FREE (800) 229-7569.
www.polyscience.com/LabManager

PolyScience Temperature Control Solutions

In laboratory settings, there are many applications that require temperature control: from GC-MS to rotary evaporators, from plasma thawing to electrophoresis. PolyScience provides solutions for them all.

Our award-winning line of circulating baths introduces a multitude of features new to the market, including touch screen displays, the patent-pending Swivel 180™ rotating controller technology and Lid-Dock™ lid docking system. Not only do these circulating baths enhance work flow and ease of use, they bring with them a new design aesthetic and are perfect for freezing or thawing or cooling equipment such as spectrophotometers, rotary evaporators, and Peltier devices.

90 Circulator models including:

- Refrigerated/Heated, Heated-only, and Immersion
- six controller options
- various communication protocols
- reservoir sizes from 6 to 75 liters

General purpose water baths provide heating required for thawing plasma or frozen samples or even warming culture media. With the see-through gable cover, flasks and other tall sample vessels are accommodated, while the lid tilts out of the way, allowing condensate to drain back into the bath.

PolyScience Recirculating Chillers provide circulated cooling for incubation water jackets, electron microscopes, and larger distillation systems. With different sizes and cooling capacities, the PolyScience Benchtop and 6000 Series Chillers fit your lab needs.

PolyScience also manufactures a wide range of specialty products including:

- histology products
- calibration baths
- viscosity baths
- 75 and 190 Liter Refrigerated Baths for accelerated beverage aging studies

So whether you're in a life science lab or a quality control lab, PolyScience can meet your temperature control needs.

For more information, visit: www.polyscience.com/LabManager

Proton OnSite Nitrogen generation systems

Proton OnSite has been developing on-site hydrogen generators for laboratories around the world for 15 years. This spring, the company will bring its expertise to a new line of cost-effective nitrogen generators.

Using membrane technology and Pressure Swing Adsorption (PSA) systems, the nitrogen generators are designed to meet a variety of laboratory budgets, sizes and demands.

Four of the new generators use membrane technology, a cost-effective option for providing a constant stream of nitrogen gas to a laboratory's applications.

The product family's other two generators use Proton OnSite's PSA technology to create nitrogen from compressed air. Designed with simplicity in mind, the compression technology helps reduce time spent on maintenance, while delivering a reliable, constant stream of pure nitrogen gas.

PROTON
THE LEADER IN ON SITE GAS GENERATION

Proton OnSite
10 Technology Drive
Wallingford, CT, 06492
+01-203-949-8697
www.protononsite.com

Simplify Your Nitrogen Supply

IInch for inch, laboratories are some of the most expensive sites in the world, and space is at a premium. Laboratory professionals are challenged to make the most of their space and equipment, while maintaining the integrity of their operations, on budget.

Some laboratories get nitrogen gas via cylinders, but forward-thinking laboratories are turning to on-site generators. That's because an on-site nitrogen generator gives laboratories a high-performance, low-maintenance solution that works every time. It's a smart choice too, as laboratories can rely on one compact generator to cost-effectively meet all of their nitrogen needs.

Constant, Reliable Supply

The typical mass spectrometer demands between 15 liters and 25 liters per minute of nebulizer gas. Laboratories running a test for 24 hours would require thousands of liters of nitrogen, while experiments demanding a drying gas need as much as 60 liters per minute for certain periods of the process. Rather than continuously managing cylinder supplies in a limited space, laboratory professionals can rely on a compact on-site generator to meet the gas demands of any experiment.

If laboratory professionals are forced to regularly replace cylinders, it's difficult to attain constant, high pressure and, in turn, a stable gas flow. This is a problem, because mass spectrometry in particular needs a stable flow as well as a stable supply to ensure flow controls work properly throughout the system. By attaching a nitrogen gas generator to a compressor, a lab professional can ensure their system will work at full potential throughout the entire process.

On Budget. OnSite.

On-site nitrogen generation systems are also cost-effective. For starters, replacing cylinders with an on-site generator eliminates the cost and logistics associated with delivering, transporting, storing and resupplying a laboratory. This frees up laboratory professionals to focus on the project at-hand.

Likewise, rather constantly monitoring and replacing cylinders of nitrogen, laboratory professionals can rely on an unattended, compact gas generator to meet the varying needs of a given experiment. Stored nitrogen cylinders left unattended also threaten to disrupt a laboratory's gas supply, which could require the laboratory team to repeat a costly process. A constant, nebulizing gas supply ensures this does not happen.

Low-Maintenance Nitrogen, Whenever You Need It

Ultimately, reliability is key for any laboratory. Whether a laboratory professional is creating life-saving drugs or testing contaminated water, they need quick, accurate results. Laboratory professionals cannot do this without a reliable stream of nitrogen gas.

