

Lab Manager[®]

MAGAZINE

Run Your Lab Like a Business

October 2011

Volume 6 • Number 8

INDEPENDENT
GUIDE TO BUYING
A LIMS
INSIDE!
WWW.LABMANAGER.COM

TOP MANAGEMENT SKILLS YOU NEED

WHAT LAB MANAGERS MUST KNOW TO GET AHEAD IN THEIR CAREERS

**THE FIFTH ANNUAL
SALARY & EMPLOYEE
SATISFACTION SURVEY**

**Making ChIP-Sequencing
User-Friendly**



TUNEology

[too'-nöl-uh-jee]

Noun: The science of merging flexible wavelength tuning with the highest sensitivity

The breakthrough optical technology inside TUNE combines wavelength selection with up to 10x greater sensitivity than monochromator-based systems. The SpectraMax® Paradigm® System with TUNE lets you optimize excitation and emission wavelengths, assay at lower probe concentrations, and get the best results from your assay.

Find your TUNEology at www.paradigm-TUNE.com



Scan the QR code with your smartphone to TUNE in to Paradigm's applications



www.paradigm-TUNE.com



www.MolecularDevices.com

For research use only. Not for use in diagnostic procedures.
©2011 Molecular Devices, LLC. All rights reserved. Molecular Devices, the Molecular Devices logo, and all other trademarks are the property of Molecular Devices, LLC.

PURELAB flex..

Innovating water purity

ELGA



NEW!

Contact us
for an
introductory
offer!

Tap to ultrapure in one step

- Absolute water purity of up to 18.2 MΩ-cm
- Ergonomic handset shows your essential water purity information
- Real Time TOC monitoring
- Unique choice of water dispense options
- Perfect for your analytical and lifescience applications

Find out more or request a demo:
email: elga.usa@veoliawater.com



(877) 315-3542
Email: elga.usa@veoliawater.com
www.elgalabwater.com

 **VEOLIA**
WATER

Solutions & Technologies

10

Top 10 Management Skills You Need

To progress in their careers, lab managers, particularly those in their first management assignment, need to develop new skills. Often they had little opportunity to do this while working full time at the laboratory bench. Yet these skills are critical to their success in their new management assignment.

John K. Borchardt

16

The Fifth Annual Salary & Employee Satisfaction Survey

What has been true over the past four years of conducting this survey remains true: Those working in the scientific research field like what they do and have no plans to change careers. Although the number was down two percent from last year, those who said they liked the type of work they do remained at a high 90 percent.

Pam Ahlberg



LEADERSHIP & STAFFING

20 Visualizing a Career Path

Lab managers are responsible for recruitment and development of chemists and other lab professionals. They often have to explain to the rest of the world the value added by the chemists and also educate the new recruits on what the various jobs entail. For lab employees, better understanding of jobs and available career paths can contribute to higher levels of job satisfaction.

Saidas M. "Sai" Ranade, Judith Santa, Jairo Maldonado, and Diana Gomez

24 The Psychobarbarian Manager

There are managers who have learned to use psychological techniques to confuse, contort, and control members of their staff. You may never encounter one of these characters, if you are lucky. However, it's amazing how many people immediately recognize the "type." Find out here how to identify and deal with your possible Psychobarbarian manager.

Ronald B. Pickett

TECHNOLOGY & OPERATIONS

32 Making ChIP-Sequencing User-Friendly

Chromatin states can influence transcription directly by altering the packaging of DNA to allow or prevent access to DNA-binding proteins, or they can modify the nucleosome surface to enhance or impede recruitment of effector protein complexes. Genome-wide mapping of protein-DNA interaction and epigenetic marks helps us to better understand the transcriptional regulation.

Tracy Cooke; Robert Kovelman; Zirong Li; Lin Ma; Ron Orallo; John Rosenfeld, Ph.D.; Michael Sturges

36 Moving Molecular Diagnostics from Bench to Clinic

The function of molecular diagnostics is to analyze the composition of a patient's genetic makeup in order to reveal any potential predispositions of that individual to specific diseases. Identifying these biomarkers can allow treatment options to be outlined that are likely to be effective in particular patients and not in others.

Dr. Ilsa Gomez-Curet

LAB DESIGN & FURNISHINGS

42 Sustainability Meets Flexibility

What does "high-quality" mean in terms of laboratory design? The lab owner may think of cost-effectiveness or the attractiveness of the lab to potential top recruits as quality issues, while the facilities manager may think of durability, flexibility, and low operational costs.

Robert B. Skolozdra and Chris Bockstael

LAB SAFETY

58 Cut to the Bone

If you examine your recent accident and injury reports, we bet that the most frequent type of injury will be cuts or lacerations. Given the volume of glassware used in many laboratory operations, chances are great that someone is going to have an accident that results in cuts, slashes or slices.

Vince McLeod

BUSINESS MANAGEMENT

68 One Step Ahead

When starting a business, an up-front investment is necessary to hire talented personnel, acquire the appropriate equipment and instrumentation, and secure the space required to operate the new business successfully. Once the business is operating well, however, the decision to continue expanding in anticipation of work becomes more difficult.

David F. Beyerlein

72 Easing Regulatory Compliance

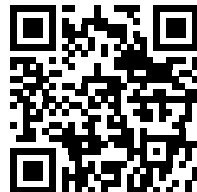
Depending on your perspective, you may view regulatory compliance as a necessary but unwelcome expense, a hurdle in the race to market, a vital measure to protect public health and safety, or perhaps all three. Whatever your views, you probably don't see regulatory compliance as a significant factor in profitability—but it can be.

Mark Harnois

GET NEW INSIGHTS ON LAB PRODUCTS

Subscribers to our newsletters may already know this, but LabX Media Group has an exciting new product coming in 2012 – **INSIGHTS**. Published as a special supplement to Lab Manager Magazine six times a year, **INSIGHTS** is a product category-specific report that provides vital information lab professionals need in one easy-to-read source. The report includes information on selecting the right product/equipment specific to your research objectives, determining ROI, first-hand end user experience, and how to prepare your staff and facility for technology change or upgrades. This new supplement provides more focused information and guidance on the products and management issues you care about most. The premier January/February 2012 issue of **INSIGHTS** will cover liquid chromatography. In April 2012, readers will get the latest info on mass spectrometry, while ELNs and lab automation are the flavors of the month in May and September, respectively. Readers can also look forward to the October and December 2012 issues of **INSIGHTS**, which will target gas chromatography and spectrophotometers.





Using the oldest Metrohm titrator?

If so, enter our contest for a brand-new one—and appear in our next ad!

Eligibility requirements: You must work/
reside in the US or Canada and have your
company's permission to participate—
no purchase necessary.

Extended Deadline:
Submit your essay by November 30th!

Enter online at
www.metrohmusa.com/oldtitrator



866-METROHM (638-7646)

Win a
FREE Titrator
and more!

0701.A1.1014-LAM © 2011 Metrohm USA, Inc.



Better Than Hot



**Consistent, uniform
temperatures protect
your samples.**

BINDER Ovens offer:

- ▶ Homogenous conditions via APT.line™ preheating technology.
- ▶ Temperatures from 5 °C above ambient to 350 °C.
- ▶ Capacities from 20 to 720 liters.
- ▶ Gravity and forced convection, vacuum and drying ovens.
- ▶ Tested to 27-point DIN 12880 standard.

Warm up to BINDER ovens at
www.binder-oven.us.

BINDER Inc. | Toll Free 866 885 9794
sales@binder-world.us | www.binder-world.us



BINDER
Best conditions for your success

PERSPECTIVE ON: AN ENVIRONMENTAL RESEARCH LAB

62

Stewart Environmental is an environmental engineering firm with three main divisions: engineering, environmental services, and laboratory services. The laboratory, which Michael Glavanovich runs, focuses on the Environmental Protection Agency (EPA) and solid waste methods. The staff analyzes for everything from metals to anions to nitrogen, and much more. **Sara Goudarzi**

LAB MANAGER ACADEMY

40

The Power of Engagement and Retention in Your Lab. **Richard P. Finnegan**

SCIENCE MATTERS

28

THE SCIENCES REQUIRE "SOFT SKILLS" TOO **Alan Edwards**

MINDMAP

00

IMPROVING YOUR LABORATORY MANAGEMENT SYSTEMS WITH LIMS

EVOLUTION OF

76

WATER BATHS AND CHILLERS

ASK THE EXPERT:

30

OVERCOMING THE CHALLENGES OF SAMPLE PREPARATION

Byron Brehm-Stecher, Ph.D., Associate Professor in the Department of Food Science and Human Nutrition at Iowa State University, discusses the challenges associated with sample prep and what an ideal sample prep process should involve. **Tanuja Koppal**

PRODUCT FOCUS

MICROPLATE READERS

48

LAB WASHERS

50

PARTICLE SIZING

51

PIPETTES

52

RAMAN SPECTROPHOTOMETERS

56

THE RIGHT CHOICE

85

ANALYTICAL BALANCES

SURVEY SAYS,

ARE YOU IN THE MARKET FOR ION CHROMATOGRAPHY?

78

ARE YOU IN THE MARKET FOR A MICROPLATE READER?

80

ARE YOU IN THE MARKET FOR A pH METER?

82

ARE YOU IN THE MARKET FOR qPCR?

84

HOW IT WORKS

ROBOTIC PERSONAL WORKSTATIONS

92

MICRO-VOLUME QUANTIFICATION

94

AN ENERGY EFFICIENT LABORATORY OVEN

95

TECHNOLOGY NEWS

86

The latest equipment, instrument, and system introductions to the laboratory market.

PRE-OWNED EQUIPMENT MARKETPLACE

97

PARTING POINTS

98

Lab Manager Magazine® (ISSN: 1931-3810) is published 10 times per year; monthly with combined issues in February/March and July/August, by LabX, P.O. Box 216, 478 Bay Street, Midland, ON Canada L4R 1K9. USPS 024-188 Periodical Postage Paid at Fulton, MO 65251 and at an additional mailing office. A requester publication, Lab Manager, is distributed to qualified subscribers. Non-qualified subscription rates in the U.S. and Canada: \$120 per year. All other countries: \$180 per year, payable in U.S. funds. Back issues may be purchased at a cost of \$15 each in the U.S. and \$20 elsewhere. While every attempt is made to ensure the accuracy of the information contained herein, the publisher and its employees cannot accept responsibility for the correctness of information supplied, advertisements or opinions expressed. POSTMASTER: Send address changes to Lab Manager Magazine®, P.O. Box 120, Georgetown, CT 06829.

©2011 Lab Manager Magazine® by Geocalm Inc. All rights reserved. No part of this publication may be reproduced without permission from the publisher.

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



Lab Manager Magazine® is audited by BPA

THE ART OF EMULATION



INFINITELY BETTER METHOD TRANSFER

Running methods developed on other HPLC or UHPLC instruments but getting different retention times and resolutions? We have infinitely better technology. Introducing the Agilent 1290 Infinity LC with intelligent system emulation technology (ISET)—the world's first truly universal LC system. Execute HPLC and UHPLC methods and get unchanged chromatographic results with a simple mouse click. ISET from Agilent. It's not just the science. It's the art of emulation*. www.agilent.com/chem/iset



*Scan this code with your smart phone to go behind the scenes to see the making-of video.

© Agilent Technologies, Inc. 2011

The Measure of Confidence



Agilent Technologies



Skills to Master

In our Fifth Annual Salary & Employee Satisfaction Survey, the majority of you told us again that you were happy in your current work situations and had no plans to change careers. However, 13 percent fewer of you than in 2010 answered in the affirmative to the statement, "I believe my job is secure." For anyone in any job market, job security is certainly not a given — especially if you believe what you hear every day on the news. Therefore, now more than ever, it would be prudent of you to consider ways to protect your current position by making sure you have the "something extra" that can set you apart if, heaven forbid, there is a head count reduction in your organization. To that end, John Borchardt identifies ten specific skills you need in order to improve your status and effectiveness as a lab manager in this month's cover story; none of which are too difficult or require going back to school. Please take the time to check those out.

The good news from this year's survey had to do with career advancement and training, with a reported four percent increase among those who felt prepared for their next position, and double digit percentage increases among those who felt their organizations provided sufficient training and professional development opportunities. If you have those opportunities, take advantage. If you don't, "use your own manager as a mentor and advisor. Consulting with other recently promoted lab managers will allow you to share common problems and develop solutions," advises Borchardt.

A different sort of career advancement plan is offered in this month's Leadership & Staffing article, "Visualizing a Career Path" (page 20), which describes a unique visual system for representing the multidimensional and many-levelled paths of an individual's career, in this case those of a refinery chemist. The system provides visual representation of what these chemists do and offers a method for determining the cross-discipline skills required to move up their specific career ladders.

Whether you are one or report to one, a lab manager should be involved in recruiting and developing their staff as well as helping guide their career growth. The operative word here is "should." Because there are other types of managers for whom the welfare of their staff and even their institution is subordinate to their own psychological quirks. This other manager is one author Ron Pickett affectionately calls the "Psycho-barbarian." Turn to page 24 for a description of this manager, one "with a weak or suspect ego, who has learned some techniques for controlling their staff members in ways that not only work but fortify their own personality." Hopefully you won't recognize him or her as the one currently managing your team.

As for business, author David Beyerlein in his article, "One Step Ahead," makes the case that it is strategically smarter to stay ahead of your client's needs than to react to them — thereby losing valuable method development and start-up time, not to mention your company's reputation. As for Beyerlein's organization, he says, "We have chosen the proactive approach to growth and generally hire individuals, acquire instrumentation, and secure space in anticipation of increased work flow rather than wait until after the work arrives. There is some risk to our approach; however, we believe there is a greater risk in being underprepared and potentially disappointing a client." Turn to page 68 to see if this method might serve your lab as well.

As always, we hope everything you find in this month's issue of the magazine helps make you a more creative and effective lab manager.

Best,

Pamela Ahlberg
Editor-in-Chief

Publisher Mario Di Ubaldi
mariod@labmanager.com
203.227.1390

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

Assistant Editor Rachel Muenz
rachelm@labmanager.com
888.781.0328 x233

Contributors John K. Borchardt, Ph.D.
John Buie
Angelo DePalma, Ph.D.
Alan Edwards
Sara Goudarzi
Tanuja Koppal, Ph.D.
F. Key Kidder
Joe Liscouski
Vince McLeod, CIH
Ronald B. Pickett
Bernard Tulsi

Account Managers June Kafato — International
junek@labmanager.com
705.812.2332
Ashley Munro — West Coast
ashleym@labmanager.com
888.781.0328 x228
Edward Neeb — Midatlantic
edwardn@labmanager.com
860.350.2761
Larry Frey — Midwest & Southeast
larryf@labmanager.com
845.735.5548

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

Graphic Designer Danielle Gibbons
danielleg@labmanager.com
888.781.0328 x231

List Rental Jen Felling — Statistics
203.778.8700

Custom Article Reprints The YGS Group
labmanager@theygsgroup.com
800.290.5460
717.505.9701 x136

Subscription Customer Service info@labmanager.com

Published by LabX

President Bob Kafato
bobk@labmanager.com
888.781.0328 x223

General Manager Ken Piech
kenp@labmanager.com
888.781.0328 x226

888.781.0328

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



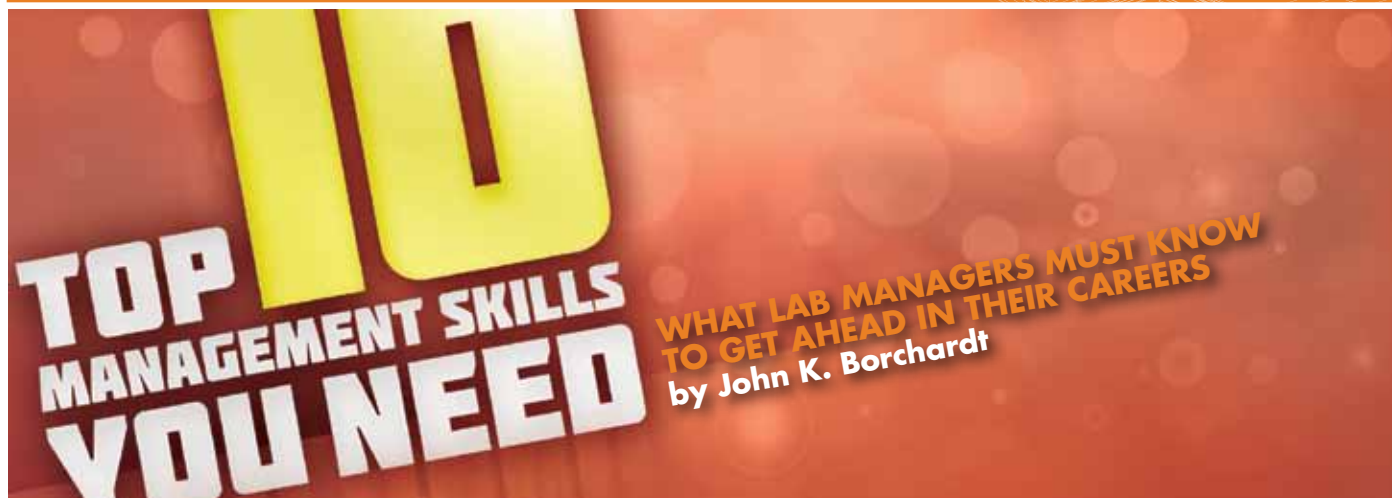
Brains & Brawn Don't Compromise



METTLER TOLEDO Excellence XS Level Balances contain the solutions you'd expect from the company world renowned for weighing technology. The Precision Balance MonoBloc Weigh Cell and Analytical Balance SmartGrid lead to faster stabilization times, and the touchscreen display with intuitive menu ensures accurate operation. **Smart.** A rugged housing neutralizes harsh environments and backing by the industry's largest service organization speaks for itself. **Tough.**

► www.mt.com/brainsandbrawn-xs

METTLER TOLEDO



To progress in their careers, lab managers, particularly those in their first management assignment, need to develop new skills. Often they had little opportunity to do this while working full time at the laboratory bench. Yet these skills are critical to success in their new management assignment. These skills include:

1. **Managing budgets**
2. **Planning and running effective meetings**
3. **Management by walking around**
4. **Leadership**
5. **Managing external R&D contracts**
6. **Doing more with less**
7. **Managing conflicting priorities**
8. **Managing diversity**
9. **Maintaining personal integrity**
10. **Developing the skills you need**

Let's look at each in turn.

Managing budgets

Usually each laboratory has its own methods for managers to manage their budget. These are usually based on the tracking of spending versus time. Good spreadsheet software will let managers do this. They track spending by month with the goal of keeping each project and activity on budget.

However, the relationship between spending and time may not be linear. Some spending may be bunched up in particular months due to project milestone dates, transfer of project team members to other assignments with completion of their milestones, and hiring of new staff members or consultants to enable the achievement of milestones. (For example, if no one in the

lab has the expertise needed to achieve a late-project milestone, managers should time the hiring so the individual isn't hired too early in the project to work productively on this milestone.)

New and transferred managers inherit the budget of their predecessors. However, in the next budget year they will have to work with their own supervisor and project team members to develop budgets for the coming financial year.

Planning and running effective meetings

Meetings require a lot of planning and follow-up to be useful management tools. Define the meeting objectives and desired outcomes during the planning phase. This means defining what needs to be accomplished during your meeting to make it successful.

Then put together a meeting agenda that will accomplish this goal. Next, use the agenda to determine which people need to attend the meeting. Keep the attendance list as short as possible to accomplish your objectives. Send copies of the agenda to all attendees a few days prior to the meeting and ask for their input. Include the objective of the meeting at the top of the agenda. You need to help meeting attendees prepare to actively participate in the meeting so they can offer intelligent input as well as listen.

Decide if you need to bring in a meeting facilitator to keep the meeting focused and on track. During the meeting, experienced meeting facilitators can also identify overlooked subjects or areas.

Before the meeting, determine the appropriate technology for the meeting. For example, are you going to use flip charts, white boards, or LCS projectors and a computer to project and record information? Are you going to designate someone as a scribe to take notes and prepare the meeting minutes?

Now it is time for the meeting. Use all of your premeeting

ErgoOne®

Pipetting optimized.



- Stress-relieving ergonomic design
- Low force tip application and ejection
- No-drift volume lock
- Chemical and UV-resistant materials
- Fully autoclavable

Comfortable
grip, weight, and
stroke length

True
4-digit
display



See more online.
Get the free mobile app
at <http://gettag.mobi>

*Schedule your demonstration
today. Find out more
about ErgoOne® at
www.usascientific.com/ergoone
or call 800-522-8477.*

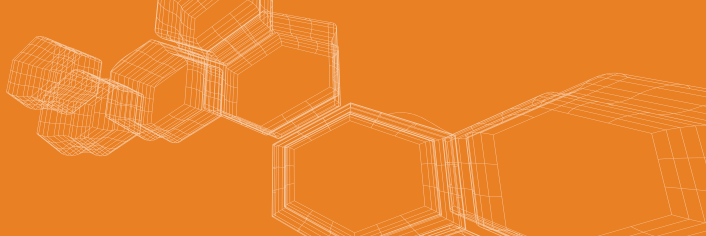


Stainless steel
ultramicro
tip cones



Works with TipOne®
and other universal tips.





activities to manage the meeting. Be sure that all attendees are engaged and offer input as appropriate. In particular, use time management skills to keep discussion of each business item on schedule so that the meeting does not run late.

Post-meeting activities are important. Most important is to review action items decided upon during the meeting, the individuals responsible for each, and the time each action item should be completed. Meeting minutes remind attendees of these action items and allow nonattendees to get information from the meeting even if they didn't attend.

Managing by wandering around

"Management by wandering around (MBWA) can be very useful to new and experienced lab managers alike. Tom Peters and Bob Waterman discussed MBWA in their classic book "In Search of Excellence." However, this technique is often forgotten, given the many demands on a manager's time. Yet its advantages make it well worth it.

Because the word "wandering" is part of the name of the method, it sounds purposeless.² Far from it. MBWA means occasionally walking through the laboratories in an unstructured manner, informally discussing the status of ongoing work with staff members. The atmosphere is relaxed and informal. Staff members often express concerns they would not mention in a formal meeting or would raise only in a performance review (often scheduled months away).

MBWA enables managers to show their concern. Having managers who are engaged in their work helps staff members feel their work is important and strengthens their engagement.

One of the best managers I ever had began her new assignment by walking around and meeting her staff members in their labs and offices. She used these discussions to get to know her staff members and learn how to facilitate their achievements. These initial discussions set a positive tone that lasted for the three years of her assignment as research supervisor.

Leadership

Management is more than just administration; it's also leadership.³ Effective, timely decision-making is an essential part of leadership. Leaders gather information, consider alternatives and then set a clear course of action. In addition to considering the data itself, managers need to consider its source and thus its value. Decisions are often based on intuition as well as data.

In making decisions, managers need to balance the tensions between the company's short-term and long-term interests and between various constituencies: high level managers, their staff members, other employees, stockholders, customers, and

suppliers. Often, decision making is not easy and managers need to have mental toughness to be decision-makers. I found a DVD course, "The Art of Critical Decision-Making," from The Teaching Company and presented by Professor Michael Roberto of Bryant University, to be of considerable help in refining my own decision-making skills.⁴

Managing external R&D contracts

Industrial R&D is increasingly being accomplished through open innovation processes.⁵ Managers and qualified staff members need to play important roles in the selection of open innovation partners and helping to define the terms under which outside organizations will work with your laboratory on projects. Customarily, this work is done under contract.⁶ Issues such as defining the roles of each partner, project milestones, determining how to decide if milestones have been met, and the amount of the milestone payments have to be discussed and negotiated.

Once the contracts have been signed, the lab manager should be involved in monitoring the working relationship between his/her staff members and the other parties to the contract.

Doing more with less

Many laboratories have had their budgets reduced due to the depressed business conditions of the recession and the current weak economic recovery. This means lab managers are being forced to do more with fewer financial resources. How can you do this?

One strategy is to refurbish your current equipment such as balances, centrifuges, microscopes and spectroscopic instruments to extend their useful operating life rather than replacing them with new ones. Another strategy is to buy refurbished equipment and instruments rather than new ones.

Consider changing your hiring practices. Rather than hiring a new full-time employee, can you hire a qualified person to work part-time instead? The use of part-timers could enable important work to get done with less impact on your personnel expenses. Some unemployed individuals might be happy to work part-time rather than not have a job at all. Perhaps some of your laboratory's retirees would like to work on a part-time basis.