Proton OnSite's latest line of innovative nitrogen generators is designed with simplicity in mind, featuring advanced technology that's made to last. With an on-site gas generator, laboratory professionals can count on a supply of constant, stable nitrogen, whenever they need it.

▲ *Proton OnSite's advanced Pressure Swing Adsorption and membrane nitrogen generators offer the reliability and superior performance that laboratory professionals need.*

The new product family features a range of volumes and sizes to fit the needs of any laboratory. Regardless of whether the laboratory's stand-alone generator feeds one or many systems, Proton OnSite's new product line offers the best solution at the best price.

New Series 3Y

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NEW DESIGN

- In 2Y series cable was hidden under the main housing now is folded behind the indicator
- New bottom design of AS/3Y and PS/3Y.

OPERATING SYSTEM – WINDOWS CE

New operating system enables better communication with external devices and improves efficiency of the balance alongside with graphic transfer to standard office printers.

NEW WORKING MODES

- Differential weighing – enables singleand multi sub sequential weighing of the same sample
- Pipette calibration – after defining pipette id dedicated data base pipette can be checked in accordance to ISO Standard
- Automatic calibration – enables statistical control from the batch in accordance to Pharmaceutical guidelines USP

UPGRADED WORKING MODES

- Formulation – enables formula making form hand or data base of formulas with automatic protection against overdosing and recalculations function
- Mass comparation – enables using balances as mass comparator

GRAPHS

Graph visualization of measurements or Gaussian distribution, zooming function and BMP file printed on PLC printers or exported into a file via USB

ExchangeDATA

Data exchange between balances software enabling programming databases from PC level

MultiUSER

Four level of accessibility to the balance menu and to each database separately

Profile personalization covers language, display and printout content functionality of buttons and proximity sensors, tailored to each working mode independently

ECONDITIONING

Monitoring of ambient conditions by internal and external sensors – THB

Air buoyancy correction calculated from internal sensors or THB2 on line

EXMEMORY

of 3Y - series solution – the size of each database is adjusted dynamically

NEW MODELS IN 3Y FAMILY

- New model – moisture analyzer MAY with all functionality and advantages of 3Y Series
- New model – XA 3Y offering high accuracy mechanism with manual opening door system

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SPEX CertiPrep has introduced several new products over the last few months including:

1 PPM ICP-MS Single Element Standards

Save dilution time without sacrificing quality with our high performance ICP-MS singles made using high purity acids, highest grade staring materials, and high purity water to minimize any contaminants. The concentration of the target element in guaranteed to ±0.5% accuracy and the Certificate of Analysis reports up to 68 trace element impurities.

USP <232> and USP <233> Elemental Impurities

Developed in accordance with USP <232> and USP <233> Elemental Impurities, these standards can be used as a calibration or check standard to verify Oral Daily Dose PDE, Parenteral Component Limit or Parenteral Daily Dose PDE.

USP <467> Residual Solvents

As required by the analytical procedure given in USP <467> for identifying and quantifying residual solvents in drug substances, drug products and excipients, SPEX CertiPrep now offers 35 analytes in Dimethyl Sulfoxide for Class 1, Class 2 and Class 3 solvents. Our products are manufactured and double checked by our QC department to validate the certificate of analysis which accompanies each product.

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Visit SPEX CertiPrep at PittCon booths 1426 & 1429 for more information about our products.

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The 1500 ShaQer™

The 1500 ShaQer™ offers a new, low cost solution with improved extraction for the QuEChERS method. It agitates up to six samples simultaneously compared to just two by hand and processes samples in one minute. The vigorous vertical clamp movement results in improved extraction. There is no variation in the agitation process which ensures equal extraction conditions for all samples. The easy-to-use clamp accommodates six 50mL vials, six 15 mL vials or six 2 mL vials. Typical samples include fruit, meat, vegetables and seafood. The 1500 ShaQer™ raises the bar for QuEChERS sample preparation in a simple, safe and effective way!

The 6970EFM Freezer/Mill®

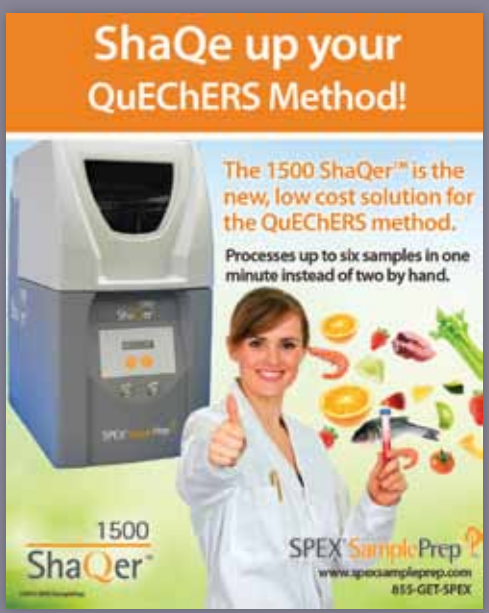
The 6970EFM Freezer/Mill® is the latest advance in cryogenic grinding. It is a large capacity, high-throughput, cryogenic mill that accommodates samples from 0.1 - 100 grams. Typical samples include Plant & Animal Tissue, Seeds, Polymers, Pharmaceuticals, Food Products, Electronic Components, Textiles, Hair, Teeth and Bone. It is specifically designed to grind through the toughest, temperature sensitive samples through the use of magnetically-driven impactors. Liquid nitrogen keeps the samples at cryogenic temperatures enabling effective grinding. Liquid nitrogen is introduced into the reservoir through an auto-fill system, which is supplied as standard with the unit. The grinding chambers, which are positioned in the LN reservoir for cooling and grinding, allow external loading of sample vials.