Managing conflicting priorities

With fewer staff and financial resources, lab managers will find it more difficult to effectively manage conflicting priorities. Strategies and methods for doing so were discussed at length in an earlier *Lab Management Magazine* article.⁷ In essence, they



A member of the Panasonic Group

PRESERVE MORE WITH LESS

*The industry's leading energy efficient
and compact -86°C ultra-low freezer.*

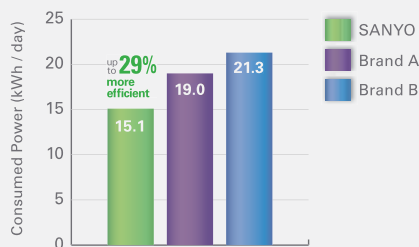


MORE CAPACITY
[25.7 cubic feet]

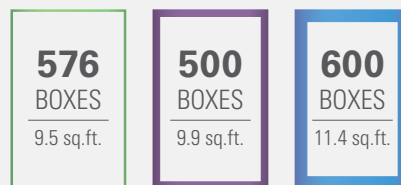
LESS ENERGY
[15.1 kWh / day]

LESS SPACE
[9.5 square feet]

MORE SAVINGS, LESS ENERGY



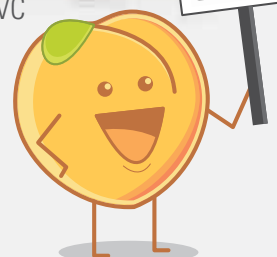
MORE CAPACITY, LESS SPACE



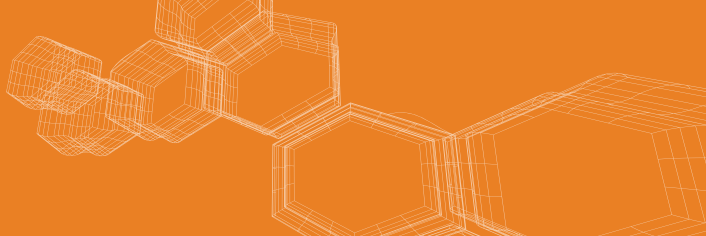
SANYO Brand A Brand B



VIP® PLUS SERIES
MDF-U76VC



Visit www.greenfreezers.com to learn more!
And to take advantage of special offers.



involve using numerical methods and information technology for establishing priorities. Managers, particularly newly appointed ones, should consult their supervisor when using these methods. It may also be appropriate to consult staff members and other members of project teams, including customers and suppliers, when engaged in this exercise.

Managing diversity

Managers have to deal with cultural issues associated with the diversity of their laboratory staff members. These are gender, racial and cultural diversity. Members of the so-called Generation X and millennials (also called Generation Y) have different attitudes than baby boomers toward their work as well. For example, millennials often have different priorities when balancing work and family demands than do baby boomers.

This diversity means that lab managers must, within permissible company limits, use different management strategies with different employees. For example, managers must know what motivates their various staff members so they use the appropriate strategies to promote engagement and reward each employee for outstanding performance.

Maintaining personal integrity

Personal integrity is essential to earning and keeping the trust and respect of your staff members and peers. To be an effective manager and leader, you must always tell the truth. If you don't know the answer or are precluded from giving it by corporate confidentiality considerations, don't lie in order to have something to say.

Managers may be confronted with moral or legal choices with regard to legal and business issues. They must always make the ethical choice. For example, a patent litigation developed at a former employer of mine. As part of the litigation, laboratory notebooks and reports had to be meticulously examined. While this was being done it became clear that one inventor had been left off the patent application. Although this inventor never complained about it, my employer did the ethical thing and corrected the inventorship, even though it was embarrassing to do so more than two years after the patent application had been filed.

In another situation I observed personally, a capable young chemist lost his job in a small layoff. Knowing his staff members were upset, the research department manager called his staff together to explain the situation. However, he then lied regarding the reason the chemist lost his job. He immediately lost the respect of his staff, and he never regained it. The situation negatively affected both department morale and the manager's effectiveness.

Developing the new skills you need

Many companies send their new managers and lab staff members they are considering for management assignments to training courses on the management techniques discussed above. However, this is less common at small firms. Many large companies cut back their training programs during the recession and have yet to restore them. In addition, few of these courses are customized for lab managers. So attendees have to devote some creative thought to how they can apply the principles being taught.

What can you do if formal management training programs are not available? The best approach is to use your own manager as a mentor and advisor. Consulting with other recently promoted lab managers will allow you to share common problems and develop solutions.

Even after mastering your current responsibilities, you need to keep learning and growing. Accept stretch assignments that expand your capabilities and increase your knowledge base about your firm, its businesses and the external world in which your company operates.

Footnotes

1. T. Peters and R.H. Waterman, "In Search of Excellence: Lessons from America's Best-run Companies," Harper Paperbacks (2004).
2. Some experts have used the word "walking" rather than "wandering" to describe the technique because of the negative connotation of the word "wandering."
3. Mike Mears, "Leadership Elements: A Guide to Building Trust," iUniverse (2009).
4. J.K. Borchardt, "Managing Crisis," *Lab Manager Magazine*, <http://www.labmanager.com/articles.asp?ID=820>.
5. J.K. Borchardt, "Open Innovation Becoming Key to R&D Success," *Lab Manager Magazine*, <http://www.labmgr.com/articles.asp?pid=163>.
6. J.K. Borchardt, "Open Innovation: Presenting New Opportunities for Contract Managers," *Lab Contract Manager*, www.ncmahq.org/files/Articles/CM0608_26-35.pdf.
7. J.K. Borchardt, "Competing Priorities," *Lab Manager Magazine*, <http://www.labmanager.com/articles.asp?ID=635>.

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

Your success circulates

Thermo Scientific temperature control systems deliver the perfect fit: reliable, accurate and stable heating and cooling for virtually any application. From immersion circulators and refrigerated/heated bath circulators to chillers and heat exchangers – your yields and processes are optimized. You can work with complete confidence, knowing our solutions deliver the precise temperatures you require, exceptional consulting expertise, and Global Support. So when temperature control means everything, it's easy to keep your cool.

at every degree

• Visit www.thermoscientific.com/tc for more information

NEW!

Thermo Scientific ThermoPolar Recirculating Chiller

Dynamic, reliable and efficient – the perfect fit for your closed or open-loop application



- Compact design
- Built-in energy-saving feature
- Up to 500 watts of cooling
- Easy to fill and drain

Visit www.thermoscientific.com/polarad to download our new product brochure

Thermo
SCIENTIFIC

THE FIFTH ANNUAL SALARY & EMPLOYEE SATISFACTION SURVEY

RESULTS INDICATE GENERAL SATISFACTION, THOUGH LINGERING JOB INSECURITY REMAINS FOR SOME by Pam Ahlberg

What has been true over the past four years of conducting this survey remains true: Those working in the scientific research field like what they do and have no plans to change careers. Although the number was down 2% from last year, those who said they liked the type of work they do remained at a high 90%. That said, there were nearly equal amounts of improvements and disappointments across all areas reported this year. Before discussing the survey results, we've provided a snapshot of this year's 1,050 survey participants.

Overview of participants

The majority of respondents (31%) work in the R&D departments of their organizations, followed by 18% in QA/QC. Those working in Technical Services comprised 12% of respondents, with the balance spread fairly evenly throughout other departments, as shown in Table 1. The overwhelming majority of respondents (48%) work in

industrial research facilities, with all others dispersed throughout clinical, university, contract, private, and government labs, as seen in Table 2. Among those working in industrial labs, chemicals, pharmaceuticals, and biotechnology shared the majority spots (Table 3).

TABLE 1: Job Function

R&D	31%
Quality Control/Assurance/Validation	18%
Technical Services	12%
Operations	9%
Manufacturing/Processing	7%
Regulatory	3%
Corporate Management	2%
Other	18%

A SNAPSHOT OF OUR SURVEY RESPONDENTS

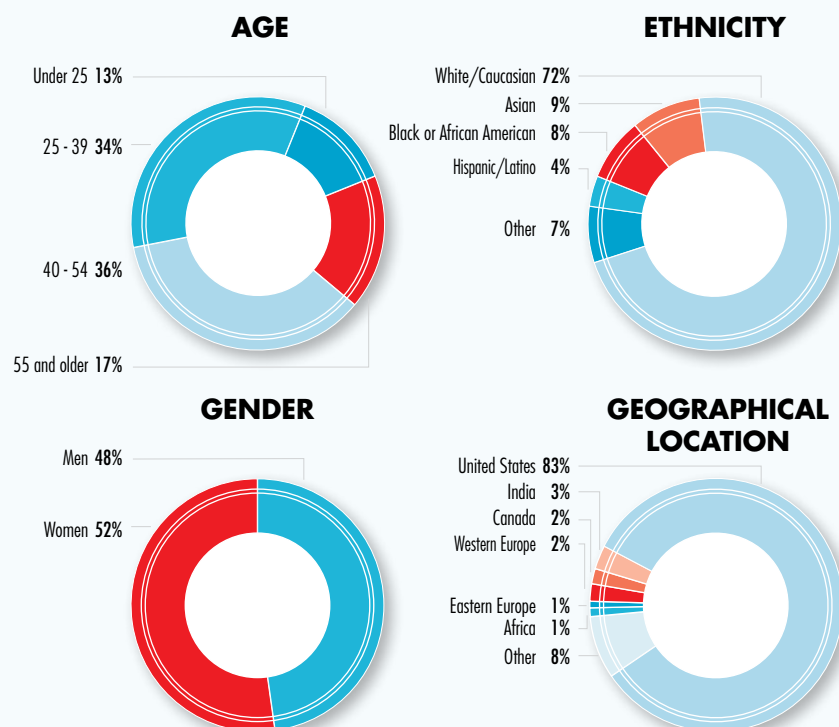


TABLE 2: Research Organization

Industrial Research Lab	48%
Clinical Research Lab /Hospital/Medical Lab	15%
University/College Research Lab	9%
Contract Lab	7%
Private Research Institution	5%
Government Research Lab	6%
Other (please specify):	10%

TABLE 3: Field of Research

Clinical Research/Trials/Hospital	18%
Chemicals	13%
Pharmaceuticals	13%
Biotechnology	12%
Environmental	8%
Plastics/Polymers	6%
Food/Beverage	4%
Microbiology	4%
Energy/Petroleum	3%
Other (please specify):	19%



Density and Refractive Index Excellence

Innovation That Stands Out

METTLER TOLEDO's Excellence line is more than just density and refractive index. Specific gravity, Brix, HFCS, Alcohol, API degrees/API gravity and user-specific concentration tables are only a few possibilities of these expandable and easy-to-use systems.

- **Simple** – One Click™ user interface, bar code scanning eliminates data entry errors
- **Sound** – Powerful automation, ErgoSens™ hands-free measurement
- **Sophisticated** – Automated multi-parameter analysis, LabX™ data management software
- **Secure** – Fingerprint log-in and Automatic Error Detection

Find out how METTLER TOLEDO Density and Refractive Index will truly stand out from the other instruments in your lab, call **1-800-METTLER**.

► www.mt.com/na-dere

METTLER TOLEDO

Overall, respondents to this year's survey appear interested in keeping their labs viable, maintaining a capable staff, and staying relevant in the ever-changing research market. While all levels of lab professionals are finding themselves with increasing responsibilities, a growing number of respondents agree (up 6 percentage points from last year to 55%) that their staffing is adequate to provide quality products/services.

Compared with last year's 7% who reported working for their current employer less than 1 year, this year that number grew 12 points to 19%. This may reflect improvement in the market, leading to more lab professionals finding jobs. Another possible explanation is that this year's respondents also included a good number of lab professionals employed by scientific specialty service organizations, such as Kelly Scientific Resources (KSR). Therefore, this higher number may also reflect those who have found temporary, contract and full-time positions with those types of organizations, and may also explain the uptick in staffing levels noted above.

TABLE 4: The Length of Time with Current Employer

	2011	2010
Less than 1 year	19%	7%
1 - 2 years	12%	14%
3 - 5 years	18%	23%
6 - 10 years	17%	20%
11 - 15 years	10%	13%
16 - 20 years	7%	7%
More than 20 years	17%	16%

And now the numbers

Perhaps this is attributable to what we see in Table 4, but with the growing number of new lab professionals entering the field, there is a significant percentage increase in salaries in the \$25,000 to \$44,999 range, as shown in Table 5 below.

TABLE 5: Annual salary, not including bonuses

	2011	2010
Less than \$25,000	13%	11%
\$25,000 - \$44,999	34%	12%
\$45,000 - \$74,999	32%	39%
\$75,000 - \$94,999	11%	15%
\$95,000 - \$124,999	7%	17%
\$125,000 - \$149,999	2%	3%
More than \$150,000	1%	3%

Overall, lab supervisors/managers/directors across all research organizations saw their pay increase in 2011. But as in previous year's surveys, as Table 6 shows, there is a sizable difference in the average salary of those working in industrial research labs compared to all other research organizations. And with the exception of those in industrial and government research labs, new chemists/scientists entering the marketplace are averaging \$25,000 to \$44,999 per year in annual salary (Table 7).

TABLE 6: Average Salary of Lab Supervisor/Manager/Director by Type of Research Organization

Industrial Research Lab	\$95,000 - \$124,999
Clinical Research Lab /Hospital/Medical Lab	\$45,000 - \$74,999
University/College Research Lab	\$45,000 - \$74,999
Contract Lab	\$45,000 - \$74,999
Private Research Institution	\$45,000 - \$74,999
Government Research Lab	\$75,000 - \$94,999

TABLE 7: Average Salary of Scientists / Chemists by Type of Research Organization

Industry Research Lab	\$45,000 - \$74,999
Clinical Research Lab /Hospital/Medical Lab	\$25,000 - \$44,999
University/College Research Lab	\$25,000 - \$44,999
Contract Lab	\$25,000 - \$44,999
Private Research Institution	\$25,000 - \$44,999
Government Research Lab	\$45,000 - \$74,999

An uptick in satisfaction

Areas of greater job satisfaction were found across the board, including staffing and training levels, resources and benefits. Specifically, 7% more respondents (71% compared with 64%) said they "strongly agree/agree" when asked if they were happy with their work-life balance. There was also a 4% increase (72% compared to 68%) among those who felt prepared for their next positions within their organizations. With regard to training and professional development provided by organizations, improvements were all in the double digits. When asked whether their organizations provided sufficient initial training, 65% "strongly agreed/agreed" (compared with 49% last year). As for ongoing training, 15% more respondents than last year (63% versus 48%) said their organizations provide as much ongoing training as they need. Regarding whether they are provided the informa-

tion, equipment and resources they need to do their jobs well, 71% “strongly agreed/agreed,” versus 61% last year.

But not so fast

Despite these generally upbeat numbers, there was almost an equal amount of job dissatisfaction in other areas. For example, when asked whether they were given enough authority to make the decisions they need to make, 72% “strongly agreed/agreed” (versus 80% last year). Another telling drop came from the statement, “I believe my job is secure,” to which 13% fewer respondents answered in the affirmative (52% compared with 65% last year), and 7% fewer respondents said they feel valued at their organizations (63% versus 70%). Based on these results, it seems research professionals still enjoy their work and are satisfied for the most part with how their organizations operate, but lingering job insecurity remains for some—not a big surprise given the current economic climate in this country.

Finding work

One interesting change from the year before was where research scientists are now going to find workers to fill positions in their organizations. As Table 8 below indicates, there has been a 21% increase in reliance on internal sources, a 13% increase in the use of online job postings, a 16% increase in the use of staffing firms and a 6% jump in the use of social networking sites.

TABLE 8: Sources for new career/position opportunities (2011 vs. 2010)

	2011	2010
Internal Human Resources Department/ Internal Job Postings	52%	31%
Online Job Boards	76%	63%
Staffing Firms	42%	26%
Personal/Professional Networks	56%	59%
Social Networking Sites	25%	19%
Classified Ads	41%	38%
Other (please specify):	4%	7%

If you participated in this year's Salary & Employee Satisfaction Survey, thank you. We look forward to returning to this important topic a year from now and will be counting on your participation.

FOR COMPLETE SURVEY RESULTS, go to:
www.labmanager.com/satisfaction5

eLINE® Pipettes

**Excellence in
performance and ergonomics**



The eLINE features:

- Unbeatable accuracy and precision with unique DC motor concept
- Patented and built-in error control for more reliable results
- The easiest tip ejection ever with the unique electronic tip ejection
- Ergonomic design that suits both left- and right-handed
- Easy programming, 6 memory places for favorite programs

**Save over 40% on
Biohit eLINE pipettes
and select quality tips!**



**Exclusive offers only available
through VWR International**

VWR

Visit us.biohit.com/vwr-promos for
promotional details.

Contact your local VWR representative or
Biohit customer service at
1-800-922-0784 for more information

VISUALIZING A CAREER PATH

REFRAMING CHEMISTS' JOBS CAN IMPROVE LAB PERFORMANCE AS WELL AS JOB SATISFACTION

by Saidas M. "Sai" Ranade, Judith Santa, Jairo Maldonado and Diana Gomez

Lab managers are responsible for recruitment and development of chemists and other lab professionals. They often have to explain to the rest of the world the value added by the chemists and also educate the new recruits on what the various jobs entail. For lab employees, better understanding of jobs and available career paths can contribute to higher levels of job satisfaction.

A report from the American Chemical Society (ACS)¹ discusses the Voluntary Industry Standards for Chemical Process Industries Technical Workers Project and issues relevant to the employment and education of chemical laboratory technicians (CLT) and process technicians (PT). It presents a list of critical job functions performed by CLTs and PTs. However, the underlying basis of dividing up the work into certain functions is not clear. It is not obvious whether the list is complete and if the job functions are of the same or different levels of difficulty. The report includes a list of over 1,000 competencies linked to the job functions. It provides useful content but not the container.

Public labor market authorities in many countries have also created skills databases such as DISCO, O*NET and Taxonomy_DB.² These databases are a good starting point for developing competency lists. However, it is not easy to comprehend the underlying patterns connecting different lists, and job types that have multiple levels are not included.

A job is not simply a set of tasks but is a part of an individual's career. These common representations do not capture the fact that career paths are multidimensional and may have different levels. The traditional formats of job representation are acceptable but not very effective as communication tools. In today's digital world, people are accustomed to seeing interactive, visual, and event-driven tools. They prefer representations that are rigorous yet simple.

The authors present a case study of refinery chemists (as an example) to illustrate how a new visual way of representing jobs might provide an efficient and effective method for answering the question "What do the chemists do?" It is very likely that some or all of the visual tools presented in this article will also accurately represent the jobs of over 35,000 (an estimate based on

data in reference 3) chemists employed by the chemical, petrochemical and refining industries as well as other professionals employed by quality labs.

CASE STUDY

Background

There are approximately 717 oil refineries worldwide, of which about 132 are located in the United States.⁴ Oil refineries produce fuels such as gasoline, diesel and feedstock for chemicals and additives. Product quality is very important because it is mandated by local and federal and, in some cases, international regulations. Chemists play a very important role in ensuring safe operations, environmental compliance and profitability of a refinery. Oil refiners employ chemists to operate on-site laboratories, assure quality of the operations and provide technical support to analysts who conduct the tests. A typical refinery with 15 process units employs 10 to 15 professional chemists.

In 2008, Ecopetrol S.A. adopted a new job representation model and method for defining competencies for refinery engineers. The maps for all engineering disciplines were completed in June 2009, and a training program is underway to bridge the identified competency gaps. In July 2009, Ecopetrol decided to extend the same competency mapping approach used by engineers to all other professionals, including laboratory chemists at the refinery in Barrancabermeja. The Barrancabermeja refinery employs six professional chemists, 30 professional analysts and 10 technicians.

A core team consisting of a GP consultant (one of the authors) and laboratory training development team members was formed to develop the visual maps. In simple terms, each task done by an employee in a lab is broken down into an "action verb" and one or more "objects" of that action verb. For example if the task is "train analysts," the action verb "train" is placed on the x-axis and the object "analysts" goes on the y-axis, creating a grid. In the next step, the action verbs are arranged by degree of difficulty from left to right and the objects are arranged based on degree of complexity as one moves up the y-axis. Each cell in the grid then represents a task, and the tasks become more difficult and complex as one moves away from the origin

ultimate protection

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

optimum capacity

• thermoscientific.com/revcouxf

Thermo
S C I E N T I F I C

**Introducing the new
Thermo Scientific Revco UxF Series**

- intuitive touch-screen controls
- maximum storage capacity
- 24/7 health monitor
- event log
- fast recovery rates
- energy efficiency

along the diagonal of the grid. Additional information on the underlying framework and steps for creating the maps is available in references 5 and 6.

Results

The new job model was first applied to the job of professional chemists and later to the job of analysts. Application of the new job model revealed that the job of refinery professional chemists is linked to four different assets, each with its own requirements. The chemists manage the laboratory equipment and analysis techniques. They manage training and development for the analysts (internal client) and they provide customer support to various units in the plant (external client). Four maps were created to match the four different functions performed by the chemists. The equipment support function is illustrated in Figure 1. It shows the equipment life cycle on the x-axis (columns) and the equipment items on the y-axis (rows). P1, P2, etc., are job levels. Level P4 is the same as Junior Chem-



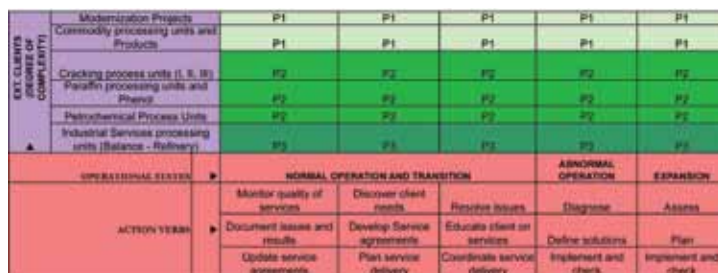
▲ *Figure 1. Visual job profile: Equipment support by chemists.*

ist. Level P1 is equivalent to a Principal Chemist.

The map for analytical technique support is shown in Figure 2. Technology adoption cycle steps are shown as columns, and the various analysis techniques are shown as rows. Figure 3 shows the map for working with external clients. The main activities associated with customer support cycle are shown on the x-axis (columns). The various processing units (or customers) are shown on the y-axis (rows). Figure 4 shows the map for the internal client training and development function. The main steps of the training and development cycle are shown on the x-axis (columns) and



▲ Figure 2. Visual job profile: Analytical technique support by chemists.



▲ *Figure 3. Visual job profile: External client support by chemists.*



the various areas supported are on the y-axis (rows).

Conclusions

The four maps (Figures 1-4) together represent the job of a professional chemist at Ecopetrol.

Creation of visual job and career paths using a common framework allows one to see how the jobs of professional chemists differ from those of other professionals. The job of refinery engineers and operators is linked to one cycle: the equipment life cycle. However, as shown above, the job of refinery chemists is more complex because they not only have to support the laboratory operations but also have to meet the expectations of the external clients. As expected, embedded within the four main cycles corresponding to the four maps are the classical problem-solving, opportunity identification and PDCA (continuous improvement) cycles that are common to many STEM professionals.

To reliably perform the actions shown in Figure 3 for the various chemical process units (clients), chemists need to be aware of the foundations of chemical engineering and basics of unit operations, such as heat exchange, distillation, etc. From Figures 1 and 3, chemists are required to provide support for the laboratory equipment and process units during abnormal conditions. They may need to participate in root-cause (after the abnormal event) and failure modes (to prevent future abnormal events) analysis sessions. Although training on the specific analysis techniques and tools will depend on the organization employing the chemists, having a fundamental understanding

of statistics and probability would be very beneficial for a new chemistry graduate joining the company. Technical writing skills are important because refinery chemists are required to document test methods, maintain testing standards (Figure 2), document client issues, and recommend solutions (Figure 3).

As seen from Figure 4, additional skills required by laboratory chemists include the skills to train and coach. It is important to note that training and coaching are different. Training is more structured and formal. Coaching is more improvisational and tends to be one-on-one. During the execution of this project, it became clear that the bulk of the technical literature is still in the English language. Hence, the ability to read and comprehend the technical literature available in English is important for chemists working in non-English-speaking countries.

Training professionals have long recognized the importance of cross-discipline skills. The visual approach to representing jobs made it easy to determine the cross-discipline skills and also provided additional evidence of the importance of these skills.