The 6970EFM Freezer/Mill® is available in single and dual grinding chamber models for increased sample throughput. Chambers can be programmed for independent operation and different protocols, providing flexibility and speed.

Features of the 6970 Freezer/Mill®:

- Entire system is controlled by a touch screen interface capable of storing up to 10 grinding programs for rapid process replication and consistency
- DNA/RNA extraction without shearing
- No loss of volatile compounds
- Samples are maintained at Liquid Nitrogen (LN) temperatures
- Vials can be cleaned or discarded to eliminate possibility of contamination
- Totally enclosed LN auto-fill system with no LN exposure
- Grinding vials available in a range of sizes and materials

For more information about the ShaQer™, the 6970EFM Freezer/Mill® and our other innovative products, please visit www.spexsampleprep.com or call 855-GET-SPEX.



A Guided Pipetting System

Problem: Published studies, such as those documented by Artel®, have shown how a change in environmental barometric pressure creates volume variations, which alters the pipetting accuracy of air displacement pipettes. This effect is particularly noticeable when pipetting small volumes.

While a pipette may be brand new or recently returned from calibration, the pipette factory may be at a different altitude than the laboratory using the pipette. Integral to the mechanical design, the air spring within the air displacement pipette changes with this variation in barometric pressure. At higher elevations with inherently lower air density, less liquid is drawn into the tip and subsequently dispensed, resulting in under-delivery and inaccuracy when compared to factory calibration. Therefore, pipettes must be adjusted for the elevation at which they will be used to account for this natural phenomenon.

Most pipette applications require users to pipette multiple liquids to complete a process from sample preparation to analysis. This complicates pipetting as each fluid's individual properties affect its liquid handling and must be accounted for to prevent poor accuracy and precision.

To manage the variety of liquid properties, technicians often calibrate separate sets of traditional pipettes for each fluid type; for example, labs contain one set of pipettes for viscous solutions, one set for volatile and one set for aqueous. Thus, a total of 9–12 conventional pipettes must be calibrated to complete a method from start to finish while ensuring the best liquid handling for each fluid used. Having to use multiple sets of pipettes is both cumbersome and costly due to the calibration maintenance required.

Solution: One option to solve such problems is Hamilton Company's Microlab 300 Series Pipettor, which was developed to bring semi-automated liquid handling and compensation technology into the hands of laboratory technicians. The Microlab 300 is used in place of conventional manual and electronic pipettes as it adjusts for elevation and is able to instantly compensate for each liquid used throughout an entire pipetting application.

The Microlab® 300 Guided Pipetting System minimizes errors while making technicians' jobs easier.

First, the Guided Pipetting System prompts users upon initial startup to input the laboratory's altitude to eliminate errors caused by variations in barometric pressure. Secondly, the product eliminates recalibration of multiple pipettes for each liquid used by providing a single pipette that achieves the accuracy and precision across the entire pipetting range (0.5 µL–1 mL). Lastly, standard and customizable Liquid Classes enable users to pipette even viscous and volatile fluids one after the other with acceptable accuracy.

Three standard Liquid Classes covering the range of liquid properties are provided with the instrument (i.e., volatile, viscous, aqueous) to quickly approximate pipetting parameters like aspiration and dispense speeds, delays and air gaps. Custom Liquid Classes can also be gravimetrically created to fine tune liquid handling of more challenging fluids. During the protocol programming, users simply select the Liquid Class that will be used at each step in the application. At execution, the Microlab 300 automatically implements the appropriate pipetting parameters per each task's specified Liquid Class.

In all, a product such as the Microlab 300 optimizes liquid handling and reduces pipetting errors by providing quick elevation adjustment and an efficient, single-probe solution that requires no additional run-time and user intervention to complete an entire method with multiple liquids.

For more information, go to: www.hamiltoncompany.com/microlab300

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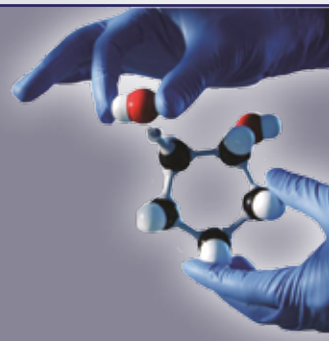

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We offer a full suite of services at the instrument and equipment level, including Support Plans, Parts and Accessories, Training, Compliance Services and more. Our solutions are designed to help you improve productivity, reduce total cost of ownership and ensure compliance throughout your laboratory - from instrument and equipment acquisition to disposition.

▲ *Uncomplicated access to the highest quality instrument and laboratory services to spend more time on discovery, less on anything else.*

A Calibration-Free, Dry-Storable pH Meter

Problem: pH, one of the most fundamental properties in all of nature, is measured in nearly every industry including general laboratory research, pharmaceuticals, food and beverage processing, environmental testing and agriculture. Despite the importance of measuring pH, traditional glass pH meters have long suffered from problems associated with calibration and maintenance.

Accurate pH measurement requires well-trained technicians to spend hours calibrating and maintaining pH electrodes, resulting in extra manpower and material costs. Complex maintenance and calibration protocols increase the possibility of human error and technical issues. The threat of contamination from broken glass electrodes often forces industrial process control users into labor-intensive and suboptimal off-line pH measurements. In addition, miscalibration and signal drift can ruin products and experiments. Unless users follow the tedious use protocols, pH electrodes are subject to breakage. Critical elements can also dry out or clog, rendering the instrument inaccurate or nonfunctional. These issues are common to virtually every pH meter in use today.

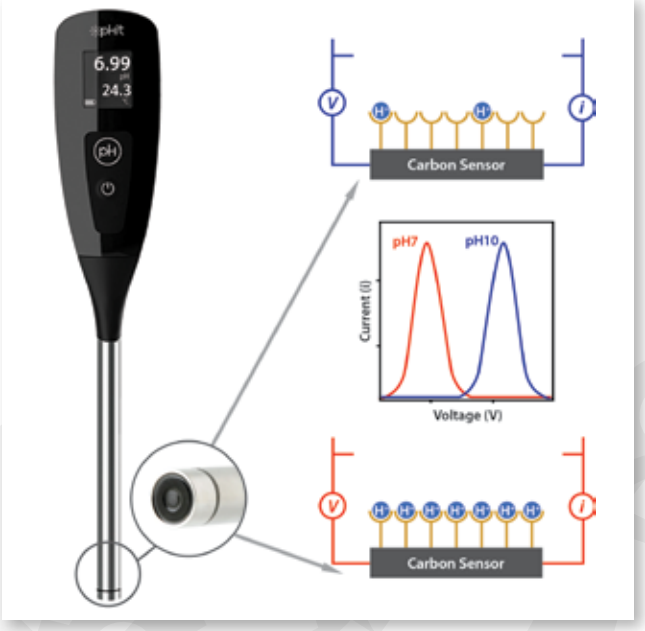
Solution: The new calibration-free pHit handheld pH scanner from Senova Systems is based on innovative technology that eliminates the frequent problems of conventional pH meters.

At the heart of the pHit scanner is its novel solid-state sensor technology. The pHit sensor, composed of carbon substrate, contains covalently attached analyte sensing molecules (ASMs). These ASMs are reduction-oxidation-active compounds which, when subjected to a voltage sweep or scan, reversibly bind hydronium ions. The pHit sensor works by applying a voltage scan across the sensor, causing the ASMs to gain or lose electrons. The voltage at which this redox reaction occurs is dependent on the concentration of hydrogen ions in the sample (pH). If there is a high concentration of hydrogen ions present (low pH), the redox reaction occurs at a lower voltage. If there is a low concentration of hydrogen ions present (high pH), the reaction occurs at a higher voltage. The relationship between the voltage at which the reaction occurs and pH is constant and reproducible. This relationship or algorithm is stored internally in the firmware, rendering user-calibration unnecessary. The scanner processes the sensor's signal to produce and display the pH of the sample being analyzed.