Recommendations

Lab managers should consider changing the format of all job descriptions from the classic bulleted list format to a visual, event-driven format similar to the maps developed in this study. The visual maps would help them share information about the jobs with potential clients and job seekers. The visual job representations would make it easy for the professional chemists and technicians working in the labs to visualize their career paths.

A single visual job representation method like the one described in this article is important for understanding how different professionals contribute to the mission of each lab. Deeper understanding of each other's jobs has been shown to improve teamwork. It is also important for recognizing the common core skills that can help better utilize a lab's training dollars.

Acknowledgement

The authors are grateful to Angela Corrales, leader of the Operational Excellence Team for Ecopetrol S.A. Without her coordination help, this work would not have been possible. Some of the comments made on an earlier version of this article by the reviewers of the ACS's *Journal of Chemical Education* have been incorporated in this article. The opinions expressed in this article are those of the authors and do not necessarily represent the views of other entities mentioned in this article.

References

1. Hofstadter, R. & Chapman, K. (1997). Foundations for Excellence in the Chemical Process Industries. *American Chemical Society*.
2. Markowitsch, J. & Plaimauer, C. (2004). Descriptors for competence: Towards an international standard classification for skills and competences. In J. Winterton, convener. *Symposium on European approach to competence* (Strasbourg, France).
3. Business & Economics Research Advisor: Issue 5/6. The Oil & Gas Industry: Refining (Business Reference Services, Library of Congress) (Winter 2005/Spring 2006). Washington, DC: U.S. Library of Congress, Issue 5/6. <http://www.loc.gov/rr/business/BERA/issue5/refining.html> (Accessed Jan 2010)
4. United States Department of Labor, Bureau of Labor Statistics, *Occupational Outlook Handbook, 2010-11 Edition*. Washington, DC. <http://www.bls.gov/oco/ocos049.htm> (Accessed Dec 2009)
5. Ranade, S.M. (June 2010). Reframe jobs, reap rewards. *People & Strategy*. 33 (2).
6. Ranade, S.M., et al. (April 2011). A competency framework for operators and maintenance technicians. *Chemical Engineering*, pp. 54-58.

Saidas M. "Sai" Ranade is the manager of innovation for General Physics Corporation's manufacturing group. He is the inventor of the model and the tools described in this article. He can be reached via e-mail: smranade@swbell.net

Judith Rocio Santa Jaimés is the coordinator of Quality Inspection for Ecopetrol S.A.'s refinery in Barrancabermeja, Colombia. She earned her master's degree in chemistry from the Universidad Industrial de Santander and has worked for Ecopetrol for 12 years.

Jairo Maldonado is the technical leader of Quality Inspection for Ecopetrol S.A.'s refinery in Barrancabermeja, Colombia. He earned his master's degree in chemistry from the Universidad Industrial de Santander. He has worked for Ecopetrol for 12 years.

Diana Lucero Gomez earned her B.S. in pure chemistry with specialization in senior management from the Universidad Industrial de Santander. She has worked for Ecopetrol S.A. for over five years as a member of the Quality Inspection Coordination team.

THE PSYCHOBARBARIAN MANAGER

TECHNIQUES FOR IDENTIFYING, PROTECTING AGAINST,
AND ESCAPING FROM A TOXIC BOSS by Ronald B. Pickett

He was concluding a presentation to which he had dedicated weeks of preparation. It had gone very well when, in front of everyone, his boss asked him a question that he couldn't answer. Worse, his boss *knew* that he didn't have the answer. He felt completely betrayed. Later, his boss came into his office and said, "Great presentation; you did well!" Talk about mixed messages! The compliment softened the abuse but left him uncertain about his competence and confused about where he actually stood with his boss.

There are managers who have learned to use psychological techniques to confuse, contort, and control members of their staff. I have come to know them as Psychobarbarian managers. You may never encounter one of these characters, if you are lucky. However, I am continually amazed by how many people immediately recognize the "type" and relate their awful personal experiences. It often sounds like "Horror Movie V."

Five characteristics

Here are five signs that you have encountered a Psychobarbarian:

1. They instill self-doubt by sending mixed messages. They have a unique ability to focus on your contribution in such a way that you question your values, competence, and decision-making ability.

"Psychobarbarians tend to be excellent at organizational politics and are threatened by anyone with similar abilities."

Example: "You did a great job, but it could have been better if ..."

Don't confuse this with good-quality coaching. In the Psychobarbarians' "coaching style," the areas of improvement may be outside your control.

2. They fire quickly and often. No other trait so clearly identifies Psychobarbarians. They fire with little cause, or they are careful to hide the reason for releasing someone, in order to establish and maintain a climate of uncertainty and fear. No matter that they often are sued or threatened with suits; firing is a feel-good drug for them. Some Psychobarbarians will appear sad and apologetic, indicating that the termination is for the good of the organization. Sometimes they're right; the people they fire might require a lot of rehabilitation. However, the real reason for firing people is the power high these managers get from the act as well as the impact the action has on the rest of the staff. Such an action serves to keep people off-balance and enhances the Psychobarbarians' control. Put them in an environment where tenure prevails, and the pattern intensifies—they must get the person to resign, and they are largely protected from being fired themselves.
3. They attempt to control all access to the world outside the





It's All About The Perfect Balance.



Speed, Performance, Value

We're talking about the perfect balance of speed, performance and value. That's what we incorporate into every balance we make. From our precision analyticals to top-loading and moisture balances, we offer a full range of balances and solutions for all your weighing applications.

Adam Equipment is a trusted company with a 40-year tradition of providing science and laboratory professionals worldwide with high-quality, affordable balances, offering you the best bang for your buck. You can't go wrong with products that give you the accuracy and reliability that you need, balanced with the features you want.

It's time you looked at Adam for your laboratory. You can't afford not to.

Adam balances and scales can be purchased through a number of dealers and distributors. For the name of your nearest Adam dealer, please contact us. For more information on all Adam balances and scales, please visit www.adamequipment.com.



Learn more



ADAM

Adam Equipment, Inc.

26 Commerce Drive Danbury CT 06810

Tel. 203 790 4774 | 203 792 3406 sales@adamequipment.com



department. They want to be an integral part of any subordinate's involvement with other departments. They demand detailed briefings about meetings, and even chance encounters, with senior management and influential people. They may attend meetings to which they weren't invited to make sure they are not missing anything that is remotely related to their department, division, or group.

4. Many Psychobarbarians exhibit paranoia. Their management techniques are highly unconventional and might be exposed if examined too closely. They

might be seen glancing over their shoulders. They can be almost-secretly gleeful when making others squirm. They seem not to recognize when they have crossed a line in a business relationship with subordinates. And some have egos the size of Montana, which makes them immune to their vulnerability.

5. They seldom are influenced by data. Numbers either frustrate them or are used to support specious arguments. One example that supports their personal belief is important; 25 examples that counter it are meaningless. They tend to be the prime examples of "conformation bias," the human tendency to disregard information that does not support an opinion we have arrived at. Interestingly, they can also exploit numbers, poring over reports and searching for meaning and relevance in minor deviations or—heaven forbid—an error.

Few Psychobarbarians will exhibit all these characteristics, although some I have known come close. So if you see a pattern of behaviors from this list, you can be pretty sure you are caught in the web of a Psychobarbarian.

If you are there

If you discover that you are in the web of a Psychobarbarian, what are your options? (First, make certain that you are not the problem. Frequently conduct objective assessments of your contribution to the organization and to the problem.)

Five things you can do:

1. First, play it straight. The most effective way to counter a Psychobarbarian's sarcasm is simply to take the comment literally. Never get into a contest of sarcasm because you can't win. Should you seem to be winning, the Psychobarbarian will find a way to punish you.
2. Never do anything that can be perceived as disloyal. Psychobarbarians are loyalty fanatics, even though they have zero loyalty to staff. Set and maintain high standards. Take away as many opportunities as possible for finding fault with your work or your attitude.
3. Gain and maintain a high profile. Get outsiders to comment favorably about what your

Pipette Management Solutions By A&D

* Pipette Accuracy Testers

- Compliance with ISO 8655 gravimetric method
- Testers come complete with balance, software, carrying case, and accessories
- Verify pipettes down to 1uL



* Air Leak Testers

- Verify internal seals and O-rings in just 5 seconds!



(800)726-3364
www.andweighing.com

A&D
A&D Weighing

group is doing. Publish and post all positive comments about your group. This will shine a positive spotlight on your group. Protect your people. Do everything you can to protect your staff, particularly those who are vulnerable because of personality traits or position, from ruthlessness and indiscriminate firings. Document anything that will put an impediment in the way of a potential dismissal or will provide support for an unlawful dismissal suit if it is necessary.

4. Sharpen your political skills. Keep your political contacts within the organization to yourself. Psychobarbarians are particularly attuned to powerful people within and without the organization. They see them as a threat to their own power and control and are fearful of important allies their staff members may develop. As with your contacts, keep your perceptions to yourself or be very careful with whom you share them. Psychobarbarians tend to be excellent at organizational politics and are threatened by anyone with similar abilities.
5. Keep a log. This can be a potent resource if the worst happens. Document specific dates and events. Don't be compulsive about it, but track specific behaviors and situations.

Time to go

"When I told her I had found a new position, her entire demeanor changed." Right! The relationship has changed; the reason for control no longer exists. You have escaped!

Sometimes nothing works. Staying too long can seriously affect your health, your reputation, and quite possibly your future. Watch for these clear indicators that it's time to leave:

1. When you have begun to question your values and skills, it is time to take drastic action. A Psychobarbarian will trivialize your values and challenge your skills. Suddenly your strengths are seen as weaknesses, and your ego is being seriously damaged. This happens because a Psychobarbarian goes for every nit, ignoring the overall value of your contribution.
2. Your health is in danger.
3. Your working hours become longer—needlessly—and you're often fatigued.
4. You find satisfaction only outside your job.

5. A good opportunity comes up. If you are working for a Psychobarbarian and hear about a great job opportunity, go for it. Factor in the cost to your health, job satisfaction, and home life when determining an equivalent salary.

Prepare an exit strategy

Keep a file of your outstanding performance evaluations and kudos. Solicit reference letters and recommendations from customers and vendors. Network, network, network! Insist on a strong reference from your boss. It shouldn't be difficult to get. This is a time when your manager is vulnerable. Exposure becomes a real concern once his or her access to punitive power is gone.

More—and some psychology

If you would like to pursue this topic from a more psychological reference, see *Snakes in Suits*, or *The Sociopath Next Door*. In my opinion, the majority of Psychobarbarian managers are not certifiable. They are simply managers, often with weak or suspect egos, who have learned some techniques for controlling their staff members in ways that not only work but fortify their own personality. How did they get that way? Probably through a wide variety of different paths, and that's a whole different story.

For further reading:

Babiak, P. & Hare, R. D. (2006). *Snakes in Suits: When Psychopaths Go to Work*. New York: Harper Collins.

Kennedy, M. M. & Pickett, R. B. (March/April 1998), Power and the management of organizational politics. *Clinical Laboratory Management Review*, 12(2), 181-182.

Kennedy, M. M. & Pickett, R. B. (May/June 1998). Power and politics, Part II. *Clinical Laboratory Management Review*, 12(3), 114-116.

Stout, M. (2005). *The Sociopath Next Door: The Ruthless Versus the Rest of Us*. New York: Broadway Books.

I am always interested in adding to my library of stories about the vagaries of these characters. Please contact me at ronp70000@aol.com or 760-738-8638 with your observations, especially what has worked for you in surviving such a manager.

Intertek

www.intertek.com

Laboratory Testing





THE SCIENCES REQUIRE “SOFT SKILLS” TOO

We all know that scientists who pursue advanced degrees like a Ph.D. are smart. They are driven. And they are no doubt passionate about their work. But can they cut it in the real world?

Recent national media reports that debate the value of advanced degrees are shining a light on the need to have marketable skills that will work beyond the “ivory tower.” Universities across the country are taking note, offering programs in a wide range of academic disciplines that not only infuse postgraduates with knowledge, but equip them with skills demanded by the spectrum of global industry.

“The problems companies face in global business now demand that their workforce be much more versatile.”

In the science world, think of our ivory tower as the lab. This is where critical ideas unfold—where the value of scientists’ education and knowledge becomes clear as they work toward the goal of an isolated experiment or project.

But, as I’ve written extensively in this

column before, the world of work—even in the science industry—is dramatically changing, and an advanced degree is only part of the message when it comes to marketing yourself in the increasingly flexible workforce. Scientists today must know how to navigate a multitude of seemingly non-science issues outside the lab, from company culture to social etiquette, in order to continue advancing their careers.

Acquiring and strengthening these so-called soft skills should be the number-one priority for scientists and other lab professionals in their search for the next job or promotion.

The struggles of those with Ph.D. degrees to transition from academia to industry demonstrate why.

As still happens too often, scientists with the highest credentials will present themselves to companies, thinking that their narrow focus and expertise in one area will be enough to

land them a job. But they’ve remained risk-averse and have failed to become agile and flexible in the workplace.

From an absolutely technical perspective, this approach may be fine. Life sciences companies certainly value and seek out specialized knowledge. But the problems companies face in global business now demand that their workforce be much more versatile than that. This means companies are looking beyond candidates’ technical skills and academic credentials for evidence that they can successfully integrate themselves into the big picture.

For example, companies will want to know if you understand the unique business issues behind their goals and how your work would contribute to reaching those goals. Scientific research in most settings, after all, is not simply an academic pursuit—it’s big business. So even if you’ve published 53 papers in the top scientific journals, the ultimate question from an organization’s point of view will always be: “How are you going to apply that knowledge to help us?”

Companies are also looking for someone who has the social skills to fit into the culture of the workplace, and who knows how to communicate effectively with colleagues to accom-

plish the task at hand. Social skills, however, remain a hurdle for many scientists. But as in most business environments, improving those skills will strengthen practically every aspect of your career.

“Scientists today must know how to navigate a multitude of seemingly non-science issues outside the lab ... in order to continue advancing their careers.”

Also know that because of the incredible pace of scientific research and advancement, employers want someone who can hit the ground running. That means knowing the current issues the company is going through and having the ability to transfer your skills and be as productive as possible in your new position.

Leaving the ivory tower is not as daunting as it seems. By taking the time to hone skills that are critical in virtually every industry, you'll see your opportunities grow exponentially in the sciences.

Alan Edwards is senior director and product leader of the Kelly Services® Americas Products Group—Science. Kelly Services, Inc., a leader in providing workforce solutions, is headquartered in Troy, Michigan. For more information, visit kellyservices.com. Alan can also be followed on LinkedIn (linkedin.com).



Your health could be in danger

if you breathe small quantities of ordinary chemicals every day
(Hydrochloric acid, acetone, acetonitrile, xylene, dichloromethane, tetrahydrofuran...)

Total protection is possible with Captair® Ductless filtering fume enclosures

- Ready to use in minutes (no tools required)
- Energy Saving (Save up to \$4,300/year)
- Flexible / Mobile
- Inexpensive
- No HVAC Connection



CaptairFlex®
Ductless Fumehood



CaptairStore®
Filtering Storage Cabinet



Visit www.captair.com for more info or call 1-800-964-4434

« EXPERT: Byron Brehm-Stecher, Ph.D.



ASK THE EXPERT

OVERCOMING THE CHALLENGES OF SAMPLE PREPARATION by Tanuja Koppal, Ph.D.

Byron Brehm-Stecher, Ph.D., Associate Professor in the Department of Food Science and Human Nutrition at Iowa State University, heads the Rapid Microbial Detection & Control Laboratory that works to ensure the safety of the food supply through improved detection and inactivation of food-borne pathogens. While the laboratory uses a combination of several different analytical tools for rapid detection, a key emphasis lies on pre-analytical sample preparation (sample prep), which is the separation and concentration of target cells from complex samples and removal of interfering matrix components prior to detection. He talks about the common challenges associated with sample prep and what an ideal sample prep process should involve.

Q: What does sample prep typically involve, and what are the common challenges encountered?

A: Sample prep is problematic on many levels. Typically there is always the need to manipulate the sample in some way prior to the analysis. Usually there are three critical things that need to be done. First, there is the sampling step. If you are working with, say, a water sample from a lake or a big container of ground beef or some bodily fluid for clinical analysis, you need to first obtain a statistically valid sample or you are going to limit your chances of finding what you are looking for right off the bat, with the result that your downstream efforts may be futile or just “hit and miss.” If you have an adequate sampling procedure in place, then the next aspect is sample prep. These two steps are often confused with each other, but they are distinct. The sample prep step is when you take your sample and do what is needed to concentrate it—to make it homogenous or to remove any substances that may interfere with the assay. The accompanying figure gives an overview of

the six critical properties characteristic of an ideal sample prep method. These concepts were first articulated by Dr. Mary Lou Tortorello, Chief, Food Technology Branch, Division of Food Processing Science & Technology, U.S. Food and Drug Administration, and later published in the *Journal of Food Protection* review on sample prep that we co-authored with Lee-Ann Jaykus of North Carolina State University and Chuck Young of the Johns Hopkins Applied Physics Laboratory. After sample prep is done, it’s time to move to the detection step. In the past, the majority of the focus has been on the detection step alone, with published assays often performed only under perfectly controlled laboratory conditions. However, in the past few years, there has been greater recognition that all three steps—sampling, sample prep and detection—are critical and each must be operating at their best to ensure an optimal result. Limitations at any step will propagate through the system, impacting the final result.

Q: Why is there now a greater need for sample prep?

A: I think that recognition of the importance of sample prep has reached a critical point. For a while, especially in the early days of molecular detection techniques, it was enough to focus solely on the detection step. Sampling methods have been around for a very long time—people have been working on these since the 1930s or earlier and how to get your best samples has been well published, at least in the food space. But now people are realizing that if they want to translate their laboratory-tested method into reality and have it used practically in the field, then they have to focus on sample prep and try to integrate all three aspects that we talked about. People now recognize that it’s an important area that they need to focus on. There is no one sample prep method that applies to everything, and that’s one

of the challenges, especially for a food microbiologist. If you are a clinical microbiologist, there are a few different types of samples you have to look at, such as body fluids, blood, vomit, feces and tissues—but the list is still fairly short. However, foods are incredibly complex and diverse. Therefore, sample prep for foods is liable to keep us occupied for a while.

Q: Is there also a push from the technical side with more sensitive and accurate detection tools allowing more quantitative versus qualitative detection?

A: If you are going to do anything with risk assessment, then you need to know how much of your target is present in the sample, and therefore, strictly qualitative analyses won’t help. But if you have a system that is sensitive enough to detect a single cell, you are definitely limited by the fact that you cannot apply that platform to its fullest ability, especially if you have an unsolved upstream sample prep issue. Surely that is a motivation to dovetail an excellent sample prep method together with the newest generation of detection instrumentation.

Q: Are there any innovative approaches being applied to sample prep in recent years, and have you had experience working with any of them?

A: There are a few things that have proved very helpful for sample prep. Some of them are not off-the-shelf technologies but just procedures that you can integrate into your own process flow. For example, there are different types of centrifugation methods and exposure to different chemical reagents to break up food emulsions. There are other techniques, such as the recirculating immunomagnetic separation approach from Matrix MicroScience, that are very interesting. We are working with InnovaPrep, LLC, a company that is developing some novel methods for foam and vacuum-based extraction of microbes from very large surfaces. These are methods that were initially developed

Byron Brehm-Stecher, Ph.D., is an Assistant Professor in the Department of Food Science and Human Nutrition at Iowa State University. The Brehm-Stecher Rapid Microbial Detection and Control Laboratory (www.brehm-stecherlab.org) focuses on the development of improved methods for the rapid detection and characterization of bacterial pathogens, as well as novel antimicrobial approaches for the control of food pathogens or spoilage organisms. Brehm-Stecher received his Ph.D. from the University of Wisconsin-Madison in 2002, where he studied rapid methods for the detection of food-borne pathogens. He continued his work in Madison as a postdoctoral research scholar in the laboratory of Professor Eric A. Johnson before taking a job in the biotechnology industry. He came to Iowa State University in September 2004, from a position as a senior scientist and molecular biologist with Applied Biosystems, Inc.

for the biodefense area, but they can easily be translated to the food science arena. Microbiologists in both areas seek to detect low levels of target organisms distributed, perhaps heterogeneously, over large surface areas, so we're finding this approach to be very useful when coupled with real-time PCR for detection of *salmonella*. There are also technologies that concentrate samples, which could be anything from simple hollow fiber filtration to techniques like SCODA (synchronous coefficient of drag alteration), a method developed by Dr. Andre Marziali at Boreal Genomics for selective concentration of nucleic acids in complex samples. That's an entirely different technology for concentrating a sample based on electrophoresis rather than physical enrichment.

Q: Do you have any advice for lab managers who are struggling with sample prep issues?

A: Lab managers working in industry who have pressing problems and not enough time and resources to do the basic research themselves need answers and need to better their processes now. For them, reaching out to companies is good. Of course, you have to look carefully and decide if any given technology is right for your application, because everyone is going to claim that they have the answers that you are looking for. But I believe that there are a number of companies that are doing some very interesting basic research and are developing some methods that can be readily picked up and applied. Many of these companies are small, so you can often simply pick up the phone and start a discussion with the right person. Reaching out to people who have the answers—whether it's something packaged commercially or something being done at a university such as Iowa State—and communicating with people facing similar problems or who are in the middle of solving problems similar to yours is the best thing to do.

Q: What, in your mind, is the Holy Grail when it comes to sample prep? What is the one thing that people are striving to achieve?

A: It comes back to the accompanying figure about the six elements that are characteristic of an ideal sample prep method. You don't necessarily need all those properties for every single assay. At the end of the day, it depends on what you are looking at. There are some combinations of platforms and reagents that allow you to cut through complex samples with minimal sample prep. For instance, we routinely use fluorescence *in situ* hybridization (FISH) and flow cytometry to analyze very complex samples like alfalfa sprouts contaminated with low levels of *salmonella*. Here, you are working with high levels of particulate matter and background microflora that are closely related to *salmonella*. When we combine FISH and flow cytometry, we can cut through all that mess. This is a unique situation, but it highlights the fact that every sample and every need is different. Some systems may need multiple sample prep steps and some may need very few.

Q: What role are the regulatory agencies playing in this field?

A: There is definitely a clear interest in sample prep on the regulatory side. In fact, the USDA, in its latest request for proposals, has indicated that sample prep is extremely important to them. They recognize that if you are going to have some way of intervening with pathogens in food then you have to be able to detect them, and that involves some amount of sample prep. The fact that they have put this on their docket is very heartening.

CRITICAL ENVIRONMENT SPECIALIST



Terra helps protect your contamination-sensitive processes

Aseptic Designs

easy-to-sterilize furnishings, pass-throughs, enclosures

Particle Control

HEPA/ULPA-filtered laminar flow cleanrooms and hoods

Humidity Control

desiccators and glovebox isolators extend shelf lives

Chemical Vapor Removal

charcoal-based ductless hoods

ESD Control

static neutralizers protect against electro-static discharge

Call to discuss custom projects
Complete pricing at TerraUniversal.com

TERRA
UNIVERSAL.COM
Critical Environment Solutions

To order: 714-578-6000
Fax: 714-578-6020

Low-Cost Solutions for High-Tech Industries

MAKING CHIP-SEQUENCING USER-FRIENDLY

EVALUATION OF GENOME-WIDE ANALYSIS PLATFORMS FOR CHROMATIN

IMMUNOPRECIPITATION by Tracy Cooke; Robert Kovelman; Zirong Li; Lin Ma; Ron Orallo; John Rosenfeld, Ph.D.; Michael Sturges

Chromatin states can influence transcription directly by altering the packaging of DNA to allow or prevent access to DNA-binding proteins, or they can modify the nucleosome surface to enhance or impede recruitment of effector protein complexes. Genome-wide mapping of protein-DNA interaction and epigenetic marks helps us to better understand the transcriptional regulation.

Prior to the development of next-gen sequencing technologies, ChIP on chip, or location analysis, was the method of choice for exploring genome-wide protein:DNA occupancy patterns. However, ChIP-seq has been increasing in popularity due to the data density and lack of interrogation bias that this platform provides.

While this application is becoming more popular, few studies have been performed to explore differences in binding site profiles obtained from the two methods.

In this article, we present data that compares the performance of ChIP antibodies by ChIP-chip as well as by ChIP-seq. For these studies, ChIP-chip using Agilent microarrays and ChIP-seq using the Illumina Genome Analyzer platform were performed. These studies may serve as a basis to allow the development of specifications for acceptable performance on these genome-wide platforms to facilitate comparisons of data sets in shared databases and in published research.

The macromolecular structure of chromatin in eukaryotic cells is dynamic, and various epigenetic marks help define a static chromatin state.¹ This chromatin state is a reflection of accessibility and/or presence of certain protein:DNA or protein:protein interactions in a location- or region-specific manner. This dynamic and

coordinated interaction directly influences the expression of a particular gene locus. Thus, the elucidation of these interactions is essential for a deeper understanding of a variety of biological processes and disease states.

One of the main tools for investigating these interactions is ChIP (chromatin immunoprecipitation). ChIP is a powerful technique classically used for mapping the *in vivo* distribution of proteins associated with chromosomal DNA. These proteins can be histone subunits, transcription factors, chromatin modifiers (enzymes), or other regulatory or structural proteins bound either directly or indirectly to DNA. Using high-quality antibodies, protein-interacting regions of chromosomal DNA,

as well as their post-translational modifications, can be detected. Typically, either end-point or quantitative PCR is performed to verify whether a particular DNA sequence (the gene or region of the genome) is associated

with the protein of interest. Using this classical approach, laboratories can evaluate the interactions of the proteins of interest for a limited number of known target genes.

However, as the need to map, characterize and understand these interactions across the epigenome has grown, labs have turned to genome-wide approaches for the analysis of ChIP using either DNA bearing microarrays (ChIP-chip) or next gen sequencing (ChIP-seq). This combination of chromatin immunoprecipitation with genome-wide analysis represents a powerful approach that can provide a comprehensive look at transcription-factor binding as well as histone modifications and other chromatin associated proteins (Figure 1). Although ChIP-chip is a powerful approach and lends itself to the

“ChIP-seq has been increasing in popularity due to the data density and lack of interrogation bias.”

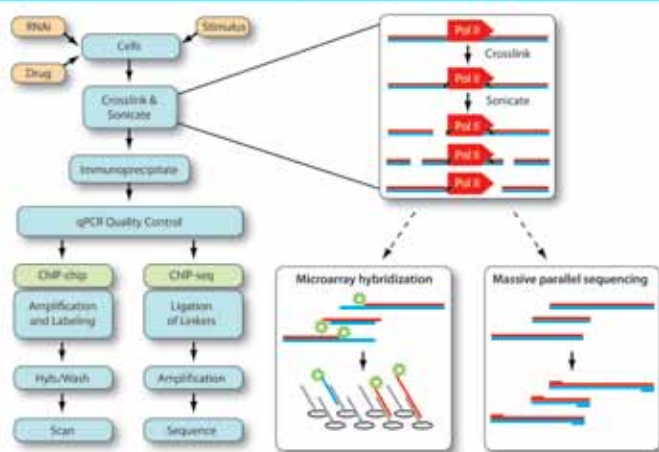
detailed analysis of specific regions of the genome or gene families using high-density arrays, the ChIP-seq approach provides genome-wide data with a high resolution and wide dynamic range, thus allowing for comprehensive coverage of the genome.

quality control process: microfluidic electrophoresis (e.g., the Agilent 2100 bioanalyzer or Bio-Rad Experion) checks the size and concentration while real-time PCR checks for enrichment of the library as compared to the input library. The ChIP library is then sequenced.

In this study, two kits from EMD Millipore containing the required reagents and protocols for either microarray or next-gen sequencing were used, specifically the Magna ChIP (microarray) and the Magna ChIP-seq chromatin immunoprecipitation kit (next-gen sequencing).

For this study, we targeted Sp1, a transcription factor that binds with high affinity to GC-rich motifs and regulates the expression of a large number of genes involved in a variety of processes such as cell growth, apoptosis, differentiation, and immune responses. The ChIP-seq library was constructed using either 10 ng or 1 ng of Sp1 ChIP'd DNA. The resulting library sample was analyzed to show size and concentration of the library using an automated gel

Workflow for ChIP-Chip & ChIP-Seq Experiments



▲ Figure 1. ChIP-chip and ChIP-seq chromatin immunoprecipitation workflow.

In the ChIP-chip workflow, proteins bound to DNA are cross-linked and the DNA is sonicated or digested by enzymes to fragment the chromatin into soluble, lower-molecular-weight species. For tightly bound proteins such as histones, cross-linking may not be necessary and the procedure known as native ChIP can be utilized. Chromatin immunoprecipitation is performed to isolate DNA bound to the protein(s) of interest. ChIP'd DNA is then amplified, labeled and hybridized to a DNA microarray. The array is scanned and the array image is analyzed to identify DNA segments bound to the protein.

The ChIP-seq workflow is similar in that proteins bound to DNA are cross-linked and chromatin fragments generated. Immunoprecipitation isolates the desired fragments. The resulting ChIP DNA is end-repaired, a dA overhang may be added, and platform-specific adaptors are ligated to the processed ChIP DNA. The ligated DNA library is then size-selected by agarose gel or other methods and amplified by PCR. The final ChIP-seq library is examined by a two-step

BROOKFIELD

YOU GET MORE

With the **DV-II+ Pro EXTRA™**

Our Most Popular Viscometer with all the best EXTRAS

Free Rheocalc Software

EZ-Lock Spindle connection

Quick Action Lab stand

Ball Bearing Suspension applies to RV, HA, HB torques



TEL 800-628-8139 or 508-946-6200 www.brookfieldengineering.com

JULABO Recirculating Coolers

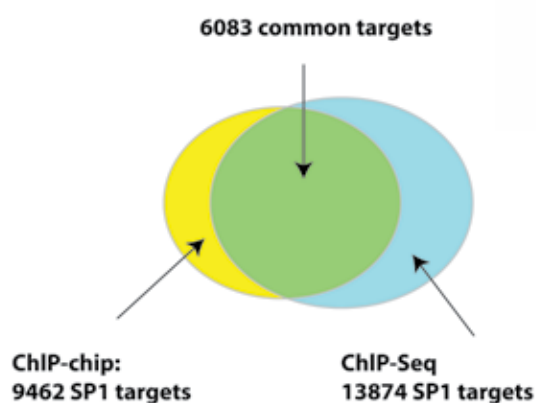
- 



Julabo
THE TEMPERATURE CONTROL COMPANY

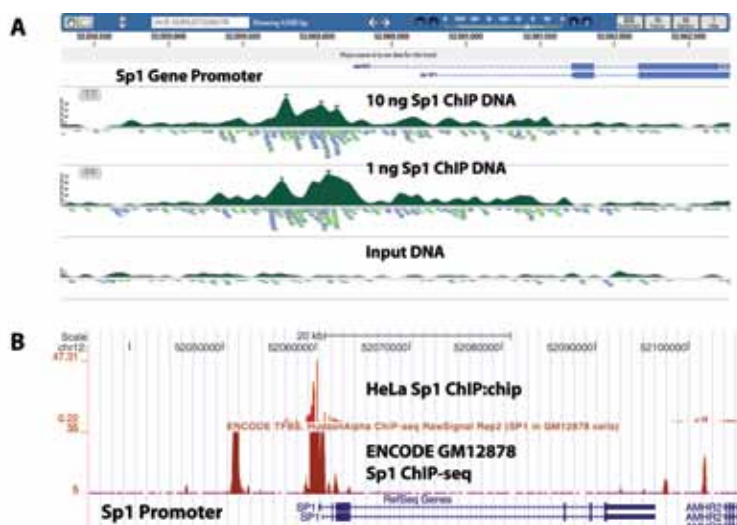
www.labmanager.com

identified 13,874 peaks of occupancy when considering non-redundant target gene binding sites (peak threshold of ≥ 6.5 fold enrichment Signal/Input). A total of 6083 putative target genes were identified by both methods. The smaller number of targets identified by ChIP-chip may result from use of the reduced representation associated with the promoter array, whereas the ChIP-seq method allows genome-wide coverage.



▲ *Figure 4. Comparison of Sp1 ChIP-chip and ChIP-seq targets.*

Sp1 binding at autoregulatory binding sites within the Sp1 promoter region is confirmed by both 1 ng and 10 ng ChIP-seq libraries when compared to the input library (Figure 5A). A genome browser view showed enrichment of Sp1 at the Sp1 promoter region in the ChIP-ChIP experiment (upper panel), which is consistent with results observed in ChIP-seq Sp1 analysis of an alternate cell line by the ENCODE consortium (Figure 5B).



▲ *Figure 5. Comparison of replicate libraries to existing ChIP-seq profiles.*

ChIP-chip and ChIP-seq are powerful tools for the exploration of nuclear protein:DNA interaction on a locus-specific and genome-wide basis. In this study, we compared both platforms using a Sp1 ChIP validated antibody. While the data generated from ChIP-chip and ChIP-seq were consistent with each other, the ChIP-seq technique used less ChIP DNA as a starting point (1-10 ng) and offered better coverage of the data. As costs of whole genome sequencing continue to fall, the application of ChIP-seq will be within reach of more laboratories. Use of this technique will be further enabled through kits and reagents specifically designed to facilitate sample preparation and immunoprecipitation.

References

1. Mendenhall EM, Bernstein BE. Current Opinion in Genetic Development. 2008 Apr;18(2):109-15

“The ChIP-seq approach provides genome-wide data with a high resolution and wide dynamic range, thus allowing for comprehensive coverage of the genome.”

Corresponding author, John M. Rosenfeld, Ph.D., Manager, Chromatin Biology R&D, can be reached at John.rosenfeld@merckgroup.com.

DRIERITE®
www.drierite.com



Desiccants to dry solids,
liquids and gases.



W.A. Hammond DRIERITE Co., Ltd.,
P.O. Box 460, Xenia, OH 45385
Phone: 937-376-2927 • Fax 937-376-1977



MOVING MOLECULAR DIAGNOSTICS FROM BENCH TO CLINIC

THE CLINICAL, ANALYTICAL AND REGULATORY ISSUES INVOLVED IN INCORPORATING NEW MOLECULAR DIAGNOSTIC ASSAYS INTO THE CLINICAL LAB by Dr. Ilsa Gomez-Curet

The function of molecular diagnostics is to analyze the composition of a patient's genetic makeup in order to reveal any potential predispositions of that individual to specific diseases. Identifying these biomarkers can allow treatment options to be outlined that are likely to be effective in particular patients and not in others. Molecular diagnostic tests can work in several ways. They can quantify the levels of certain genetic materials that may be expressed by a bacterium, virus or cancer, or they can sequence specific regions of DNA to pinpoint genetic mutations.

“By implementing the latest technology, laboratories can measure DNA, RNA and protein concentration, while also determining sample purity in accordance with A260/A280 and A260/A230 ratios.”

“A molecular diagnostic assay should be appropriately validated before it can be used in a clinical setting.”

The field of molecular diagnostics is being revolutionized through the development of biomarker identification and the continuous improvement of molecular techniques. However, translating these techniques from the bench to the clinic is an ongoing and delicate process. In particular, proteomic, genomic, and multiplex-based assays require extensive optimization before any results may be interpreted and used appropriately in a clinical setting. This article will discuss the clinical, analytical, and regulatory issues involved in the development and incorporation of new molecular diagnostic assays into the clinical laboratory.

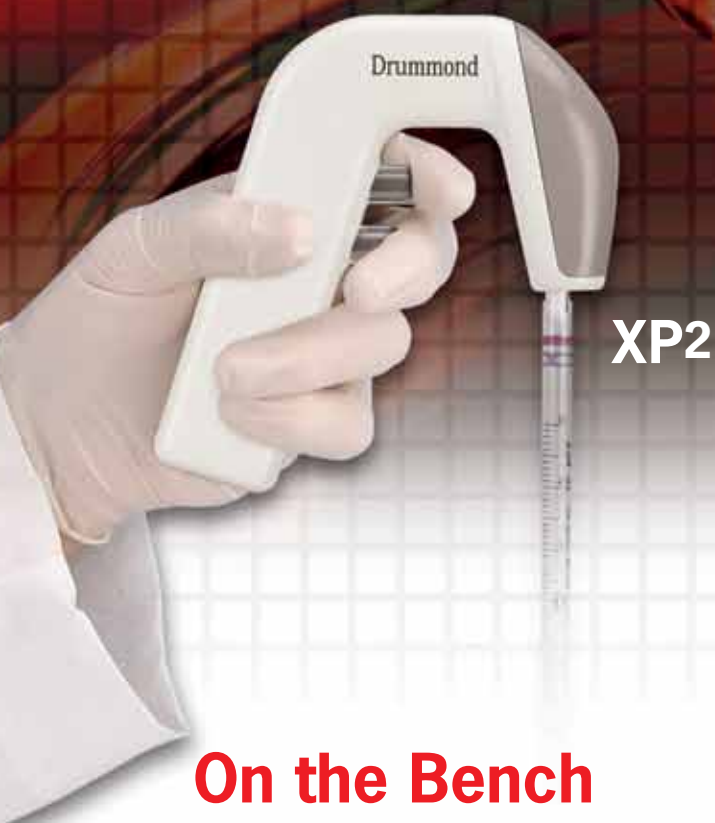
Regulation and accreditation within the laboratory

Laboratory diagnostics, as the backbone of medical treatment, diagnosis and prevention, influence the majority of all hospital health care decisions. Attempts to enhance laboratory quality aim to reduce diagnostic errors and decrease turnaround time. It is also essential to ensure full traceability of all laboratory procedures to minimize risk and assure the safety of patients. This often requires a tailor-made approach for each individual laboratory, with the basic criteria being comprehensiveness, availability, response time, reliability, and accuracy of information.

Laboratory accreditation helps to ensure smooth quality control by providing means for third-party certification of the competence of laboratories to perform specific types of testing and calibration. Accreditation provides formal recognition of competent laboratories and, as a result, provides a ready means for customers to find reliable testing services in order to meet their demands.

Xceed Xpectations

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



On the Bench

or

Under a Hood

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

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

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

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

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



DRUMMOND
SCIENTIFIC COMPANY

500 Parkway, Box 700
Broomall, PA 19008

In the United States, two of the key accreditation certifications for clinical laboratories are the Clinical Laboratory Improvement Amendments (CLIA) and the College of American Pathologists (CAP) accreditation programs. CLIA and CAP accreditation is regarded throughout the diagnostic industry worldwide as signifying that a laboratory performs diagnostic testing at the highest quality standards.

CLIA certification

The U.S. Congress passed CLIA in 1988, establishing quality standards for all clinical laboratories that run tests on human samples and provide results for the prevention, monitoring, diagnosis, or treatment of disease. CLIA has set standards for quality control (QC), quality assurance, proficiency testing, and many other laboratory and administrative procedures. These standard practices ensure that lab tests are performed in an accurate, reliable, and timely manner. The requirements outlined by the CLIA regulations apply to clinical laboratories in all types of settings, including commercial, hospitals, medical centers, and physician offices.

However, because current CLIA regulations are not optimized for molecular diagnostic tests, clinical laboratories may choose to be certified through a professional organization such as the CAP accreditation program.

CAP accreditation

The CAP accreditation program helps clinical laboratories establish and maintain quality standards. The accreditation is based on standards that are categorized into specific checklists that provide detailed plans for laboratories to follow. An advantage of the CAP program is that it covers a variety of disciplines, providing an optimized checklist for molecular diagnostics and testing procedures.

To ensure that correct processes are put into place and maintained on a routine basis, it is vital that all laboratories identify the best accreditation program for their needs.

Authorizing new testing protocols

According to the CLIA, every laboratory is responsible for validating each new test before using it in a clinical setting. There are many elements involved in the valida-

tion of an in vitro diagnostic test, including its intended use and the environment in which it will be used. Method validation should be used to define the detection limits of the test and should also estimate the reproducibility, reliability, accuracy, sensitivity, specificity, and dynamic range of the test. Literature review, clinical trial data, current clinical practice, and regulatory guidelines are all used to assess clinical validity; platform description and instrument and software validation also play an essential role.

Analytical validation

A molecular diagnostic assay should be appropriately validated before it can be used in a clinical setting. Numerous guidelines are recommended for successful analytical validation of a novel molecular assay. Goals must be clearly defined—namely, who the biomarker is for and whether it is a primary test to evaluate disease risk or a secondary test to confirm disease. Analytical validation of a novel test should include estimation of

critical parameters such as disease prevalence, test sensitivity and specificity, and the predictive value of a positive and negative test.

The population of a validation study should be carefully selected. Consideration should be given to whether the results of a particular study will apply to individuals with a specific disease at varying stages

and if the results can be extrapolated to a different population. Focus should also be on developing a sensitive and specific biomarker and not on achieving statistical significance. Clinical validity of a test cannot rely solely on the statistical differences found between affected and non-affected individuals participating in the validation studies. Sensitivity and specificity are key to successful translation of a test from the bench to the clinic.

Proteomic and gene expression patterns used as biomarkers require special statistics due to the possibility that genomic- and proteomic-based assays could cause overfitting of data. As a result, analysis should be carried out by a statistician with experience in working with scaled data sets.

Various factors can affect the robustness of a molecular assay, including tissue sampling and handling; tissue stability; and nucleic acid isolation, preparation, concentration and quality. Therefore, it is essential that effective QC measures for each molecular technique are used to

“Developing a robust and reproducible assay is as important as finding the biomarker.”

minimize failure of downstream steps in the workflow. The latest microvolume quantification instrumentation, such as the Thermo Scientific NanoDrop 2000c UV-Vis spectrophotometer, can be implemented as a routine QC step to minimize consumption of precious samples and provide fast assessment of nucleic acid concentration and purity. Advanced spectrophotometers now enable the analysis of sample volumes as small as 0.5 - 2.0 μL with a dynamic range of 2 - 5,000 ng/ μL for nucleic acids and without the need for a cuvette or dilutions. The spectrophotometers are able to determine nucleic acid concentration and generate full absorbance spectral data. The spectral data provided can offer analysts additional information regarding the presence of potential chemical contaminants such as phenol, glycogen, guanidine and Ethylenediaminetetraacetic, that may be introduced by extraction procedures and have the potential to inhibit downstream applications.

Developing a robust and reproducible assay is as important as finding the biomarker and, as such, a molecular assay developed for diagnostic purposes should have a broad dynamic range and allow reliable detection of low levels of the biomarker detected by the assay.

Present landscape of molecular diagnostics

Tests in molecular diagnostics investigate genes, metabolic pathways, drug metabolism, and disease risk or progression. Genetic tests focus on DNA and RNA sequences and how they are related to disease, while proteomic tests focus on the function, structure, and chemical modifications of proteins and how these relate to the onset or progression of disease. In addition, the emerging category of metabolomic testing evaluates chemicals or metabolites such as lipids and carbohydrates.

Over recent years, rapid and sensitive high-throughput methods have been developed with the ability to detect nucleic acid and protein variations on a genome-wide scale. Some of the emerging molecular techniques making their way into molecular diagnostics include microarrays, multiplex nucleic acid amplification techniques, mass spectrometry, high-density microarrays, next-generation sequencing, comparative genomic hybridization, and miRNA arrays. These emerging molecular techniques are being developed for a wide range of applications, such as disease prediction, companion diagnostics, prognosis and characterization of unknown tumors, prediction of treatment efficacy, and personalized medicine.

There are numerous challenges associated with

emerging molecular diagnostics. Clinical laboratories will need to know how to work with new and complex platforms (e.g. microarrays and next-generation sequencing) and how to store, analyze, and integrate complex data from various sources. Also, close attention to sample extraction and processing is essential to ensure that high-quality starting material is used for downstream applications. When performing nucleic acid-based assays, variations in the quantity, purity, and integrity of DNA or RNA samples can result in variable results and erroneous conclusions. By implementing the latest technology, such as the Thermo Scientific NanoDrop 2000c, laboratories can measure DNA, RNA, and protein concentration, while also determining sample purity in accordance with A260/A280 and A260/A230 ratios. In addition, the instrumentation is preconfigured to simplify and accelerate common applications for nucleic acid, microarray, and protein quantification.

The implementation of proper QC measures is necessary for appropriate validation of emerging molecular techniques. These measures can identify the need for improvements in sample processing, workflow, or downstream processes, and will ultimately aid in the development of a robust molecular assay that improves patient care and has minimal test-associated risks.

Improving patient experience

In the present biomedical landscape, the effective transition of instruments from the bench to the clinic is vital. Yet there are considerable challenges in achieving this transition smoothly and efficiently. Before results can be appropriately interpreted for clinical use, assays require extensive optimization to ensure accuracy and safety. Overcoming this challenge necessitates rigorous validation processes and QC procedures, along with technologically superior instrumentation. With these assurances in place, patients can be provided with improved screening, monitoring and treatment of various disease conditions.

Dr. Ilsa Gomez-Curet, Bioscience consultant, Thermo Scientific NanoDrop Products, can be reached at igomezcu@netscape.net or by phone at 302-479-7707.

For more information on the Thermo Scientific NanoDrop family of products, please visit www.thermoscientific.com/nanodrop or call 302-479-7707.



STAY INTERVIEWS

THE POWER OF ENGAGEMENT
AND RETENTION IN YOUR LAB
by Richard P. Finnegan



For decades, labs have struggled to find clear solutions to better engage and retain their best employees. At some point, doesn't it make sense to say, "Why don't we just ask them?"

Well, we *do* ask them. We ask them through engagement surveys, opinion surveys, climate surveys, and exit surveys. We survey online, over the phone, and with live and recorded voices. These surveys generate reports, and from reports come scores and rank orders, which then become benchmarks. From benchmarks we set goals to improve our scores on the next survey.

The primary outcome of all our surveys is that *we build programs*. To improve recognition, we add employee appreciation week and employee of the month. To improve communications, we hold town hall meetings and write more informative newsletters. To improve careers, we hold brown bag lunches and career fairs. Our employees tell us that this ongoing survey process makes them feel like hamsters on a wheel. In the beginning, it made sense to use expanding technologies to measure employees' opinions as a pathway to improvement. But over time, these surveys have morphed into redundant administrative processes that effect

few new outcomes. Instead, they have become periodic rituals like preparing budgets, leading to jaded comments like, "Is it *that* time again?"

The good news is that we have a better way to strengthen each employee's engagement and retention, and that better way is *simple*.

THE GOOD AND BAD NEWS ABOUT SURVEYS

Let's look at the ways organizations use employee surveys and examine what works and what doesn't work.

Exit surveys can be called "the original retention tool." We have long believed that knowing why employees leave will direct us to retention solutions for survivors. But, although based on logical thinking, exit surveys rarely lead to retention or engagement solutions. The primary obstacles are the following:

- Departing employees often do not tell the truth.
- Employee participation is too low in part because surveys are too long.
- Surveys are designed to accept "attendance" and "better opportunity" as reasons for leaving, which fail to trigger solutions.

- Companies are reluctant to make policy or management changes based on "autopsies," on the words of employees who no longer work there.

In the past year, I have polled hundreds of HR professionals to determine if they had ever improved their companies based on exit survey results. The number who indicated they had improved their companies in any way was zero.

The belief that exit surveys are a must-have tool has been reinforced by vendors that have leveraged technology to make gathering survey data easier for HR executives. Companies now purchase electronically delivered exit surveys that lead to pages of reports telling them how departing employees rated their pay, benefits, communications, and other variables. Missing too often is the answer to *why the employee left*, although there is no guarantee that executives could improve their companies if they actually knew.

One way to measure the effectiveness of employee surveys is to ask, "Will our resulting action plan lead to improved engagement and retention for our top performers?" The real answer is *you just don't know*.

LABCAST

If you missed Richard Finnegan's Lab Manager Academy webinar, "Retaining the Best Employees in the Lab," originally broadcast on Wednesday, October 5, visit www.labmanager.com/retaining to watch the archived video.

Modular Furnishing for High Quality Lab Spaces

THE STAY INTERVIEW ADVANTAGE

A Stay Interview is a structured discussion a leader conducts with each employee to learn the specific actions he or she must take to strengthen that employee's engagement with and retention in the organization.

Stay Interviews do three things that surveys do not: They bring information that can be used *today*; they give insights for engaging and retaining *individual employees*, including top performers; and they put *managers* in the solution seat for developing individual stay plans. Gone are the following obstacles to and distractions from implementing real engagement and retention solutions:

- Time delays. Delays occur along the way, from surveying employees to distributing reports to writing action plans to implementing those actions. How soon does data become stale?
- Watered-down solutions. Since all data is aggregated into groups, only group fixes can be developed, which applies a broad-brush approach to all employees regardless of whether they are your best or worst performers.
- Short-term, feel-good programs. Programs like casual Fridays or free coffee do nothing to improve supervisory skills and ultimately have no bearing on whether employees stay, leave, or increase their engagement.