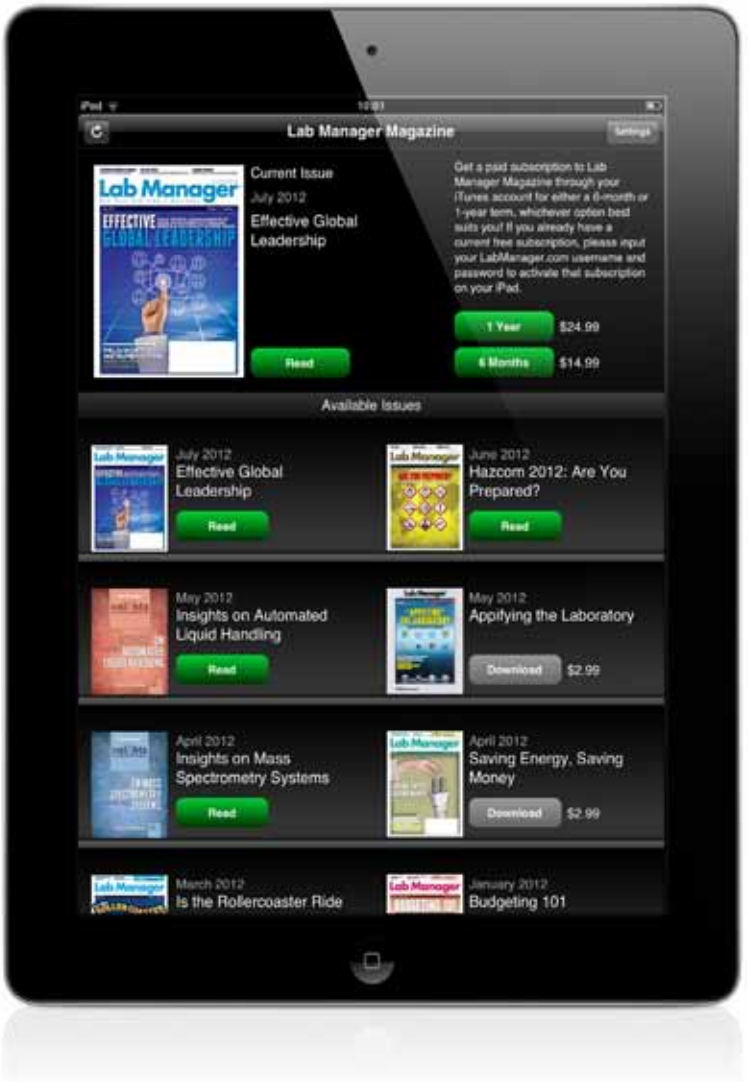
The pHit scanner is one option that minimizes the risk of miscalibration that can result in ruined experiments, damaged product and wasted time. The instrument is more than just calibration-free; it is almost maintenance-free and nearly indestructible. The solid-state sensor and stainless steel body increase durability, and the threat of drying and clogged elements is eliminated because the sensor is composed of carbon and can be stored dry.

For the user, products such as the pHit handheld scanner allow time and energy to be devoted to more important tasks. For the lab manager, they offer a significantly lower cost of ownership by reducing manpower requirements and by eliminating calibration buffers, storage solutions and the frequent replacement of glass electrodes. The pHit Scanner does this while producing results with accuracy and precision that are comparable to the highest priced conventional pH meters on the market today.

For more information on the pHit handheld scanner, please visit www.senovasystems.com



▲ *The pHit sensor contains analyte sensing molecules (ASMs) covalently attached to a carbon substrate. The pHit Scanner applies a voltage scan across the sensor, causing the ASMs to gain or lose electrons. The voltage at which this reaction occurs correlates to a specific pH.*



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Temperature Monitoring

Problem: A researcher or lab manager's worst nightmare is to walk into their lab and find a freezer, refrigerator, or any temperature controlled storage unit that has failed overnight and ruined or jeopardized precious samples, specimens, tissues, or products—not to mention the loss of countless hours of research. A real-life example most of us are sadly familiar with by now is the loss of critical autism research samples at Harvard in June 2012 due to a freezer failure which thawed 147 brains donated from deceased people with autism. Although an alarm and monitoring system was present, it failed to notify staff of the freezer malfunction so the problem could be rectified quickly. A higher level system of monitoring with built-in redundancy could have helped produce a better outcome, however most are cost prohibitive for individual labs to install and maintain. Many temperature monitoring systems do alert staff, however they stop at a certain point and don't have automated measures to continue alerting until a confirmation is received and corrective action is taken.

Solution: Temperature monitoring systems should be affordable and allow remote monitoring of all temperature controlled storage units, while also securely logging data and offering immediate alerting whenever conditions exceed pre-defined thresholds. In today's modern world, the convenience, flexibility, and importance of cloud-based monitoring and mobile application access to system statistics cannot be overemphasized. This could have quickly headed off the catastrophe at Harvard if offsite check-in on freezer system statistics had been enabled, and continual alerting had been possible at initial signs of freezer failure.

Recognizing the importance of these concepts and striving to create a monitored environment for her laboratory specimens, Sarah Kucenas, Ph.D., Assistant Professor of Biology at the University of Virginia's Physical & Life Sciences Building who runs the Kucenas Lab, was inspired to look into Minus80's new technology. Sarah's goal was to offer better protection for the contents of the lab's -80C and -20C freezers as she and her colleagues investigate the role of glial cells in the formation of the nervous system early in development, and investigate the preservation of the nervous system during disease and injury. Like Harvard, Sarah's lab also experienced the failure of two storage units and wanted to incorporate temperature monitoring to protect specimens and guard against a repeat experience.