How much can your lab improve engagement and retention with programs alone, without effective day-to-day supervision and leadership? When is the last time you heard a good employee say, "*My boss treats me like dirt, but I'm holding on for employee appreciation week? I'll get a balloon and a hot dog, and I'll be recharged for another 52 weeks?*"

Leaders who substitute morale-improvement programs for fine-tuned supervision skills take few steps if any toward actually becoming better leaders.

Dick Finnegan is the CEO of C-Suite Analytics, which provides fresh thinking for employee engagement and retention. This article is adapted from his upcoming book, "The Power of Stay Interviews for Engagement and Retention," to be published by SHRM later this year. Mr. Finnegan welcomes your comments and can be reached at DFinnegan@C-SuiteAnalytics.com.

- For General Contractors, Architects or Project Managers
- Produce efficient and practical modern laboratories
- Essential storage for laboratory equipment
- Increase the functionality of your lab's working environment



1. Turn any space into a high quality lab space with modular Dimension 4 modular labstations. Reconfigure work cells into any configuration when needed.
2. IAC builds custom casework to your specifications— ideal for a clean incorporation of plumbed-in electrical, fluid and gases .
3. IAC modular lab furniture excels in providing storage space, from suspended drawers and storage lockers, to upper storage cabinets.



FurnitureForLabs.com

Call: (714) 990-8997

labsales@iacindustries.com

SUSTAINABILITY MEETS FLEXIBILITY

CURRENT TRENDS IN LAB INTERIORS by Robert B. Skolozdra and Chris Bockstael

What does “high-quality” mean in terms of laboratory design? The lab owner may think of cost-effectiveness or the attractiveness of the lab to potential top recruits as quality issues, while the facilities manager may think of durability, flexibility, and low operational costs. The research scientists themselves may think of aesthetics and good lighting, as well as ergonomics and sustainability—not to mention robust power and environmental systems.

Good lab design clearly satisfies not only individual expectations but even the psychological and emotional makeup of the user group. Beyond solving technical issues, successful lab designs integrate these humanistic issues, from organizational planning concepts for major program spaces to collaboration drivers like lab meeting spaces to key details such as how bio waste is stored.

The best design team must consider all these variables at once. The most effective lab design strategy is a holistic one that considers all aspects of the project as potentially mutually beneficial if properly planned and executed. The goal of the facility—results-oriented research or breakthrough science—must be paramount, but issues such as cost-effectiveness, sustainability, maintenance, and aesthetics must be considered simultaneously, in concert with the main goal.

The various stakeholders all want to see the accomplishment of successful research and scientific advancement. A holistic design approach will satisfy all of them, but may challenge them as well.

When it comes to laboratory interiors, traditional approaches are time-tested but have notable drawbacks. New approaches and technologies are altering the landscape of research space interiors; design teams creating new lab spaces must understand the whys and hows of these changes so that their clients may reap the benefits.

The flexible lab

Yale University School of Medicine aspires to be at the forefront of medical research, in every aspect. As the institution entered into the planning phase for a series of new labs, the design firm Svigals + Partners of New Haven, CT, presented a range of options for modular lab design, demonstrating several possible solutions.

“Good lab design clearly satisfies not only individual expectations but even the psychological and emotional makeup of the user group.”

Yale, like most institutions, had been using traditional modules: built-in-place, fixed systems that are, in effect, seated permanently to the floor. In order to exchange or move modules, a construction crew would be required since the module cores themselves would have to be excised, moved, and replaced. The university recognized that these fixed cores and supporting infrastructure were under-serving the needs of diverse research teams, whose needs differed. The Svigals + Partners team presented

a “flexibility spectrum” that encompassed varying degrees of adaptability; the university chose one of the most flexible options.

The option, a table system only slightly less flexible than a rolling cart concept at the far end of the spectrum, almost completely eliminated the fixed core. Core elements, available through plug-and-play pods in the ceiling, required an

▼ A typical corridor seating alcove at Yale University's department of genetics includes casual seating, collaboration space, and natural wood finishes. PHOTO: WOODRUFF/BROWN ARCHITECTURAL PHOTOGRAPHY



adapted infrastructure of mechanicals, power, telephone, data, and plumbing, so that all the casework could be fed access to these systems as needed. If the requirements for the room were to change, however, no construction crew would be necessary for the changeover.



◀ *The typical laboratory peninsula at Yale University's cell biology lab is designed for a high degree of flexibility and sustainability. In addition to casters and adjustable legs, the tables feature low-VOC finishes and durable wood surfacing.*

CREDIT: OLSON PHOTOGRAPHIC

One can think of the flexible lab space as analogous to a “black box” theater. In a traditional theater, there is a single configuration; the proscenium arch, a part of the theater's structure, separates the house from the stage. The black-box space, on the other hand, can be configured in any number of ways, with the stage located anywhere and the audience seated on one side or the other, on several sides, or “in the round.” As such, black boxes have become a mainstay of modern theater, adaptable to any kind of show and encouraging experimentation and risk taking.

The flexible lab interior is similar in overall concept; the facility frees its occupants to accomplish their research by offering the flexibility to configure the space to the specific needs of a particular research project. This avoids placing undue burdens of cost and lost time on the corporation, funding institution, university, or research team.

There is a balance that the lab design team must strike between cost and flexibility; the design should not produce a laboratory whose flexibility is underutilized. An optimally functional lab, not making strides in lab design techniques, is the goal. But an appropriately flexible interior will benefit every stakeholder

and promote successful research—a result that will benefit the research team's attitudes and outlook as much as the science itself.



▲ *A seminar room at Yale University's cell biology lab seminar room, using relatively low-cost yet durable rolling tables and stackable chairs. The space can be reconfigured on the fly for use as a conference room or swing work space.*

CREDIT: OLSON PHOTOGRAPHIC

Crystal Clear Polystyrene Serological Pipettes



Our Innovative Design Means Greater Accuracy.

Globe Scientific's pipettes are **manufactured as a single piece**. Unlike other brands that weld separate tip and mouth pieces to the main body, our one-piece seamless design eliminates the weld points that trap liquid. This unique design ensures complete flow out of the sample and provides a higher degree of accuracy.

Additional Features:

- **Aerosol barrier plug** prevents liquid and aerosols from contaminating the pipettor.
- Calibration is **certified for accuracy**.
- **Specially designed tip** provides best fill and release rates, even with viscous liquids.
- **Shorter design** for comfortable use in tight spaces and under laboratory hoods.
- RNase-free, DNase-free, pyrogen-free, non-hemolytic and non-cytotoxic.
- Sizes: 1mL, 2mL, 5mL, 10mL, 25mL.

globe
SCIENTIFIC INC.

Tel: 1-201-599-1400 • www.globescientific.com

Flex strategies

In the past, most casework types could not support a highly flexible design because they could not offer the needed stability. More recent improvements in systems and equipment are generating new possibilities. To make the most of this opportunity, there are certain strategies that will lead to the most advantageous results.

Planning an effective lab interior requires consideration of the needs, the comfort, and even the sentiments of potential occupants. But while there have been improvements in equipment, one finds that the standard module type and size have changed very little over the years. Benches and equipment continue to fit a 10-foot lab module; following this general guideline will assist in designing for flexibility, since equipment space and bench space will be essentially interchangeable.

Next, there will need to be infrastructure in place for multiple uses, meaning gases, water, ventilation, etc. Supplying the needed infrastructure from day one means that there is no disruption or need for construction crews when new pieces of equipment come on board. However, this does not mean supplying everything to every area. Piping water to every corner of the bay is unnecessary, for instance, since not every team or researcher will need a wet bench. The optimal approach is to keep most

benches dry and near the perimeter. Sinks and wet areas are best kept inboard near the support areas. Some manufacturers are creating casework systems with flexible water and drain connections, but until this technology becomes commonplace, plan for restricted wet areas. Limiting the supply of vacuum and gases will also save on infrastructure and operating costs. This infrastructure

arrangement will serve most research purposes more than adequately.

It is also highly beneficial to bring lab spaces to the exterior parts of the building. Heavy equipment, less-trafficked spaces, and storage should be kept near the core, so the building occupants can benefit the most from natural daylight and exterior views. The strategy of bringing natural daylight into the areas where people spend the most time produces several benefits: significant reduction in lighting costs, improved occupant health and morale, and, more than likely, improved research quality.

Establishing benchmarks for success is also vital. A good lab design team will collect data from previously completed projects in order to make use of the lessons learned. Revisiting a lab project, we may discover that a certain number of lab hoods (or sinks, or benches) went largely unused. The number and relative location of these elements provides a point of reference for tweaking the designs of current and future lab projects.

► *Things people like make lab offices and administrative areas successful and attractive: Big views and bright daylight inspire the bioinformatics team at the Yale University Genetics Department.*

CREDIT: WOODRUFF/
BROWN ARCHITECTURAL
PHOTOGRAPHY



▲ *Yale Cell Biology typical laboratory peninsula.*

CREDIT: OLSON PHOTOGRAPHIC



A post-occupancy survey is also a critical indicator of a lab's success, providing a much-needed look back at what design elements are most valued and utilized by the occupants. Again, this helps gauge the humanistic impact of the lab interior on people in the research organization.

Furnishing the bay

Assuming you will have a flexible space, as easily

adapted to an open, high bay for large equipment as to a need for row after row of benches, the furnishings will be as important as the infrastructure. The casework and other components will hopefully be as easily reconfigurable as the space is adaptable. Moreover, the proper

“An optimally functional lab, not making strides in lab design techniques, is the goal.”

furnishings should also help to accomplish the holistic objective of meeting all the facility's goals and the branding requirements of the client.

Furnishings must always be specified for durability and safety, and traditional casework systems serve these objectives well. We know that sustainable content is important, but one must balance sustainable casework specifications with the durability of proven products. An untested product may have to be replaced fairly quickly, perhaps within five or 10 years, which is neither cost-effective nor truly sustainable. Also, owners shouldn't have to be burdened with that liability and risk.

Fortunately, strides are being made to improve casework technology. A lab team can afford not to settle for the traditional countertop composed of epoxy, as it is arguably unsustainable. Equally durable and moisture-resistant substitutes are available: Ceramic is highly sustainable but may be cost-prohibitive. At least one manufacturer offers the option of epoxy containing 10 percent recycled glass. Phenolic resin countertops also may be less sustainable, but there are newer resins with more sustainable content and comparable durability.

Specification of ceiling components, wall finishes, and especially flooring should be given equally careful consideration. And as with the above, specify first for durability and safety, then for sustainability and flexibility—and with a sense for how these choices will affect the everyday users of the space in the long term.

Benches and casework

Specifying the benches makes the biggest impact on the interior. They are the most used, most prominent furnishing in the space, and they

represent a high percentage of the cost of laboratory fit-out. Since interchangeability is crucial to a flexible interior, make certain the benches are available to swap out for equipment. It also makes good sense to contemplate adjustable-height countertops. Big equipment sometimes requires an adjustable height for ease of access; in fact, the development of flexible casework systems largely arose from this requirement.

Traditional shelving components typically have cabinet doors, but should they? While designing a product research and

Who knew stainless steel could be so flexible?

Labconco Glassware Washers offer more options and flexibility than ever before, including:

- Up to 6 purified water rinses;
- purified water pump included
- Interchangeable racks to handle narrow neck and wide mouth glassware
- Programmable water temperatures to 93° C
- Forced air drying up to 99 minutes

**SteamScrubber®
and FlaskScrubber®
Glassware Washers**



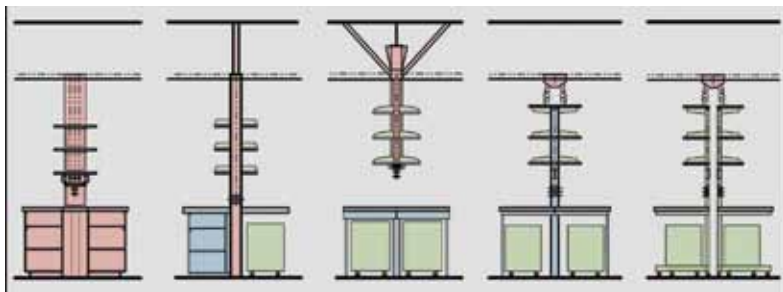
See what advanced technology can do for your lab. Learn more at www.labconco.com or call 800-732-0031.



Protecting your
laboratory environment
LABCONCO®

Kansas City, MO | 800.732.0031
www.labconco.com





▲ *Traditional fixed casework; overhead braced fixed center core with cantilevered casework; overhead supported shelves with floor mobile casework; floor mobile tables, shelves, and cabinets; and floor mobile rolling table, shelves, and cabinets* Courtesy Svigals + Partners



▲ *Yale Genetics Department—Conference Room.*

CREDIT: WOODRUFF/BROWN ARCHITECTURAL PHOTOGRAPHY

refinement laboratory for corporate client PepsiCo, the Svigals design team realized that cabinet doors might be slowing researchers down since needed items are obscured from view. Rather than opt for clear cabinet doors (which would still present a wear-and-tear issue over time), PepsiCo took the firm's recommendation: open shelving. The solution offers ease of location and access for the researcher's required tools, and even saves the client the cost of the doors.

A final word: support spaces

While the research team will spend most of its time in the lab, the time spent in break rooms and meeting areas should be given consideration as well; in fact, a client may desire to maximize the time researchers spend in those areas. Since the lab infrastructure is very costly, it makes sense to encourage occupants to work elsewhere when the task requires only a fraction of that infrastructure. This idea has given rise to planning that removes work carrels from the bay.

The ideal space for these carrels is a breakout area that promotes collabora-



Miniature, Regulated High Voltage Modules 100v-8kV

THE **C & CA SERIES** PROVIDE CLEAN, RELIABLE HIGH VOLTAGE IN A SHIELDED, PC MOUNT PACKAGE. FEATURING PRECISION 0 TO 100% PROGRAMMABILITY, VERY LOW RIPPLE AND EMI/RFI, THESE COST-EFFECTIVE POWER SUPPLIES ARE IDEAL FOR INTEGRATION INTO COMPACT, SENSITIVE EQUIPMENT.



<http://emcohighvoltage.com>

tive effort and a communal atmosphere. Such a room is a place for meeting as well as eating; it can provide a crucible for interchange between colleagues as well as a comfortable setting for support work, writing, and thinking. As an added benefit, the absence of work carrels creates more room in the lab interior.

“One must balance sustainable casework specifications with the durability of proven products.”

Natural daylight and warm finishes are recommended aspects of both the breakout space and the lab. The stakeholders may also want to consider an investment in art for this room: inspiration may generate scientific breakthrough.

Robert Skolozdra, AIA, LEED AP, is a partner and LEED design specialist, and Chris Bockstael, AIA, is an associate principal with Svigals + Partners, an integrated architecture and art provider with more than 25 years of expertise in designing laboratory and research-and-development facilities. The firm has additional specialization in educational, mixed-use, and corporate facilities. The company is based in New Haven, Connecticut.

DON'T FORGET THE GREEN

It's really not optional anymore. Sustainable design *must* be a part of the holistic approach to building a lab.

A few tips and techniques can help create synergy among the various design elements, yielding an optimized interior that is cost-effective, productive, healthy, green, and even inspiring.

- Investigate low-flow and ductless hoods, and use these wherever applicable. Some manufacturers use technologies based on models of airflow from computational flow dynamics. The resulting hoods operate at half the required power of conventional fume hoods, but with the same safety factor.
- Install occupancy sensors on the sashes for fume hoods. Open input sashes mean that air is flowing and power is being consumed; occupancy sensors will reduce or eliminate unnecessary flow, triggering the sashes to open only when a person is detected near the hood. Sensors may also be used to throttle back airflow for an entire bay.
- Capture energy before you vent. On the topic of ventilation, one can incorporate a system to capture heat from exhaust, using it to heat the intake air. Heat recovery can significantly reduce energy costs.
- Be water-efficient, too. Install flow restrictors on faucets and sinks to reduce water consumption.
- Daylighting offers a better quality of light. Replacing ambient lighting with harvested daylight — augmented as needed with task lighting — is healthier and more enjoyable for the lab occupant, and saves electricity.
- Use alternative systems. Assuming that you've been able to reduce air change rates to six (or even four) air changes per hour — no mean feat considering safety requirements — consider introducing alternative mechanical systems like chilled-beam cooling. The reduced air change is crucial, however: higher change rates mean that the convection process by which chilled beams cool the air will be insufficient to keep up.

NEW!



Precise, Light & Dependable

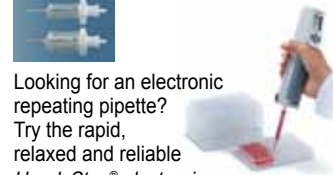
BRAND HandyStep® S Repeating Pipette

The NEW HandyStep® S provides unprecedented versatility in a mechanical repeating pipette, with accuracy, precision and dependability.

- **Comfortable, light weight, and well balanced**
- **Easy one handed volume selection**
- **Flexible; accepts third party tips – no more being locked into a sole source**
- **Tip ejection system allows tip removal without user handling.**



Economical BRAND PD-Tip™ syringe tips fit all repeating pipettes using non-proprietary designs.



Looking for an electronic repeating pipette? Try the rapid, relaxed and reliable HandyStep® electronic.



Lab Rats Trust BrandTech!

BRANDTECH®
SCIENTIFIC, INC.

Toll Free: (888) 522-2726
www.brandtech.com

EVOLUTIONARY CHANGES BRING GREATER FUNCTION, FLEXIBILITY

by Angelo DePalma, Ph.D.

Although a mature product category, microplate readers are evolving towards greater functionality, flexibility, and throughput. All top instrument makers are focusing at least some efforts on multiplexing.

“Vendors are introducing evolutionary improvements in performance, reliability, user interface, and support,” says Xavier Amouretti, product manager at BioTek Instruments (Winooski, VT).

Supporting applications and methods

Users, according to Mr. Amouretti, expect a short learning curve, user-friendly software, and instrument reliability. BioTek maintains an in-house applications laboratory staffed by scientists who develop, run, and publish applications and methods. Each year, this team selects and delves into several broad application areas such as toxicology studies, and makes them available to the public. This year, the applications group has targeted, among others, biofuels and biologics drug discovery. Publications of biofuels methods began in mid-2011. In

2010, the group published 75 application notes and posters and several peer-reviewed papers.

Justifying higher densities?

When plate densities were increasing during the last decade in response to very high-throughput studies, it appeared that plate readers would require upgrades as well. Luckily, experiment densities have stabilized, with life science researchers turning to smaller, “smarter” screens. 384-well plates have become standard in industry, while 96 wells is quite common in academic research.

However, the desire to consume less sample and fewer reagents continues. BioTek has developed the Take3 Micro-Volume Plate accessory that works on principles similar to Thermo’s NanoDrop UV/Visible analyzer. After depositing 2 μ L samples on the 16- or 48-spot plate, the second optical surface engages, and the plate is read in the standard manner.

Not that ultra-dense plates are completely out. “The emergence of the 3456-well format has created de-

mand for screening an entire compound library on one plate,” says Dr. Michael Fejtl, international sales and marketing specialist at BMG Labtech (Ortenberg, Germany).

Is it an array or a plate?

One indication of the maturity of the plate reader market is the number of vendors involved. According to the *Lab Manager Magazine* website, more than 25 manufacturers operate in the United States. The consequence of so many vendors competing for modestly growing research and high-throughput markers has been a steady stream of technologic innovation and price reductions.

“There is significant competition these days among instrument companies within the sub-\$20,000 price range,” says Darren Cook, director of business development at Douglas Scientific (Alexandria, MN). “At the same time, I see some of the more complex reading technologies now being offered in that economical format.” Readers have similarly improved in sensitivity, dynamic range, and flexibility. Some offer full visual spectrum read.

The lower-cost instruments lack the throughput of high-end systems, but for their target markets—basic research and academic labs—they offer a level of sophistication that cost two or three times as much just a few years ago. “These are researchers who can afford to wait eight or 10 minutes for a read-out,” Mr. Cook adds.

“They have the time but lack the capital. Systems that measure much faster than that still command a significant price premium.”

Douglas Scientific is taking an approach that it believes will provide “more than incremental gains” for the high-throughput end of the spectrum, which according to Mr. Cook has hitherto been the norm. Douglas’s ArrayTape is a revolutionary idea. Instead of an injection-molded plastic microtiter plate or microarrays, ArrayTape is a continuous polypropylene (or polystyrene, polycarbonate) strip embossed with reaction wells that hold less than 800 nL of test fluid. Wells are arranged in familiar SBS format (96, 384, 1536, etc., wells), but the savings in reagent and solvent are phenomenal—as much as 90 percent compared with standard microwells.

Every operation associated with ArrayTape—from charging wells to incubation and reading—has been streamlined and miniaturized. “We’ve leveraged the ‘lean’ manufacturing idea that’s been used in automobile manufacturing for decades,” says Mr. Cook.

Douglas is currently pursuing two major upgrades: a multimode detector for its reading system and support for its microplate operations. “Users with existing microplate systems and methods will not need to mothball them if they upgrade to an ArrayTape system,” says Mr. Cook.

“Vendors are introducing evolutionary improvements in performance, reliability, user interface, and support.”

What purchasers should look for

Anita Kant, Ph.D., application scientist at Molecular Devices (Sunnyvale, CA), says purchasers should consider their specific applications, the number of expected users, sensitivity, current vs. future needs, system versatility, and single- vs. multimode-reading capability; for example absorbance and fluorescence in a single experiment.

“Single mode is less expensive, but that may not satisfy future needs,” says Dr. Kant. Nevertheless, multimode (and some other) capabilities may be added later on, provided the instrument can handle upgrades.

“Multiplexing has become more commonplace for conducting significant numbers of biological assays quickly, cost-effectively, and with improved reproducibility,” notes Mark Torresan, sales director for detection and separation at Tecan US (Research Triangle Park, NC).

Users must also consider reliability, validation capabilities, throughput, automation, user interface, software, and service. Validation capability, once solely the domain of regulated or high-end labs, may be something else to think about.

Mr. Torresan notes that assay reagent providers are continuously introduc-

ing new technologies requiring flexible, high performance instruments. Microplate readers should therefore be purchased with “room to grow” into more-complex analysis modes. “Always consider possible future detection modes, sensitivity, throughput, and modularity or upgrade path.”

Dr. Kant describes these factors as starting points for purchasing a plate reader. “Different labs will begin at different points, depending on their specific situations, and work through some or all of the other factors,” she observes. The most common place to begin is price, but labs unconstrained by budgets might look first at throughput or flexibility. “But eventually everyone considers price,” she notes.

Angelo DePalma holds a Ph.D. in organic chemistry and has worked in the pharmaceutical industry. You can reach him at angelo@adepalma.com.



GET A BETTER REACTION

Winooski, VT | 888.451.5171 | www.biotek.com

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

TO CENTRALIZE OR NOT TO CENTRALIZE?

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

The question of limited access or general access to laboratory goods and services applies to a range of instruments, utilities, and competencies. These questions take on added significance for midsized or larger labs.

Whether to employ central washing stations or point-of-use washers located under a lab bench or in a corner is also something that has to be addressed with regards to laboratory glassware washers. The former provide an economy of scale and are popular with lab workers who, almost universally, hate to “wash the dishes.”

The downside for central washing stations is that glassware tends to disappear over time, due to breakage and operator error. Nobody cares if they lose a beaker or Erlenmeyer flask. The problem arises with specialty glassware such as distillation heads or Soxhlet extractors, or custom-blown glassware, which is expensive and can take days and many dollars to replace.

Jenny Sprung, a product manager at Labconco (Kansas City, MO), notes that washing stations can take many hours or days to return glassware. “Central glassware washing is great in principle, but if you rely on it and the person in charge of collecting glassware and running the washer is out, you can have a very long wait.”

Point-of-use washers provide a level of control that central stations do not.

Workers can, for example, set the machine to run overnight and then return to a fresh set of sparkling glassware the next day. And, at the very least, if that \$500 condenser is reduced to sand because it banged around inside the washer, they’ll know who to blame.

Specialty applications

Two other situations suggest the superiority of point-of-use washing. Laboratories handling diluted, highly

“Point-of-use washers provide a level of control that central stations do not.”

sensitive samples, or whose analytic methods are extremely sensitive, might not tolerate residues left behind by cleaning products — whether they be detergents or chemical agents. Biological or forensic analysis that looks for needles in haystacks immediately comes to mind. It should be noted, however, that leading machine manufacturers claim that their washers leave behind as close to zero residue as possible.

Radioisotopes are rarely used for analysis these days, but if your lab employs them, you might consider keeping associated glassware away

from any washers to avoid permanently contaminating the machine and cross-contaminating subsequent loads. At Brookhaven National Laboratory, where I worked in the 1980s, we cleaned glassware contaminated with isotopes in a dedicated nitric acid bath.

Hand washing might make economic sense for very “clean” workflows that include foods and beverages, but it too has drawbacks. As Ms. Sprung points out, acidic and alkaline baths must be properly neutralized or appropriately discarded as waste, while hand-washers tend to over-apply cleaning agents and almost always leave residues. Finally, glassware that is manually dried might require an extra autoclaving step for sterilization.

What to look for

“To determine the best option for your lab, you need to carefully analyze these factors, plus the ongoing cost of hand washing vs. the acquisition of a glassware washer that will last years after the initial purchase,” Ms. Sprung tells *Lab Manager Magazine*.

Mike Henley, general manager at LANCER (Winter Springs, FL), adds local, factory-trained service, and maintenance agreements to the list of desirables for a lab washer. He says that remote diagnostics are more

Emerging methods focus on discrete particle analysis, which affords much higher resolution and more detailed information on particle characteristics. These techniques rely on imaging technologies, which have progressed tremendously over the last two decades, thanks to advances in optics and digital photography.

One might ask how imaging fits in with particle sizing. "That question is the crux of the issue," Dr. Rhyner explains. "Particle *sizing* is extremely well understood and mature. What customers are after today is particle *characterization*—shape, morphology, surface charge, porosity, roughness, and optical properties based on user specifications."

Thus, imaging fills the huge gap between knowledge of a simple diameter or cross-section measurement and properties critical to a particle's behavior.

Take an ensemble of rod-shaped particles, for example. The particles show up as a distribution of "sphere equivalents" when analyzed by light scattering, depending on what part of the rod the laser "sees." In contrast, a Coulter counter, which detects changes in electrical resistance, reports only the volumes that particles displace, so the readout will be monodisperse.

The method will not tell you if the particle is a sphere or a cylinder, however. That requires an imaging step.

Irregularly-shaped but uniformly-manufactured nanoparticles are increasingly important in optics, electronics, and consumer products. Particles that impart color to an ink-jet toner, for example, are purposely oblong. Quality control during their manufacture demands knowledge of their size or volume, and shape.

The "second variable"

Richard Nameth, general manager at Cilas (Madison, WI), calls particle shape "the second variable of the particle characterization equation." Cilas, which specializes in laser diffraction for liquid and dry particle dispersions, combines this laser-based method with visible light microscopy.

"When this tandem technique started, nobody cared," he says. But with so many industries now concerned about what happens to particles during manufacture, shipping, storage, and use, shape has taken on new significance.

One reason is that nanoscale (and to some degree micron-sized) particles behave differently from macroscale materials. Physical forces or moisture can cause particles to clump together. When analyzed by size alone, agglomerates will appear as larger particles. That may cause a batch of mineral or food additives to go back to the mill instead of to process development, where the real cause of the sizing issue needs to be addressed.

Similarly, a batch may appear perfect at the plant, but by the time it reaches a customer, sizing reveals it to be out of spec. Imaging is the most reliable way to determine if the material was indeed milled incorrectly or if some other factor is at work.

Before imaging, the only way to determine the cause of too-large particles was to size a sample. When a bimodal distribution appeared, the sample was subjected to ultrasound one or more times to forcefully separate agglomerates. "If the hump was still there, you knew it was not an agglomerate, but a milling problem," Mr. Nameth tells *Lab Manager Magazine*. "It's much easier and faster if you have a microscope integrated to the particle sizer so you can analyze the sample in two different ways."

Angelo DePalma holds a Ph.D. in organic chemistry and has worked in the pharmaceutical industry. You can reach him at angelo@adepalma.com.

Bringing Single Particle Optical Sizing Technology to Online Processing



The *AccuSizer FX* and *FX NANO* are a series of laser diode based single particle sensors that use focused beam technology. They count and size particles over a wide dynamic range starting at 0.15 microns and at concentrations exceeding 10 million particles per mL.

These unique sensors can be combined with a host of new automated sampling systems to provide extremely accurate size and count information for a host of applications. They possess the sensitivity to detect low levels of aggregates several standard deviations away from the mean of a distribution.

Whether in an R&D or process environment, these sensors can provide the information that is crucial to your bottom line.

Particle Sizing Systems
8203 Kristel Circle
Port Richey, FL 34668
T: 727-846-0866
F: 727-846-0865
Website: psnicomp.com



MAKING THE MOST OF MAINTENANCE OPTIONS

by Angelo DePalma, Ph.D.

Best practices dictate that pipettes undergo preventive maintenance and calibration at least once per year. Calibration involves dispensing set volumes of a liquid, usually water, into the weighing pan of a calibrated balance. Service personnel correct for temperature, humidity, and atmospheric pressure, and then compare the expected weight to the actual weight. Among the numerous service options are end-user, in-house instrument service groups, third-party maintenance organizations, and the original manufacturer. All have their benefits and drawbacks.

Small, independent service providers are numerous and focus on academic customers within a relatively small geographic area. Regardless of their size, service organizations work either through “depot” arrangements (pipettes are boxed and shipped to the servicer) or on-site. Servicers generally do not require a minimum number of devices for depot service, but all have requirements for on-site service.

The fly in the ointment for third-party servicing in general is the electronic pipette. Although electronic pipettes comprise just 7–8 percent of all pipettes in use today, electronic models are the fastest-growing segment of pipette products. Multichannel pipettes make up approximately 20 percent of

sales, while standard, single-channel piston and o-ring devices comprise about 70 percent of the market.

“Although electronic pipettes comprise just 7–8 percent of all pipettes in use today, electronic models are the fastest-growing segment of pipette products.”

“Most service providers can easily service standard pipettes,” says Joe Fredette, product director for liquid handling and consumables at Thermo Fisher Scientific (Hudson, NH). Thermo Fisher and other manufacturers provide calibration and service instructions freely to users who choose to service their own pipettes. But electronic pipettes, which contain printed circuit boards and onboard logic for storing methods, can be challenging. “They require a professional service provider,” Mr. Fredette adds.

Users who service their own pipettes have several options. A&D Weighing (San Jose, CA) sells a dedicated balance for pipette testing that includes accessories for servicing pipettes. The main components are software and an evaporation trap to ensure that very low liquid volumes do not evaporate or pick up moisture from the air. A&D also sells a leak tester that induces a vacuum to detect leaks in pipette seals, pistons, or o-rings.

“Any organization can perform its own calibration and routine service. Whether they are actually interested [in doing so] is another matter,” observes Markus Jansons, weighing products manager at A&D. “You need to have a relatively large number of pipettes to justify dedicating equipment and personnel to pipette calibration.”

Remember, though, that pipetting is susceptible to end-user technique, and what holds for pipetting in general is doubly true for pipette calibration.

Due to issues of time and convenience, demand is rising for servicing pipettes on the customers’ premises, but hardcore metrologists protest that control over environmental conditions is impossible. Rigorous depot calibrations take place in environmentally controlled rooms. “Saying that you’re not getting a true calibration is a bit hard-



 **GILSON®**

Increase Productivity *Without Sacrificing Comfort!*

You asked, we delivered. PIPETMAN® L was designed with you in mind pairing legendary PIPETMAN robustness with new features to help you increase productivity and pipette longer without sacrificing comfort.

- *Lockable Volume Ensures No Accidental Volume Changes*
- *Lightweight Body for Comfortable Pipetting All Day*
- *Low Pipetting & Tip Ejection Forces*



Learn more and enter to win a FREE

pipetman® 

www.PipetmanL.com

Restrictions apply. Void where prohibited by law or institution. All entries must be submitted by September 30th, 2011.

line,” says Mr. Fredette. “But in fact, what many users receive on-site is not a calibration, but a service check.”

Like most large manufacturers with service businesses, Thermo Fisher performs on-site service using a NIST-traceable balance that is calibrated twice yearly. It also provides GMP/GLP-compliant calibration reports, which are required in the pharmaceutical industry and are increasingly favored by academic labs as well. An ISO 17025 calibration, which entails 10 measurements per volume at three different volumes (versus four measurements at two volumes), represents the pinnacle of calibration but also doubles the cost.

What goes wrong

The reason pipettes require regular maintenance is that they are mechanical devices that are, in many instances, used constantly. Volatile acids, bases, and organic solvents wreak havoc on the seals, o-rings, and metallic components.

“Stainless steel pistons oxidize and suffer corrosion under conditions of harsh use,” notes Jesse Cassidy, product manager for liquid handling at Eppendorf North America (Hauppauge, NY). “The state of the piston holds great implications for a pipette’s accuracy and longevity.”

Eppendorf has replaced stainless steel in its pistons on some models with Fortron®, a high-performance thermoplastic developed by Fortron Industries (Florence, KY). The strong polyphenylene sulfide plastic possesses high resistance to chemicals, oxidation, and temperatures as high as 200°C.

The company has introduced another interesting calibration-related feature that it calls “secondary adjustment.” This is useful when, for whatever reason, a pipette is calibrated to the mass of a solvent other than water. Through secondary adjustment, calibrators can dial in a value for the nonaqueous solvent, which applies both to calibration and subsequent use with that fluid.

Complex design, complex maintenance

In our last survey on laboratory pipettes, published in January 2011, 85 percent of 464 users cited ease of use and ergonomics as key factors in purchase decisions. Ergonomics followed closely behind accuracy, performance, durability, and availability of consumables.

Ergonomics is the key behind VistaLab Technologies’ (Brewster, NY) radical pipette design. “We think the world has seen enough stick pipettes,” says VP of engineering Jeff Calhoun. VistaLab’s

designs resemble a staple gun or pistol.

Servicing the company’s Ovation line of single-channel and multichannel pipettes can be somewhat challenging, as the devices are mostly electronic and their layouts are unfamiliar.

“As the manufacturer, we’d like to see all our pipettes come back here for service and calibration, because nobody’s better at servicing them than we are,” Mr. Calhoun tells *Lab Manager Magazine*. VistaLab maintains five certified repair facilities, with locations in Europe, Asia, and Australia, as well as one site (VistaLab itself) in the U.S.

The company has a training program for third-party service organizations, and sells them replacement parts as needed. “We’re very flexible about helping outside calibration labs service our pipettes,” Mr. Calhoun says. “We completely support our customers as much as possible.” He estimates that training enables service organizations to handle about 90 percent of problems encountered with Ovation pipettes.

Angelo DePalma holds a Ph.D. in organic chemistry and has worked in the pharmaceutical industry. You can reach him at angelo@adepalma.com.

Eppendorf—your complete liquid handling solution

From pipettes to calibration to automation



eppendorf

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

10 tips

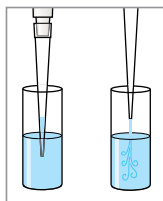
to improve your pipetting technique

Of all the factors contributing to the performance of a pipette, the most critical are the skill and expertise of the operator.

1 Prewet the pipette tip

Aspirate and fully expel an amount of the liquid at least 3 times before aspirating for delivery.

Failure to prewet increases evaporation within the tip air space, which can cause significantly lower delivery volumes. Prewetting increases the humidity within the tip, thus reducing evaporation.



2 Work at temperature equilibrium

Allow liquids and equipment to equilibrate to ambient temperature prior to pipetting.

The volume of liquid delivered by air displacement pipettes varies with relative humidity and vapor pressure of the liquid — both of which are temperature-dependent. Working at a constant temperature minimizes variation of pipetted volume.

3 Examine the tip before and after dispensing sample

Before dispensing, carefully remove droplets on the outside of the tip with a lint-free cloth, being sure to stay clear of the tip opening to avoid wicking liquid out of the tip.

After dispensing, and before releasing the plunger, deliver any residual liquid remaining in the tip by touching the tip to the side of the container. Surface tension will help draw the remaining liquid out of the tip.

4 Use standard mode pipetting

Depress the plunger to the first stop, immerse the tip into the liquid and aspirate by releasing the plunger. Remove the pipette from the liquid and depress the plunger to the second stop to dispense the entire contents.

Standard (or forward) mode pipetting yields better accuracy and precision than reverse mode for all but viscous or volatile liquids. Reverse mode often results in over-delivery.

5 Pause consistently after aspiration

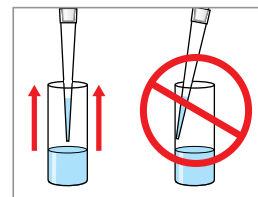
After aspirating, and before removing the tip from the liquid, pause for one second. Make this pause as consistent as possible.

Liquid continues to flow into the tip for a short time after the plunger stops. At the same time, evaporation within the tip is occurring. Pausing consistently balances these two effects and ensures correct aspiration.

6 Pull the pipette straight out

When aspirating, hold the pipette vertically and pull the pipette straight out from the center of the container.

This technique is especially important when pipetting small volumes (less than 50 μL). Holding the pipette at an angle as it is removed from the liquid alters the volume aspirated. Touching the sides of the container causes wicking and loss of volume.



7 Minimize handling of the pipette and tip

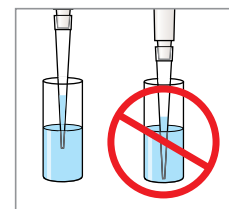
Hold the pipette loosely, return it to the pipette stand or set it down between deliveries. Avoid handling pipette tips, or containers of liquid to be pipetted.

Body heat transferred during handling disturbs temperature equilibrium, which leads to variations in delivered volume.

8 Immerse the tip to the proper depth

Before aspirating, immerse the tip adequately below the meniscus. Large volume pipettes (1-5 mL) should be immersed 5-6 mm, while smaller volume pipettes should be immersed 2-3 mm.

Too little immersion, particularly with large volume pipettes, can lead to aspiration of air. Too much immersion can cause liquid to cling to the outside of the tip. Contacting the container bottom with the tip may restrict aspiration.



9 Use the correct pipette tip

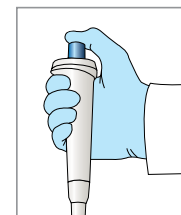
Use high quality tips intended for use with the pipette. In most cases, manufacturer tips perform well. Alternate brands are also acceptable if their performance has been proven with the pipette model.

Mismatched tips and pipettes can result in inaccuracy, imprecision, or both. Quality tips provide an airtight seal, are made of superior materials, and are free of molding defects — thereby ensuring dependable liquid delivery.

10 Use consistent plunger pressure and speed

Depress the plunger smoothly until coming to rest with a light and consistent force at the first stop. Immerse the tip, then release the plunger at a constant rate.

It's all about rhythm — repeatable actions produce repeatable results.



ARTEL®

25 Bradley Drive, Westbrook, Maine 04092 • toll-free: 888-406-3463
tel: 207-854-0860 • fax: 207-854-0867 • email: info@artel-usa.com

www.artel-usa.com

OUT OF THE LAB, INTO THE FIELD

by Angelo DePalma, Ph.D.

Raman spectroscopy has undergone a revolution during the last seven to 10 years, largely as a result of massive investment in the telecommunications industry. Improvements have come through what Eric Bergles, VP of sales and marketing at Bayspec (San Jose, CA) calls a “perfect storm” of price reductions, hyper-competition, miniaturization, and reliabil-

ity. What were previously very large benchtop instruments requiring a Ph.D. operator, liquid nitrogen cooling, and price tags approaching half a million dollars, have evolved into portable and even handheld instruments suitable for both laboratory and field operations.

“By overcoming fluorescence effects, 1064 nm excitation easily unravels the algae’s lipid fingerprint, quantifying fuel-rich cultures within a few minutes.”

ity. What were previously very large benchtop instruments requiring a Ph.D. operator, liquid nitrogen cooling, and price tags approaching half a million dollars, have evolved into portable and even handheld instruments suitable for both laboratory and field operations.

“The catchphrase here is ‘out of the lab,’” Mr. Bergles says. “And that has been the key to applying Raman to new markets and applications, which are cropping up everywhere.”

Raman is effective for noncontact, nondestructive chemical analysis. Its attraction has been its applicability to many sample types with no preparation required.

One knock against Raman, however,

is that many materials exhibit light-induced fluorescence when common Raman excitation wavelengths of 532 nm or 785 nm excitation wavelengths are used. Fluorescence interference may be tens or hundreds of times higher than the useful Raman signal.

But at longer-wavelength 1064 nm excitation, Raman overcomes in-

terfering fluorescence, enabling the practical application of Raman in situations where it could not previously be used.

Bayspec is targeting instruments employing the new wavelength to food safety; homeland security; forensics; law enforcement; and the chemical, biochemical, pharmaceutical, and biofuels markets. The latter represents an interesting example of Raman’s “new” analytical capabilities.

Algae are one very promising source of biofuels, because lipids make up about 60 percent of their body mass. These fats are easily converted to diesel fuel. During process development, investigators are eager to screen algae culture conditions for their ability to promote

lipid biosynthesis in the organisms. Wet chemical techniques for this purpose are time-consuming, whereas fluorescence completely swamps the short-wavelength Raman effect.

By overcoming fluorescence effects, 1064 nm excitation easily unravels the algae’s lipid fingerprint, quantifying fuel-rich cultures within a few minutes.

Whereas 785 nm excitation produces only a large fluorescence shoulder, analysis at 1064 nm clearly shows multiple lipid components with no baseline correction necessary.

Over the next decade, Mr. Bergles sees Raman moving into food inspection applications, among others. With up to 40 percent of our produce coming from overseas, monitoring fruits and vegetables for pesticide residues through traditional testing could hold up shipments for days or weeks. “With Raman, you can do spot checks and know instantly if the produce is contaminated.”

Overcoming inertia

Perhaps no industry has been as slow to take analysis “out of the lab” as highly protocol- and regulation-driven pharmaceutical manufacturing. Seven years into the U.S. Food and Drug Administration’s PAT (Process Analytic Technology) initiative,

samples from production suites are still walked over to a wet lab, where their analysis can take hours, sometimes days.

For small-molecule drug making, Raman is used to image the distribution of ingredients in pills and to confirm the identity of raw materials at loading docks, but its application is nowhere as diverse or deep as in broader industry. And despite having several applications where Raman would be ideal, biotech manufacturing is still farther behind than small-molecule drug manufacturing.

A 2011 report from VTT Technical Research Centre of Finland notes that Raman has not been applied to bioprocessing despite its being standard in other process industries.

One downside of Raman as an at-line or in-line bioprocess “laboratory,” says Lee Smith, Ph.D., president of Process Instruments (Salt Lake City, UT), is the presence of highly-colored or fluorescent materials. “When present, they will swamp the weak Raman signal,” he says. A corollary is that Raman is not particularly sensitive below part-per-million concentrations.

“Raman is very good at distinguishing slight structural changes,” notes Maryann Cuellar, an applications scientist at Kaiser Optical Systems (Ann Arbor, MI). Kaiser has pushed Raman for process applications for 20 years, but according to Ms. Cuellar, small-molecule drug development

and manufacture have been slow to adopt the technique, and biologicals have been even slower.

She cites reluctance on the part of biotech precisely when other industries are becoming interested to restrictions of 21 CFR Part 11 (electronic signatures), which puts restrictions on software.

In a bioreactor, Raman is capable of detecting analytes currently measured by sensors or off-line analysis (e.g., HPLC and LC-MS). Examples are glucose, lactate, glutamine, glutamate, cell density, osmolality, ammonium, and dissolved gases. Unlike off-line measurements, Raman provides numbers in real time.

“‘We will need a paradigm shift for bioprocessors to adopt Raman fully,’ says Maryann Cuellar.”

A group at Biogen Idec (Weston, MA) recently reported the use of real-time Raman spectroscopy for measuring growth and metabolic profiles of mammalian cell cultures, as well as levels of cell metabolites. Currently, cell analysis is conducted offline by removing an aliquot, staining with fluorescent dyes, and sorting cells with a flow cytometer or imaging under a microscope. Bristol Myers Squibb and Johnson & Johnson have also presented data on Raman for bioprocess analytics.

Raman and near-infrared (NIR) are

complementary techniques. NIR is based on absorption and Raman on scattering, and their spectra appear as mirror images. Both techniques identify and quantify chemical structures. And unlike mid-infrared, both methods are unaffected by water. Without water interference, there is no need for spectral subtraction.

“We will need a paradigm shift for bioprocessors to adopt Raman fully,” says Ms. Cuellar. She cites as hurdles a lack of trained spectroscopists in the biotech world and a lack of such training among process engineers and biologists. “There is also a shortage of trained chemometricians capable of extracting information from Raman data.” Chemometrics is a technique that applies concentration models to complex mixtures of chemicals. “In a process setting, Raman is about more than just acquiring spectra.”

Angelo DePalma holds a Ph.D. in organic chemistry and has worked in the pharmaceutical industry. You can reach him at angelo@adepalma.com.

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

CUT TO THE BONE

A DOZEN TIPS FOR WORKING SAFELY WITH LABORATORY GLASSWARE

by Vince McLeod

If you examine your recent accident and injury reports, we bet that the most frequent type of injury will be cuts or lacerations. Given the volume of glassware used, the frequency of daily use, and the diverse types of glassware in many laboratory operations, chances are great that someone is going to have an accident that results in cuts, slashes or slices. Minor cuts are the most frequent result of laboratory glassware accidents. But more serious accidents present hazards from flying glass, exposure to chemical solutions, and potential fires. Consider these recent scenarios.

“Minor cuts are the most frequent result of laboratory glassware accidents.”

- While filtering an ethidium bromide solution through activated carbon into a standard Erlenmeyer flask using a house vacuum, the extraction flask imploded, spraying broken glass and solution into the air.
- During an attempt to upscale an ozonolysis procedure, the reaction flask exploded, embedding flying glass into the face, neck, and (luckily) safety glasses of the lab researcher.
- A 250ml glass flask became over pressurized and burst, spraying two lab workers with glass. The worker holding the flask was cut on the hands, face, chest and stomach, while the other worker, standing across the room, received cuts on the stomach. The worker holding the flask noted glass shards embedded in his safety glasses.¹

Full disclosure here: During the period between 2006 and 2008, the STARS report for the University of Florida shows that the group cause code for cuts, punctures, and scrapes accounted for 742 of the 3,359 workers' compensation claims reported. And the incurred costs for those claims totaled more than \$100,000.²

Research laboratory facilities are most at risk when it comes to tasks using specialized glassware during potentially dangerous procedures. We guarantee that your facility has many laboratory jobs where glassware could present hazards to workers. The biggest thing when it comes to working safely with laboratory glassware is hazard awareness. In addition to reducing injuries, hazard awareness can save time by preventing ruined procedures and reactions, and save money by minimizing broken glassware and wasted reagents. Read on for the Safety Guys' dirty dozen tips on safe use of laboratory glassware.

- 1.** Begin with the right personal protective equipment (PPE). At a minimum, PPE for lab work should include a lab coat, proper gloves, and eye protection. Long pants and closed-toe shoes are also a must.
- 2.** Pay attention to apparatus setup. Many procedures require clamping glass to supports, ring stands, etc. Take care not to overtighten any glassware clamps. Hand-tighten only with firm, but not extreme, pressure. Overtightening can produce mechanical stress.
- 3.** Always examine glassware for any chips. Chips weaken glassware and can lead to possible breakage and injury. Since specialty glassware is expensive, repairs may prove economical. Make sure any glassware sent for repair is empty and clean. If solvents are used, rinse the item with water and let dry completely.

Miele . . . It's worth the investment.

Invest in a Miele and you get:

- Consistent repeatable results every time.
- Complete wash cycles in less than 1 hour.
- Precision engineered, robust construction.
- Products that stand the test of time.
- A nationwide network of trained service technicians.



PG85
Perfection
Guaranteed



Ask about our PG 85 Perfection Guaranteed products.
☎ 800.991.9380 ✉ proinfo@mieleusa.com 🌐 labwasher.com

View our video online

Miele
PROFESSIONAL

SAFETY TIP

MAINTAIN A CENTRALLY LOCATED DEPARTMENTAL SAFETY LIBRARY

By James. A. Kaufman

One of the characteristics of an effective safety program is the availability of reference and resource materials. Employees need to have easy access to this information. Your chemical hygiene plan, your material safety data sheets, and other references should not be far away. Don't make it hard for people to get answers to safety questions.