To provide the monitoring and protection Sarah needed for the lab, a Minus80 control unit was installed on the freezers that needed to be monitored. These control units send real-time information wirelessly to an onsite data gathering appliance, which then sends the information to the Minus80 cloud-based monitoring center. The control unit installed easily in minutes and constantly monitors the storage units' interior temperature, ambient room temperature, door open/close status, and movement of unit.

With this solution in place, Dr. Kucenas and her lab manager receive immediate alerts if issues arise with the freezers or incubators. A mobile application allows them to monitor real-time status, and historical reporting allows them to track the performance of each unit. All of this was done without any capital investment by the lab.

Without a complex installation, this temperature monitoring solution is now available to researchers like Sarah Kucenas. More importantly, this is available as a low cost monthly subscription service and this system can also grow and scale so users can flexibly manage monitoring needs as they change. Different from other solutions, it also meant no large amount of capital to secure, no upfront equipment to purchase, and no ongoing maintenance of expensive servers.

For more information, please visit: www.minus80monitoring.com

Minus80 Monitoring mobile phone app

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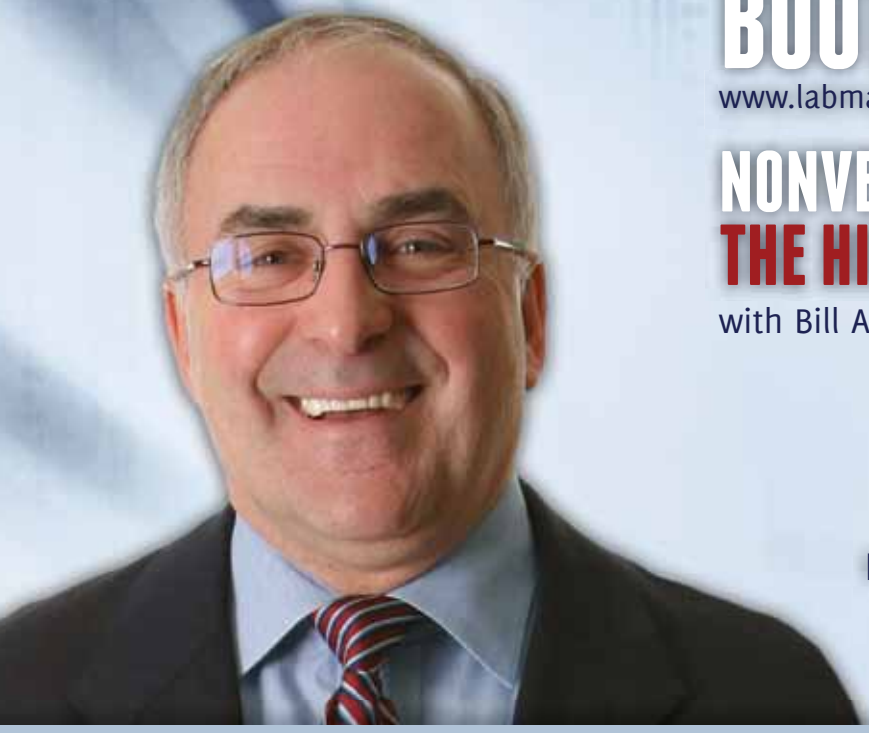

NONVERBAL COMMUNICATION: THE HIDDEN MESSAGE

with Bill Acheson

1:00-5:00 PM ET
TUESDAY MARCH 19, 2013

PENNSYLVANIA CONVENTION CENTER
PHILADELPHIA, PAT

In face-to-face communication, body language accounts for more than two thirds of the impact of your message. It is always more emotionally revealing and more emotionally accurate than what you say. One researcher claimed that in making a first impression, nonverbal communication is ten times more powerful than what you say!

In this session you will learn ways to enhance your own body language as well as how to understand the hidden messages sent by others. Special attention is given to how gender differences account for some forms of misunderstanding.

WE EXAMINE THREE KEY POINTS:

- **The Power of First Impressions**
- **Projecting Greater Personal Power**
- **Establishing Rapport**

Learn how to use appearance, posture, gesture, facial expression, eye contact, and voice to communicate more effectively. Small changes in your behavior can create big results.

The presentation style is educomedy; a mix of academic research and humor designed to educate and motivate.

Bill Acheson is an expert in nonverbal communication. As a faculty member of the Department of Communication at the University of Pittsburgh for over 20 years and as a professional speaker since 1994, Bill has spoken to thousands of people across the United States about how to use body language to communicate more effectively.

From the classroom to the courtroom to the conference room, Bill has worked with professionals who want to improve their bottom-line performance. Find out what employees from American Century, Bank of America, Ernst & Young, Glaxo SmithKline, Ivy Funds, Jackson National, John Hancock, Legg Mason, Merrill Lynch, Met Life, MorganStanley SmithBarney, Nationwide, SunTrust, Transamerica, Wells Fargo, the United States Coast Guard, and the U.S. Army have already discovered. It's not just what you say; it's how you say it.