- "Safety in School Science Labs", Clair Wood, 1994, Kaufman & Associates, 101 Oak Street, Wellesley, MA 02482
- "The Laboratory Safety Pocket Guide", 1996, Genium Publisher, 1 Genium Plaza, Schenectady, NY
- "Safety in Academic Chemistry Laboratories", 1998, ACS, 1155 16th St., N.W., Wash, DC 20036
- "Manual of Safety and Health Hazards in The School Science Laboratory", 1984.
- "Safety in the School Science Laboratory", 1979, NIOSH
- "School Science Laboratories: A guide to Some Hazardous Substances" Council of State Science Supervisors (now available only from LSI.) 1984
- "Handbook of Laboratory Safety", 5th Edition, CRC Press, 2000, Corporate Blvd, N.W., Boca Raton, FL 33431
- "Fire Protection Guide on Hazardous Materials", 1997, National Fire Protection Association, Batterymarch Park, Quincy, MA 02269
- "Prudent Practices in the Laboratory: Handling and Disposal of Hazardous Chemicals", 2nd Edition, 1995
- "Biosafety in the Laboratory", 1989, National Academy Press, 2101 Constitution Avenue, N.W., Washington, DC 20418
- "Learning By Accident", volume 1 (1997) and volume 2 (2000), The Laboratory Safety Institute, Natick, MA 01760
- Laboratory Waste Management: A Guidebook, ACS RCRA Task Force
- Biological Safety: Principles and Practices, Diane Fleming, ASM
- Handbook of Chemical Health and Safety, Bob Alaimo, Oxford Press
- Working Safely with Chemicals, Hugh B. Kareful, Genium

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

4. Take special care when washing glassware by hand. This single task is the source of the most injuries. Wear heavy-duty gloves and handle glassware delicately.

5. Beware of potentially hot glass. The problem is that glassware looks the same whether it is hot or not. We recommend you develop standard operating procedures that follow routines and set up out-of-the-way areas for allowing hot glassware to cool. Keep appropriate gloves hanging near autoclaves and other apparatuses where glassware is routinely heated.

6. Handle glass tubing carefully. Another common procedure in labs is inserting glass tubing into rubber stoppers or similar operations. These tasks are safer and easier if the glass tube is lubricated first. Laboratory grease is best but may not be suitable for all applications. Remember, even deionized (DI) water is better than nothing. Be sure to wear appropriate gloves or protect hands with rags or other means.

7. Ditto for plastic tubing. Lubricate the nipple or side arm of the flask (DI water works here too) and then gently work the tubing on, using gloves of course. The bigger problem we run into here is when removing plastic tubing. Do not try to pull it off. Put the tubing and nipple against a strong support and cut the tubing close to the end of the glass. Finish by then cutting the tubing lengthwise along the nipple and removing the waste material.

8. Pay attention to fittings. After tubing, the many different types of glass fittings present the next biggest potential for accidental cuts. Problems arise from the barbed glass nipples to the ground glass joints when it comes to mating fittings. Take care when making and undoing connections. Choose hardware that is less prone to "freezing" (such as round instead of tapered ground-glass joints).

9. Use care when dealing with frozen joints. Applying laboratory grease can reduce the likelihood of "freezing." If grease is not suitable, Teflon sleeves may be an option. Soak frozen joints overnight to try loosening them. Failing the soak, heat may be used. First try a heat gun (a high-heat hair dryer). Also, a gas torch works well, but all flammable solvents must be removed first and proper technique used. Heat the outer surface quickly, while keeping the inner glass piece from heating too much. Tug gently while heating and do not heat for more than about 30 seconds. Remember to use your PPE.

Want low cost & high throughput?

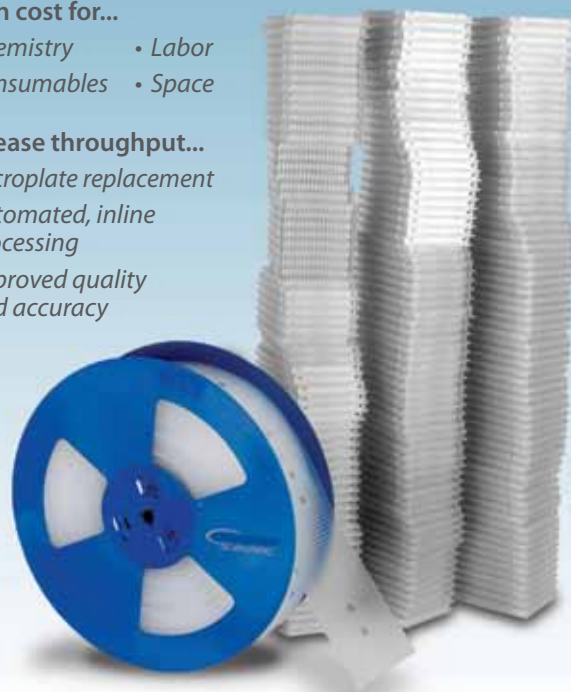
Find it with Array Tape™ Automation!

Slash cost for...

- Chemistry
- Labor
- Consumables
- Space

Increase throughput...

- Microplate replacement
- Automated, inline processing
- Improved quality and accuracy



The inline modular Array Tape platform is a highly automated, flexible microplate replacement for high throughput applications.



Left to right: Araya® inline fluorescent scanner, Soelllex™ PCR thermal cycler, Nexar® liquid handling system

10. Equipment under pressure or vacuum requires extra care. Before using any glassware for this type of work, carefully inspect each piece for any surface scratches that can lead to weakness and breakage. Pressurized and vacuum pump systems should be set up in a fume hood with the sash down. If out on a bench, use shields where practical. Design systems with relief devices to reduce chances of breakage. Keep in mind that round vessels will withstand more pressure or vacuum than flat-sided ones.

11. Test for stressed glass routinely. This occurs when glass is heated unevenly above its strain point and is most severe in thick glass. Polarized light (polariscope) is used to identify glass stress lines. Annealing (heating to a specific temperature depending on glass type followed by slow cooling) may remove the stress.

12. Dispose of broken glass safely. Make sure all chemical and biological hazards are removed prior to disposal. Use a puncture-resistant “sharps” container. Do not overfill; three-quarters full is the maximum. Affix proper labels and close securely before placing in the appropriate trash dumpster or recycling receptacle.

Summary

Every laboratory uses glassware. By observing our twelve-step program you can greatly reduce the number of accidents and injuries from cuts and lacerations. Be safe out there.

1. *Laboratory Safety Incidents: Glass vessel rupture*, Laboratory Health and Safety Committee, American Industrial Hygiene Association, Fairfax, Va., 2011 <http://www.aiha.org/insideaiha/volunteergroups/labHandScommittee/Pages/IncidentsGlassVesselRupture.aspx>
2. *University of Florida STARS Report FY '08/'09, '09/'10, '10/'11*, Florida Department of Financial Services, Division of Workers' Compensation, Tallahassee, Fla., 2011

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.

Request a free sample today!

www.DouglasScientific.com/freesample

Douglas
SCIENTIFIC

CREATIVE MANAGEMENT AND A VERSATILE RESEARCH TEAM MAKE A WINNING COMBINATION

by Sara Goudarzi

▲ Lacey Setbness, microbiology supervisor, enters client result data into the LIMS (Laboratory Information Management System).

Michael Glavanovich receives calls with all kinds of strange requests. Once, a woman phoned to ask him if a piece of meat tossed into her yard for her dog contained poison. Although he couldn't help the woman, Glavanovich was able to direct her to a lab that could help answer the question.

"Our lab is small compared to most environmental labs, but versatile."

"I maintain a list of alternate laboratories for [callers'] unique needs," says Glavanovich, the laboratory manager of Stewart Environmental Consultants, LLC, in Fort Collins, Colorado.

Stewart Environmental is an environmental engineering firm with three main divisions: engineering, environmental services, and laboratory services. The laboratory, which Glavanovich runs, focuses on the Environmental Protection Agency (EPA) and solid waste methods. The staff analyzes for everything from metals to anions to nitrogen, and much more.

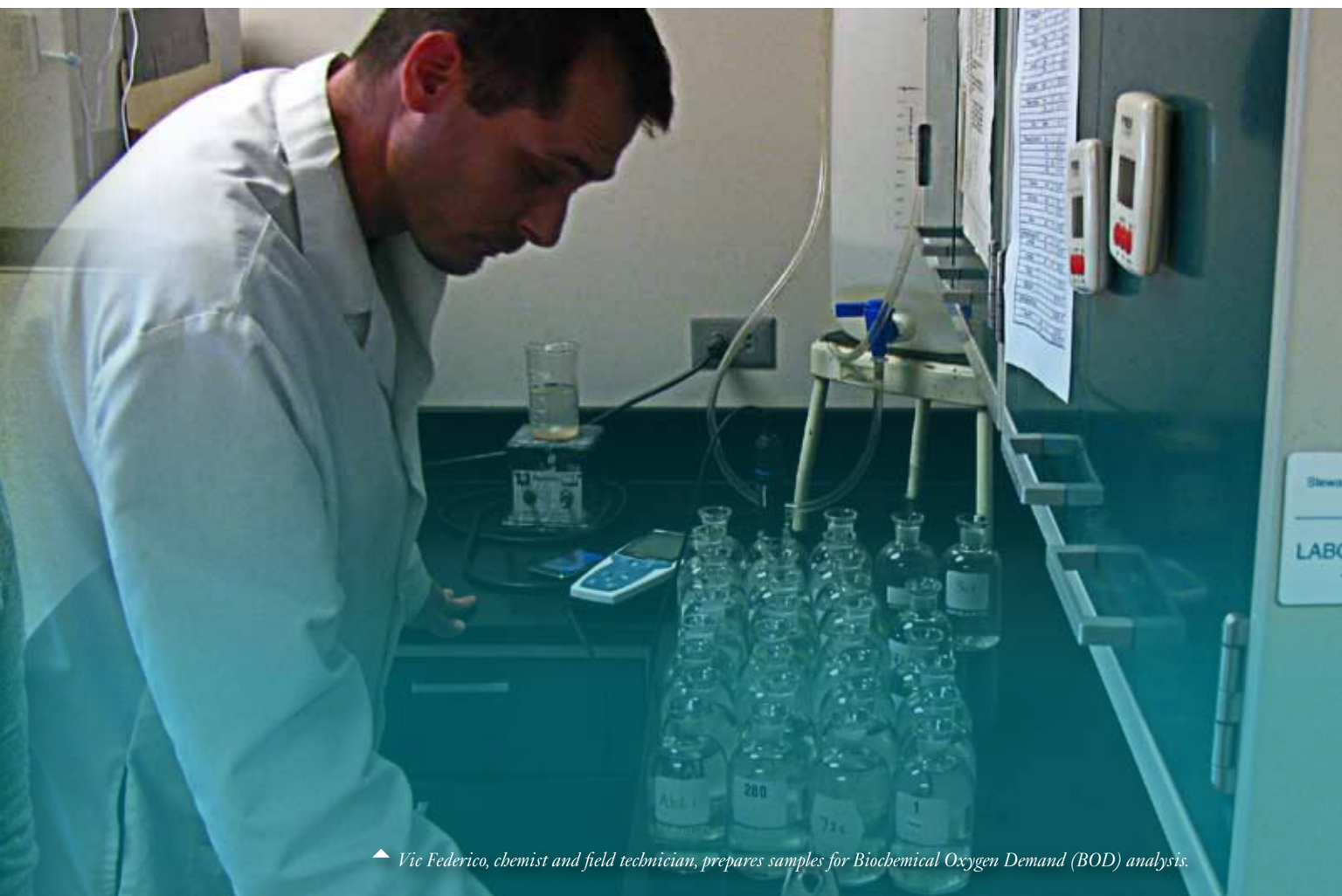
"Environmental chemistry has distinct groups of analyses: those for drinking water; those for wastewater, such as a wastewater treatment plant's industrial discharge (water that has gone through an industrial facility and is discharged either to a waste treatment plant or to an existing body

of water); and those for solid waste, for material that may end up in a landfill," Glavanovich explains.

Environmental labs typically analyze water, solids, and air. Each lab tends to have a specific focus. Because air sampling requires specialized equipment, Stewart Environmental's lab focuses only on analyzing water and solids matrices.

"Our lab is small and serves a local community," Glavanovich says. "We cannot test for everything, so we tend to subcontract some analyses. Other labs are very large and have multiple sites nationwide. These labs tend to have capabilities in many areas."

The lab's clients range from private citizens concerned about the quality of water from their wells to permitted dischargers, such as industrial



▲ Vic Federico, chemist and field technician, prepares samples for Biochemical Oxygen Demand (BOD) analysis.

companies that must regularly test the quality of the discharge to ensure it meets federal and local regulations. The lab also caters to specialty clients whose analytical needs are not part of the compendium of analytical tests that the EPA or code of federal regulations prescribes.

“We develop special methods and tests for these clients’ needs,” Glavanovich says. “This is where my job becomes more interesting.”

Company structure

Each of Stewart Environmental’s divisions focuses on a specific goal, creating a full-service company that meets many of the community’s environmental needs.

“The primary focus of the engineering division is the cleanup and use of water

from oil and methane gas wells, which is very important here in the West where water is a precious commodity,” Glavanovich says.

The Environmental Services division performs on-site assessments, wetland delineation and mitigation, revegetation plans and sample collection; it also obtains local and federal environmental permits for clients, among other tasks.

The Laboratory Services division, occupying about 3,000 square feet, is responsible for the analysis of samples, including microbiological, metal, inorganic, and asbestos testing. All work is performed by just a handful of employees.

“Our lab is small compared to most environmental labs, but versatile,” Glavanovich explains. “Five people

report to me, and as manager of the laboratory division, I report to the president of the company.”

Together, the team analyzes approximately 10,000 samples per year, comprising about 100,000 separate measurements.

Glavanovich’s team members have degrees in chemistry, microbiology and food science. But the degree, according to this lab manager, is not what makes a good team member in the lab. Instead, it’s a person’s ability to learn new methods and think on their feet that helps the lab run as smoothly as his does.

“I can teach anyone to run a method, but to have the intuition to understand it, to think ahead as to what may cause problems in the analysis or troubleshoot a problem once it

happens, takes something that is far beyond what a formal education can teach,” he says. “The ability to multitask is also important. Seldom does a person in my lab just do one thing at a time.”

This is in part because, as laboratory manager, Glavanovich is given the freedom to handpick his staff. “I am responsible for hiring and firing, although I’ve never had to perform the latter,” he says.

Glavanovich’s own background is in analytical chemistry. After receiving his Bachelor of Science degree from Hope College in Holland, Michigan, Glavanovich attended graduate school at the University of Minnesota, followed by a postdoctoral position at Upjohn Pharmaceutical Company in Kalamazoo, Michigan.

“I spent 12 years in the pharmaceutical field before joining Stewart Environmental as the manager of the laboratory,” he says. “Laboratory operations in the pharmaceutical world are under very close scrutiny by the Food and Drug Administration. The EPA oversees laboratory operations in the environmental world. It was only a matter of learning a new set of rules.”

Laboratory upkeep

The lab utilizes a variety of instruments to run necessary tests. Some of these include inductively coupled plasma (ICP) for measuring metals; ion chromatographs (ICs) for measuring common soluble anions, such as chloride, fluoride, nitrate, and sulfate; and gas chromatographs (GCs), which are workhorse instruments for testing volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, herbicides, PCBs, polyaromatic hydrocarbons

▼ A series of samples tested for Chemical Oxygen Demand (COD).



and a whole host of other compounds. To maintain these instruments, Glavanovich and his staff regularly inspect each unit and typically make repairs in-house when necessary.

“I have a great deal of experience in maintaining and repairing equipment,” he says. “This is helpful when I cannot afford to wait for a service technician to come to our site or for equipment to be sent in for service. Some instruments are under a service contract and are maintained and serviced by the manufacturer.”

“There’s tremendous competition when it comes to pricing procedures.”

The lab staff also assumes the responsibility of making sure all necessary supplies and consumables are available. Should an item be running low, after performing inventory, the lab member will report it to Glavanovich, who then takes care of the ordering.

Challenges and solutions

Like many lab managers, Glavanovich wears many hats—from running in-house operations to meeting with clients—so his days are often a juggling act.

“I manage four things throughout the day: sample analysis, reports to clients, supplies ordering, and the lab budget,” he says. “I receive many calls and emails throughout the day as well [and] respond immediately if I can, but sometimes I need to focus on a task at hand and let voice mail do the work. I usually set aside a block of time when I reply to calls and emails before the end of the day.”

Of all these tasks, his biggest challenge is meeting the budget. Because environmental labs all pretty much perform the same analytical methods, there’s tremendous competition when it comes to pricing procedures.

“I cannot just price everything so that I meet my budget,” Glavanovich says. “I am forced to compete with every other lab on price.”

What Glavanovich can do to distinguish his lab from many other environmental labs, however, is to provide excellent service to his clients.

Do you need to twist your assay to fit your microplate reader?



Coming soon*: The new **Infinite® M1000 PRO** features 10 detection modes including **AlphaScreen®** for highest assay flexibility

With the Infinite M1000 PRO you do not have to decide between performance or flexibility

- Validated and certified for a wide range of assay formats
- Fully upgradeable and future proofed for **AlphaScreen®**
- Highest plate flexibility from 6-1536 well plates with ability to define own plate formats
- New optimal read (OR) function for reliable cell based and biochemical assays
- New features like patent pending NanoQuant Plate™ compatibility for DNA quantification in 2µl volumes and Luminescence Scanning



More reasons to Talk to Tecan



NanoQuant Plate™
compatible



www.tecan.com/InfiniteM1000PRO



AlphaScreen is a registered trademark by PerkinElmer, USA. HTRF is a registered trademark of Cisbio international, France. LanthaScreen is a registered trademark of Invitrogen Corporation, Carlsbad, USA. Transcreeper HTS Assay Platform is a patented technology of BellBrook Labs, LLC USA. Transcreeper is a registered trademark of BellBrook Labs, LLC USA. DLReady is a trademark of Promega Corporation, USA.
© 2011 Tecan Trading AG, Switzerland, all rights reserved. *Please ask your local sales representative for availability.

TECAN.

Read. Wash. **Win!**
Tecan Award 2011
www.tecan.com/Award

Grant

Water Baths and Circulators

Comprehensive Range Provides Maximum Flexibility and Precise Temperature Control



Combination Orbital Linear Shaking Water Bath—patented magnetically coupled shaking mechanism enables easy switching from orbital mode to reciprocating modes

NEW

Extensive range of unstirred baths—stainless steel tanks, digital or analog controllers with ambient to high temperature and boiling options for unstirred baths



Optima™ Digital Circulator Series—provides precise heating/cooling from -47°C up to 200°C suitable for use as both open and closed loop systems

Robust, durable construction—ensures long life, reliable operation, and low cost of ownership



Exclusive Three Year Warranty



Experience Grant World Class Quality at an Affordable Price—For More Information and a Dealer Nearest You Visit www.grantbaths.com

Grant

Grant Instruments

601 Route 206, Suite 26-730
Hillsborough, NJ 08844
800-992-3028 • Fax: 908-431-3029

TOP INSTRUMENTS USED

- INDUCTIVELY COUPLED PLASMA (ICP)
- ION CHROMATOGRAPHS (IC)
- GAS CHROMATOGRAPHS (GC)
- CYANIDE ANALYZER
- A SPECTROPHOTOMETER

“My clients have needs and deadlines, so timeliness matters,” he says. “I’ve also taken the initiative and asked my permitted clients for their discharge limits [and] keep a spreadsheet by my desk. When I check their reports, I compare the results to the limits and call them if I see an overage.”

“I can help my clients the most, though, by learning about all the ways to solve their problems,” Glavanovich explains. “I have discharge clients with problems meeting their requirements, drinking water providers that cannot manage to remove enough naturally occurring uranium from their water, private citizens whose well water smells like rotten eggs and a whole host of other problems.”

“I have answers for all these problems. I’m also willing to work with them and a third party to get their problems solved,” he adds.

These extra efforts build lots of goodwill with Stewart Laboratory’s clients. “It’s that extra step that I can offer that most labs cannot—because of my own experience and education, and because right outside my office door is a team of about 20 engineers [(in the engineering division)] who may be able to help,” says Glavanovich.

All this comes easy to Glavanovich because he loves his job and the people who work for him.

“It’s the sense of being on a team and serving that team that brings me back every day,” he says. “A manager is a leader to a degree, but a manager must also serve his or her team.”

To serve his team, this lab manager works hard to continually keep up the morale of his employees and to foster a sense of community in the lab. It also helps that the lab staff maintains a positive attitude and a sense of humor, without which a day’s work could prove to be monotonous. Glavanovich capitalizes on these qualities in his colleagues to make the job seem, well, less like a job.

“I’m probably lucky that I have people skills as well as

chemistry skills, and I use both of them on a daily basis," he says. "My employees are not mine to boss around; they know what needs to be done, and I generally get out of their way. I'm always there for them to answer questions, and more important, to lighten the mood if I can and to be a little social."

Part of this approach comes from the fact that Glavanovich was once on the other side, working for a lab manager who was not inspiring to him.

"He was a micromanager and never socialized with the staff," he says. "Consequently, most people felt he was aloof and someone to be feared. I am the complete opposite. We have a wonderful sense of comradeship in the lab, and I have the respect of my staff because they know that I have their backs, that I care about them. My philosophy is that if we are not having fun in the lab, then I'm not doing my job."

Glavanovich and his team participate in something called the Friday After-work Club (FAC), where they unwind over beer and snacks, bringing the staff closer to each other and to their lab manager in a more relaxed atmosphere than the one in which they spend the workday. Activities like this one and an occasional luncheon hosted by Glavanovich help the staff grow closer to each other.

"We are also a very social group in general; if all we did was talk about work for eight hours a day, we'd get pretty bored," Glavanovich says.

Such social activities also help promote technical and work communication, which, according to Glavanovich, is a vital part of running a laboratory.

"We are a small lab, and I really need to know what's going on," Glavanovich says. "When customers have questions or concerns, I'm the one who takes the call, and I really need to know if anything was unusual in the analysis of their samples."

For example, many of Stewart Lab's clients are permitted dischargers. If any one of their parameters is over limit, Glavanovich needs to know about it right away. This can happen only if the staff communicates issues in a timely manner. "In such cases, I take the initiative and call [the client] soon, so that they have time left in the month to resample if necessary," Glavanovich says.

Sara Goudarzi is a freelance writer based in New York City. Her website is www.saragoudarzi.com.

Grant

Shaking and Mixing for Life Sciences

The PHMP multifunction three-in-one microplate shaker operates either as a thermoshaker, incubator, or just as a shaker



Bidirectional heating for even heating of microplate and elimination of condensation

Programmable time, temperature, and shaking speed reduces operator workload and increases efficiency for high throughput

Comprehensive line of reliable rotators, rocker mixers, and shakers for life science applications



Be sure to check out the original Grant-bio line of innovative, multi-function sample preparation instruments for the life science laboratory.

Exclusive Three Year Warranty



Experience Grant World Class Quality at an Affordable Price—For more information on the Grant-bio line and the name of a dealer nearest you visit www.grantbio.com



Grant

Grant Instruments
601 Route 206, Suite 26-730
Hillsborough, NJ 08844
800-992-3028 • Fax: 908-431-3029



ONE STEP AHEAD

THE BENEFITS OF BEING PROACTIVE VERSUS REACTIVE IN HIRING AND PURCHASING PRACTICES

by David F. Beyerlein

When starting a business, an up-front investment is necessary to hire the talented personnel, acquire the appropriate equipment and instrumentation, and secure the space required to operate the new business successfully. Typically those initial activities require an investment of time and money prior to securing the work that will fund those resources, but new business owners likely have anticipated, and are prepared to accept, that initial risk or the business never would have been started. Once the business is operating successfully, however, the decision to continue expanding in anticipation of work, or expand only in response to increased workflow, becomes more difficult.

Both approaches have tangible risks. When a company chooses to expand proactively, it assumes the financial burden of the growth prior to the increase in revenue associated with the new projects. While that risk may worry the board of directors at many corporations, expanding reactively places clients' projects and timelines at risk. Therefore, when planning a sustainable strategy for growth, the management team at any company should consider the value of the company's reputation and weigh the short- and long-term opportunities and financial risks for the company.

At MicroConstants, we have earned a reputation in the industry for providing high-quality contract research services to our clients. Since the majority of our new business comes from referrals, that reputation has been fundamental to our growth and sustainability as a company throughout the last decade and is not something we are willing to put at risk. So to maintain our reputa-

tion, we have chosen the proactive approach to growth and generally hire individuals, acquire instrumentation, and secure space in anticipation of increased workflow rather than wait until after the work arrives. There is some risk to our approach; however, we believe there is a greater risk in being underprepared and potentially disappointing a client.