RTVC Membranes

Problem: Counting the total number of live microorganisms (TVC/TVO) on a Petri dish is one of the main laboratory procedures. It has been used worldwide in microbiological, medical, food, biotechnological, and environmental laboratories ever since the Petri dish was invented more than 120 years ago. Each cell in the sample produces a colony on the surface of solid nutrient agar. It takes at least 24 hours of growth to produce a clearly visible colony on solid nutrient agar. Using microscopy at the early stage of colony forming is impossible because the majority of micro-colonies are colorless and/or transparent. The result of microbiological analysis after 24-48 or more hours does not satisfactorily meet the modern medical and industrial practice. It is one of the most critical modern microbiological diagnostics problems. Reducing the time of TVO/TVC analysis to 8 hours (one work shift) or even less in a simple and cost-effective way will have a significant impact in medicine and industry.

Solution: Micro-colonies start appearing on solid nutrient agar within several tens of minutes of inoculation. Thus *E. coli* having a duplicating time of 20 minutes will contain around 500 cells in the micro-colony after three hours of growth, 4,000 after four hours, more than 250,000 after six hours, and more than 2 million after seven hours. Micro-colonies containing 0.5-2.0 million cells are practically invisible because they are small and pellucid. Nevertheless they become clearly visible and countable if cells can be stained. Invented RTVC membranes contain vital chromogenic dyes, polymers and biochemical enhancer immobilized on a highly smooth (much less surface roughness) cellulosic hydrophilic membrane. They are designed to stain micro-colonies to an intense dark blue color and enable them to be clearly visible. The method contains the following steps: grow sample on appropriate nutrient agar 1/4-1/3 of regular growth time; place RTVC membrane over agar with micro-colonies for 5-10 minutes for bacteria or 15-20 minutes for yeasts. Chromogens slowly released from membrane penetrate cell walls and are transformed by enzymes to a dark blue insoluble precipitate. The precipitate is collected inside each cell but not in the surrounding space. Thus micro-colonies obtain an intense blue color and become clearly visible at the early stage of colony forming. Stained micro-colonies can be enumerated either on the membrane or from the bottom of the Petri dish if the membrane is not peeled. Method works with any kind of nutrient agar and any bacteria or yeasts.

For more information about RTVC membranes, visit www.specTroferm.com

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Social networking website LabRoots connects the scientific world leveraging a myriad of unique features and tools, discovering meaningful collaborations across geographic boundaries and fields of expertise.

John K. Borchardt, Ph.D.
1946 - 2013

Dr. John K. Borchardt was a chemist, freelance writer and ACS career consultant for over 15 years, until his sudden passing in late January. Beginning his career as a bench chemist, John went on to become a team leader, group leader and technology manager for three large companies: Hercules, Halliburton Services, and Royal Dutch Shell and a small specialty chemical company, Tomah Products. In addition to being a regular contributor to *Lab Manager Magazine*, he was the author of the ACS/Oxford University Press Book "Career Management for Scientists and Engineers," and had more than 1,500 articles published in a variety of other magazines, newspapers and encyclopedias. As an industrial chemist, he held 30 U.S. and more than 125 international patents, and was the author of more than 130 peer-reviewed papers. John's advice, insights and articles helped hundreds of scientists improve their professional lives, and he will truly be missed.

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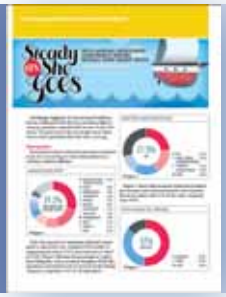
PRE-OWNED MARKETPLACE

MARKETPLACE

PARTING POINTS

Takeaways from this month's issue:



STEADY AS SHE GOES

Lab Manager Magazine's Fifth Annual Investment Confidence Survey, conducted in late Q4 2012, revealed a slight increase in optimism compared with the end-of-year 2011 survey. Main findings of this year's survey included:

- Optimism about general business conditions was similar to last year
- Generally, respondents were more optimistic about the future this year
- Estimates of investment in new technology were up for 2012
- Slightly improved optimism did not carry through to capital-intensive expenses

10

20

THE PROCUREMENT DILEMMA

When dealing with vendors, is it better to play for keeps and try to beat them at every turn or perhaps wiser to leave a few dollars on the bargaining table and part on friendly terms? Things to consider in building good relationships with vendors include:

- Check with people in a supplier's network about their reputation
- Try not to focus too much on getting the best deal all the time
- Many vendor issues can be avoided through better preparation
- Engage the supply base early to close any gaps

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HARBORING A HOARDER?

In laboratories and research facilities around the world, you will sometimes come across a very peculiar type of person—the lab hoarder. Pros and cons of hoarders include:

- They regularly restock shared buffers
- Their huge stock of lab supplies could help in an emergency
- Extreme hoarders may steal lab equipment and take it home
- Some hoarders may pose a health and safety risk

44

PREPARED FOR POWER FAILURE?

Most laboratory operators budgeting for and installing new equipment tend to overlook key elements of their projects. Keys to a successful installation include:

- The site preparation or preinstallation guide/checklist
- Developing the skills to manage the experts in each respective area of the project
- Understanding the fine details of how infrastructure improvements are made
- You may need to consult with lab construction and other specialists

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BLOOD, SWEAT & FEARS

A significant concern for scientists in biohazard labs is preventing contact with potentially contaminated human body fluids, whether it is during collection of samples or during evaluation and analysis in the laboratory. Ways to do this include:

- Strong implementation of OSHA's BBP standard 40 CFR 1910.1030
- Developing an exposure control plan (ECP)
- Training, or communicating the hazards
- Use of appropriate PPE

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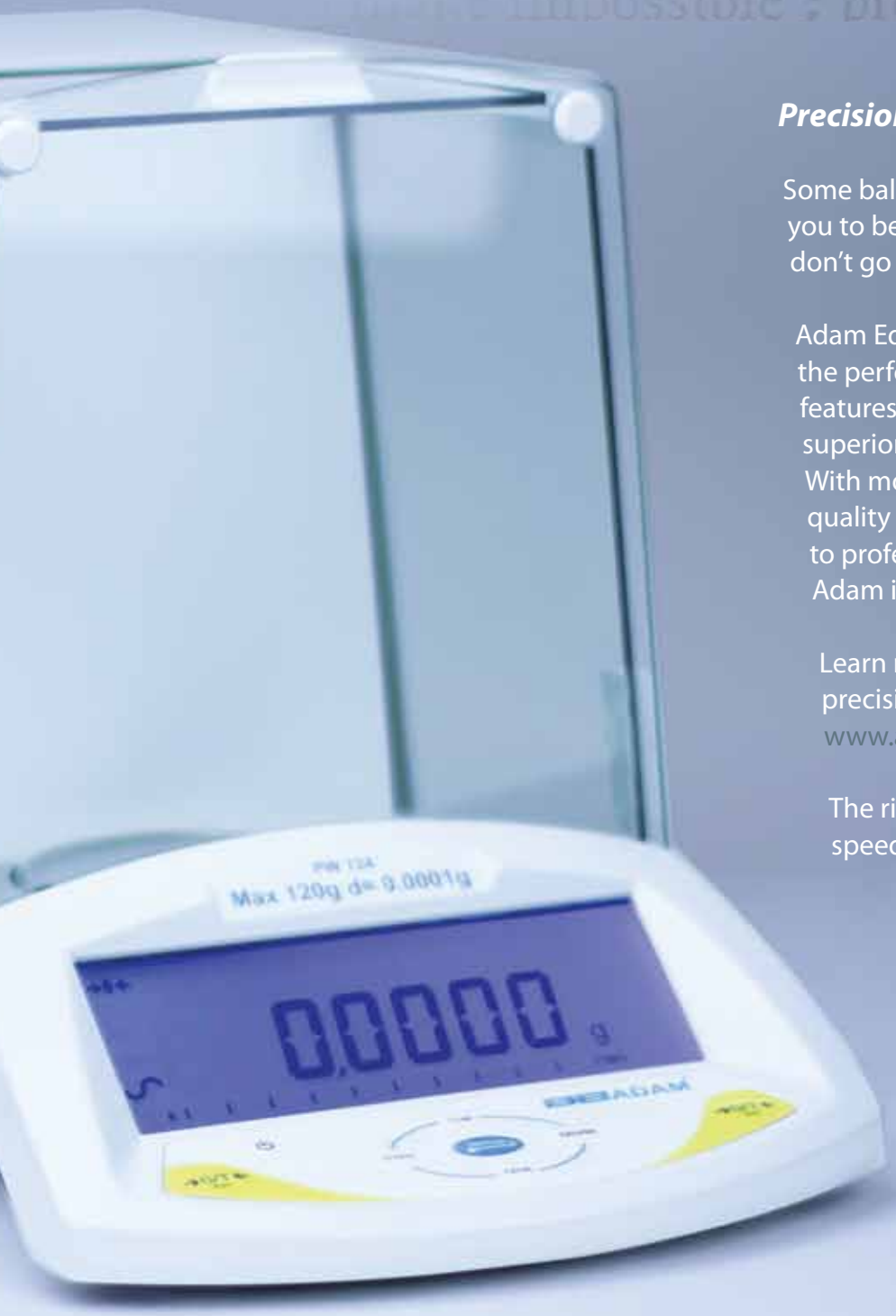
pre·ci·sion (prĭ-sĭzh′ən) *n.* The state, property, or quality of being precise.



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