Our clients expect us to provide advice and guidance based on our scientific expertise; therefore, it is important that we hire experienced scientists to develop our analytical methods and oversee our departments. These individuals make up the backbone of our teams and add value to every clients' projects. Filling these positions

with the best candidates often requires a significant amount of time and effort since these scientists are in high demand. With that in mind, our proactive approach allows us to take the time required to find those exceptional individuals. The alternative approach—waiting to fill key positions out of

“We generally hire individuals, acquire instrumentation, and secure space in anticipation of increased workflow rather than wait until after the work arrives.”

necessity or in response to a flood of new work—can lead to hiring individuals that may not be experienced or skilled enough to handle the position. These individuals will often not last long in their positions, and high turnover causes lack of continuity in the group. In the end, this approach is a disservice to clients, increases pressure to fill the position as quickly as possible, and results in a revolving door in the department, causing unwanted stress in the company.

Our management team is also proactive in the way it purchases our analytical tools. When it comes to purchasing equipment and instrumentation, one of our



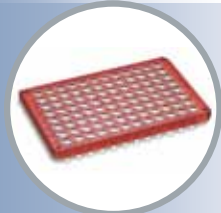
- Combine up to 30 cyclers in one network



- The new **vapo.protect®** lid reduces evaporation



- New software functionality



- A perfect team with Eppendorf consumables



There's no way out!

Mastercycler pro with *vapo.protect*

Reproducibility, specificity and speed, these are the requirements for PCR in any application. The Mastercycler pro is unparalleled in its ability to fulfill these requirements:

The proprietary **vapo.protect** technology* reduces evaporation to a minimum. Thus, concentrations in your PCR master mix remain stable and lead to a stable and reproducible specificity. Non-specific binding is minimized beyond importance.

The Mastercycler pro

- Ultimate reduction of evaporation
- Extremely fast heating and cooling rates
- Gradient blocks with SteadySlope® technology
- Upgradable to real-time PCR
- Optional self-test of peltier elements

For more information, visit: www.eppendorf.com/pcr

eppendorf
In touch with life

www.eppendorf.com • Email: info@eppendorf.com

In the U.S.: Eppendorf North America, Inc. 800-645-3050 • In Canada: Eppendorf Canada Ltd. 800-263-8715

*Patents pending. This product is licensed under U.S. patent Nos. 5,525,300, 5,779,981 and 6,054,263. The heated cover device is licensed under US 5,552,580 and foreign equivalents. The user of the Eppendorf Mastercycler pro might require additional rights for kits, reagents and other components required for his/her application. Such accompanying rights for these kits, reagents and other may be obtained by the respective holder of such rights. No rights are conveyed expressly, by implication or estoppel to any patents on real-time methods, including but not limited to 5' nuclease assays, or to any patent claiming a reagent or kit. Mastercycler pro upgraded to a Mastercycler ep realplex requires a Real-Time Thermal Cycler License under Applied's United States Patent No. 6,814,934 and corresponding claims in non-U.S. counterparts.

objectives is to anticipate our clients' needs (often before they have) and add value to their projects by already being positioned to meet those needs. This way, when we are tasked with some of the toughest analytical challenges, we have the instrumentation in place and the highly-skilled individuals integrated into our team to quickly solve those analytical challenges that our clients and other CROs may be unable to overcome. Our method development team has been instrumental in helping us

"Our objective is to anticipate our clients' needs (often before they have) and add value to their projects by already being positioned to meet those needs."

achieve this objective by evaluating new technologies (equipment, instrumentation, software packages, etc.) and making recommendations to the management team. Through their efforts, and with the support and vision of our management team, we have acquired and implemented many new technologies that have helped us

maintain our competitive edge.

In 2008, our method development team recommended the purchase of a Spark Holland Symbiosis online SPE system, to be coupled with one of our tandem quadrupole mass spectrometers. The team felt several ongoing projects would significantly benefit from this type of system if one was available to them. It turns out they were correct. Within two years, we had acquired, installed, and qualified three Spark Holland systems, all coupled with

Waters Quattro micro tandem quadrupole mass spectrometers. These systems have allowed us to analyze extremely unstable compounds in biological fluids by performing the extractions without external manipulation and with minimal sample handling.

Since installation, we have been asked to work with several unstable compounds that would have been virtually impossible analytically without these tools being available to our method development team. With the online SPE already in place, we developed novel methods for these unstable compounds much more quickly and secured several new clients

and entire clinical programs. The systems also provide automation for some of the less challenging compounds we are asked to analyze, which reduces the effort required by our scientists in the lab and shortens our timelines for our clients.

Another significant investment in instrumentation that enabled us to improve the quality of our services came from our DMPK group recommending the purchase of a Q-ToF mass spectrometer to expand our drug metabolism services. We carefully evaluated the cost of the system while also considering the new service offerings and potential value it would allow us to provide to our clients and their projects. Although it was not a decision we made lightly, we did purchase a Waters Q-ToF Premier in 2009. The system was initially purchased primarily to perform metabolite profiling studies, but it also wound up providing an unexpected solution to a completely different problem. A client sponsored a large analytical study in which 11 different compounds were evaluated for binding to a specific



**IS VERY HAPPY TO CONGRATULATE NUAIRE
ON ITS 40TH ANNIVERSARY
SERVING THE LABORATORY MARKETPLACE.**



NUAIRE, INC.
40TH ANNIVERSARY

Lab Manager
Run Your Lab Like a Business

LabX
AUCTIONS, CLASSIFIEDS & NEW PRODUCTS

LabWrench
Lab Equipment Information and Discussions.

protein. Rather than separately develop the analytical method for each compound on a tandem quadrupole mass spectrometer, all 11 methods were developed simultaneously on the Q-ToF with sufficient sensitivity and outstanding linearity. The selectivity of accurate mass detection and the consistency of the ultra performance liquid chromatograph to which the Q-ToF was coupled, permitted the use of a generic method for all compounds without separate infusion and tuning of each compound. Additionally, all 11 analytes were included in each calibration standard, so one set of injections provided 11 calibration curves. The time savings allowed the project to be performed within budget and on schedule. This purchase has allowed us to successfully grow our DMPK department and provide higher-quality services for our clients' drug metabolism studies.

In addition to purchasing new technologies, laboratory management must also decide when to upgrade existing instrumentation or purchase the latest models. To stay on the cutting edge and develop the best possible methods, analytical labs really cannot afford *not* to upgrade their systems and instrumentation. Therefore, our management team has been extremely proactive in the acquisition of the latest instrument models to meet future demands for increased sensitivity and capacity. One of our more recent acquisitions was the Waters Xevo TQ-S tandem quadrupole mass spectrometer coupled with the Acquity UPLC system. The speed, sensitivity, and accuracy of the new LC/MS/MS system have allowed us to quantify compounds at lower concentrations than previously possible and shorten our method development timelines. Since the installation, we have also been able to increase our overall throughput and capacity, thus improving the quality of our services for all our existing and future clients. A few months after we purchased the new system, a client requested a method with a lower limit of quantitation (LLOQ) of 0.25 pg/mL for one of their compounds in human plasma to support an upcoming clinical trial. With this instrument already in place, we were prepared to confidently move forward with this new project. Had our management team waited to reactively purchase the Xevo TQ-S, there would not have been enough time from the inquiry to the start of the study to acquire, install, and qualify the new system and develop and validate the method to the requested LLOQ.

At MicroConstants, we have chosen to proactively hire individuals with the scientific expertise our clients have come to expect from us and acquire the latest instrumentation needed to solve the toughest analytical challenges. This expansion approach has contributed to our positive reputation and enabled us to provide the highest-quality contract research services to our clients. For these reasons, we will continue to expand proactively in an effort to reduce risk for our clients, maintain our reputation, and reach our long-term goals.

David F. Beyerlein, vice president of Global Operations at MicroConstants, Inc., has over 12 years of experience managing laboratory operations. He can be reached at dbeyerlein@microconstants.com or by phone at 858-652-4600 x4605.

Buck Scientific IR Spec \$10,500



Free
Software

Great for mid-IR work
No sensitive KBr optics

AA Spec \$9,500



3 different models
to choose from
rugged & accurate

FID GC \$8,745



Modular GCs
15 detectors
&
12 Injectors
to choose from

*In House training is always Free!
We'll even buy lunch*

**Automated
Telephone
Support**

Full specs, prices, &
videos on-line @
www.bucksci.com

EASING REGULATORY COMPLIANCE



HOW INFORMATICS STANDARDIZATION CAN HELP LABS ACHIEVE QUALITY AND EASE COMPLIANCE BURDENS by Mark Harnois

Depending on your perspective, you may view regulatory compliance as a necessary but unwelcome expense, a hurdle in the race to market, a vital measure to protect public health and safety, or perhaps all three.

Whatever your views, you probably don't see regulatory compliance as a significant factor in profitability—but it can be. Think, for example, about the impact on profitability if an organization spends an inordinate amount of time and effort achieving and maintaining compliance. If staff members are investing more hours meeting compliance requirements than performing tasks that build their business, productivity, and profitability will be negatively affected. Likewise, too little focus or an ineffective use of resources may result in the issuance of a consent decree that could dramatically impact profitability.

For many companies, maintaining compliance is not a small problem—and it's getting bigger as the regulatory burden grows. This can be attributed in part to the considerable challenge of harmonizing operations that arise as the result of mergers, acquisitions, and globalization in biopharmaceutical, food, and other regulated industries.

One effective way to ease the compliance burden is by standardizing the laboratory informatics software. This can streamline processes, improve workflow, increase productivity, and, thus, boost profitability. At the same time, it can deliver other welcome benefits, including improved product quality, reduced waste and variability, and simplified training and support.

The heterogeneous laboratory

To appreciate the impact of laboratory informatics standardization, you first have to look at the apparent disorganization that exists in today's laboratory environ-

ments. Most companies use an assortment of diverse analytical instruments from a variety of vendors. The data generated by those instruments is often collected and managed by multiple software products, few of which are integrated with one another. There are even laboratories that still keep records using paper and pen or simple spreadsheets. For companies with multiple laboratories around the globe, the problem is compounded; often, each lab does its own custom workflows with no common processes or sharing of best practices.

Laboratories that have not standardized their software are thus more likely to have inefficient workflow, productivity issues, and a greater risk of human error in their compliance reporting. But perhaps most significantly

“One effective way to ease the compliance burden is by standardizing the laboratory informatics software.”

for their long-term prospects, companies with nonstandardized laboratories lack an effective means to achieve significant process improvements.

How big a burden is regulatory compliance?

Laboratory-related regulatory requirements vary by industry, with some of the most stringent rules governing the pharmaceutical and biotech industries. In the U.S., those requirements are primarily driven by the U.S. Food and Drug Administration's (FDA's) GxP regulations, which provide mandatory rules or Good Manufacturing Practice for Finished Pharmaceuticals. The regulations are intended to ensure that a manufactured

drug is safe for users and meets its intended use. These regulations are captured in Title 21 of the Code of Federal Regulations, or 21 CFR, as it is commonly known, of which parts 211 and 11 are most important to life sciences in general. 21 CFR Part 211 spans a wide range of components, from equipment and facilities to personnel and processes. 21 CFR Part 11 is focused exclusively on electronic records and electronic signatures, with the intent of ensuring that the records generated on a computer are as trustworthy and reliable as paper records and manual signatures.

Like most government regulations, 21 CFR only defines the rules; it does not dictate how to achieve compliance with the requirements. Typically, companies enforce compliance by implementing their own controls, including audits, system validations, audit trails, electronic signatures, and documentation for software and systems.

Documentation is key. In a paper-based world, that means creating, managing, and storing volumes of paper records. In the realm of electronic records, documentation is software-based. FDA passed 21 CFR 11 in order

to support the use of electronic records and signatures.

Companies have an added incentive for implementing electronic records; the traceability of records essential to compliance is also key to making processes more efficient by eliminating waste and reducing variability. Finding information in electronic documents is as easy as Ctrl + F (much more efficient than paging through 25 users' notebooks).

What laboratory standardization can accomplish

Laboratory standardization supports electronic record keeping and regulatory compliance efforts through the use of a minimum number of common software products across all of an organization's laboratories. By standardizing on a single chromatography data system (CDS), for example, to manage all its liquid and gas chromatography instruments, a company gains the benefits of easier data sharing, easier training, improved skills management, streamlined validation effort, simpler support, and easier information exchange among different systems. With a single data format across all instruments,



Spectroscopy Standards



GET THE MOST ACCURATE RESULTS IN YOUR ENVIRONMENTAL TESTS

Spectroscopy Standards

- Atomic Absorption (AA) Standards are made from high-purity solutes and solvents
- ICP product line includes all elements required by the EPA Contract Laboratory Program (CLP)
- Single and Multi-element Standards
- Additional elements are available
- AA and ICP Standards are available in various concentrations and matrices

A sample listing of our Environmental products includes:

AAL1KH-100	Aluminum AA Standard	1,000 ppm Al in 3% HCl	100 mL
ACA1KN-100	Calcium AA Standard	1,000 ppm Ca in 3% HNO ₃	100 mL
AFE1KH-100	Iron AA Standard	1,000 ppm Fe in 3% HCl	100 mL
AHG1KN-100	Mercury AA Standard	1,000 ppm Hg, HgO in 3% HNO ₃	100 mL
APB1KN-100	Lead AA Standard	1,000 ppm Pb in 3% HNO ₃	100 mL
PBA1KN-100	Barium ICP Standard	1,000 ppm Ba in 3% HNO ₃	100 mL
AAS1KN-100	Arsenic AA Standard	1,000 ppm As, As ₂ O ₃ in 3% HNO ₃	100 mL



1.800.GO.RICCA • sales@riccachemical.com

Right. Ready. RICCA.

record keeping for compliance purposes is simplified.

Laboratory standardization works—as proven by the experience of a top 10 global pharmaceutical company that recently standardized its laboratory informatics environment. Over a number of years and several mergers and acquisitions, this company found itself with more than 15 manufacturing sites located around the world. The company found it challenging to produce the same product with the same specifications at several of its sites while successfully passing regulatory audits, sharing information, integrating with laboratory information management system (LIMS) and enterprise resource planning products, and keeping training costs down.

The pharmaceutical company made the strategic decision to standardize on a common CDS, LIMS, and scientific data management system (SDMS) across all its laboratories. In short order, the company gained a better handle on regulatory

issues, found information exchange easier, was able to integrate with other systems, and, ultimately, gained greater visibility into the operational processes at all sites. The initiative helped the organization achieve its quality and regulatory compliance goals.

At the same time, the added visibility to information enabled the company to reduce waste and variability in its processes, ultimately reducing costs and boosting profitability.

How standardization eases the compliance burden

Standardization supports regulatory compliance in several ways; first, by enabling common laboratory workflows, such as chromatographic method validation.

Typically, there is an inherent variability and waste in workflows from one laboratory site to another. The use of a common software platform makes it possible to develop and refine a robust, reliable, validated method that all laboratory staffers can use. The result is less variability in the product quality testing and easier adherence to compliance requirements.

Because leading SDMS products support electronic worksheets, the use of a common SDMS also enables standardized documentation workflows. This improves the quality of record keeping during a product quality test

and eliminates the risk of manual transcription errors.

Laboratory informatics standardization makes it easier to capture and exchange data from multiple, heterogeneous instruments at multiple sites. Standardization also makes it possible for an organization to take enterprise-wide advantage of helpful tools and services, such as compliance tools and services. Together, all these factors can bring greater automation, efficiency, and accuracy to the ongoing compliance effort.

Standardization is a growing trend

On a larger scale, standardization has become a key component of the drive to accelerate development and maximize productivity in the increasingly competitive pharmaceutical industry. For example, in the discovery phase of drug development, more and more companies are standardizing laboratory procedures such as the

purchase of reagents as well as the washing of glassware. From the laboratory informatics perspective, e-notebooks are being used to standardize biology and medicinal chemistry documentation workflows so chemists and biologist can focus more on science and less on documentation.

But standardization is nothing new. Standard operating procedures have been employed in the pharmaceutical industry for many years. LIMS solutions were introduced as early as the 1980s to standardize sample tracking and scheduling. And since the 1990s, companies have used SDMSs to standardize the format of printed records and to capture and catalog all analytical data in a central repository.

More recently, the International Society for Pharmaceutical Engineering formed the Good Automated Manufacturing Practice committee to promote standardized processes based on best practices in pharmaceutical manufacturing.

Laboratory standardization also mirrors the broader standardization occurring in information technology (IT). The advent of server virtualization has made it possible to standardize the IT operating environments that serve analytical laboratories, and desktop virtualization solutions such as Citrix XenDesktop and Windows Remote Desktop Services are standardizing the user

“Standardization has become a key component of the drive to accelerate development and maximize productivity.”

experience across devices and environments.

All these developments suggest that laboratory informatics standardization is one of a number of strategies organizations should consider as they seek to streamline their regulatory compliance activities.

Taking the first steps toward standardization

Launching a laboratory standardization initiative may make strategic sense, but the effort requires careful planning and due diligence. The more laboratories and software products an organization has, the more complex the effort, and some laboratory personnel may be resistant to changing their preferred tools and methods.

With those issues in mind, we recommend that companies contemplating laboratory standardization begin by taking the following five steps:

- 1. Get a handle on your existing environment and software investments.** Do an enterprise-wide inventory of instruments and software installations and licenses to better understand the size and scope of the effort. Make sure to take into account the number of integration touch points that are maintained to keep data flowing smoothly and the validation effort required for each upgrade to informatics point solutions. Do software upgrades break existing data integration points and require a significant amount of effort to maintain and revalidate?
- 2. Investigate software products to standardize on.** Even if you already have a particular solution in mind, the standardization initiative provides an opportunity to ensure that you select the product that best aligns with your organization's requirements and preferences. As you do, look for software products that include compliant-ready support capabilities.
- 3. Take advantage of compliance-ready features already built into your laboratory software.** Many companies may not realize that their existing software products already include compliance support features. Making use of these features can ease the regulatory compliance burden today while helping the laboratory staff become familiar with new skills needed to implement standardization.
- 4. Consult your informatics vendor about services to support the standardization process.** Leading informatics vendors offer services that can ease and speed the transition

to a standardized laboratory. An investment in these services can deliver major savings in the long run.

- 5. Explore how standardization can work hand in hand with Lean Six Sigma and other quality/process improvement efforts.** Besides better supporting regulatory compliance efforts, laboratory informatics standardization can create a foundation upon which to build other, equally beneficial programs to streamline processes, improve quality, and foster continuous improvement and innovation.

Mark Harnois, director, Informatics Product Management, Waters Corporation, can be reached at mark_harnoise@waters.com or by phone at 508-482-2148.

Premiere Ergonomic Seating for Productive Laboratory Environments

Bevco's polyurethane seating is specifically designed for outstanding comfort, easily adjustable pneumatic seat height, easy clean-up and long lasting use in the toughest laboratory environment.

- ◆ Durable seats and backs resist stains and damage from punctures, grease, water and chemicals.
- ◆ Many options for **made-to-order** seating to meet **your** requirements.
- ◆ Certified ESD and Class 10 Cleanroom models available
- ◆ Models that meet **CAL 133** standards for fire retardance.
- ◆ Exceeds **ANSI/BIFMA** standards for safety and durability.
- ◆ Exclusive **12 year warranty**



NOW MEETS
CAL 133
STANDARDS

Style and Comfort
by Design ... **BEVCO®**

Call for a **FREE**
brochure

(800) 864-2991
www.bevco.com

EVOLUTION OF WATER BATHS AND CHILLERS

BY JOHN BUIE

There are a number of standard laboratory procedures and processes that need to be conducted at specific and stable temperatures. As this temperature may be either above or below room temperature, devices capable of both heating and cooling are required in most labs. In many cases it is essential to achieve a precise temperature, sometimes to within a tenth of a degree Celsius, and usually this temperature must be maintained for a period of time without significant fluctuation.

Over the years, devices used to achieve appropriate temperatures in the lab have become increasingly sophisticated. The water bath has evolved from a simple heated vessel to a precision instrument that is carefully calibrated and engineered to offer accuracy and reliability. Many types of laboratory water baths now exist, including circulating water baths, shaking water baths, and digital water baths. Recently, waterless lab baths using small beads instead of water have become popular. Waterless baths avoid the contamination that can be a problem with traditional water baths, use less energy, and have a reduced risk of causing burns or injury.

While water and waterless baths are used to elevate temperatures, lowering temperatures can be achieved using lab chillers. Chillers are refrigerators that cool down samples or processes to preset temperatures by removing heat from one element and transferring it to another, typically air or water. Chillers operating down to temperatures near -40°C are relatively inexpensive and use a single compressor. Chillers offering a temperature range of -40°C to -95°C are available, but rely on two compressors and are therefore significantly more costly. Some chillers also provide modest heating, to about 40°C .

The following article presents some of the key milestones in the development of lab water baths and chillers:

EARLY HISTORY

In 1748, artificial refrigeration was demonstrated for the first time by William Cullen of Glasgow University, UK.

In 1851, the first ice-making machine was invented by John Gorrie. Ice baths quickly became a popular way of cooling reactions and other lab processes, and this low-tech technique is still frequently used today.

In 1876, a continuous process of liquefying large volumes of gas was invented by the German engineer Carl von Linde. This invention eventually made chilling and refrigeration possible on a domestic and industrial scale and laid the groundwork for the development of the modern refrigeration industry.

In 1921, the first centrifugal water chiller was patented by an inventor named Willis Carrier. Before this time, chillers used a reciprocating compressor to move the refrigerant through the system. The main part of a centrifugal chiller is the centrifugal compressor. The design of the first centrifugal compressor was similar to the centrifugal blades in a water pump.

During this time, lab processes that required elevated temperatures tended to be heated directly over a flame, or conducted in a water bath which was itself heated directly. However, the number of naked flames used in labs at this time represented a major fire hazard, particularly as many of the solvents being heated were highly flammable. This problem was resolved in the 1930s by husband and wife team Glen and Ruth Morey, who invented the heating mantle, a reliable and non-flammable heating device with electric resistance wires woven into a fiberglass cloth sheath. The first heating mantle was sold in 1939, and the couple formed the Glas-Col Apparatus Company to manufacture their new product.

In 1950, the first industrial chiller was designed for use in the plastics industry.

In 1984, New Brunswick Scientific updated their classic G76 water bath shaker by introducing the G76/D model. This instrument used much of the same technology as the original model, but incorporated microprocessor technology for much greater control over temperature and speed. The G76/D was able to control temperature to within 0.1°C and speed to within 1 rpm.

1960

1970

1980

1950s and 1960s

During the 1950s and 1960s, water baths became more sophisticated, offering improved control and a greater number of features. For example, during this time, New Brunswick Scientific developed the G76 water bath shaker, which used a triple eccentric drive to achieve optimal shaking while maintaining the temperature within a controlled range. The company claims this iconic water bath shaker is still being used in many labs worldwide today.

During these decades, New Brunswick Scientific also developed the first refrigerated incubator shaker.

FUTURE OF WATER BATHS AND CHILLERS

In the future, it seems likely that water baths will be replaced more and more frequently by bead baths, which offer a large number of advantages over water baths. The principal advantage is the absence of water, which helps avoid one of the greatest sources of contamination in the laboratory. In addition, bead baths can be maintained at the appropriate temperature even when not being used, do not require vessels to be supported in racks or holders, and can support a much wider temperature range than water. Future innovations are likely to involve the development of new bead formulations that offer even greater temperature ranges and stability. Water chillers are likely to evolve more gradually over the coming years, with the emphasis on creating units able to offer greater energy efficiency and less environmental impact, as well as offering increased temperature ranges and greater stability.

In **1994**, Yamato completed improvements in its low-temperature water bath series and low-temperature/constant-temperature incubator series in response to fluorine regulation.

In **2007**, Grant Instruments began selling two new unstirred water baths intended for everyday use in general laboratories; the SUB Aqua range, which was a digital instrument; and the analog JB Aqua range. These instruments were intended to offer good value for the price while still providing excellent reliability and temperature stability.



In **2011**, Grant Instruments expanded its Aqua range of unstirred water baths by introducing the GLS Aqua Plus series linear shaking water bath, targeted to molecular biologists for applications such as hybridization, producing bacterial culture media, and for solubility studies.

Between **2000 and 2006**, Julabo introduced a range of innovations to the field of lab circulators, offering alternative ways to heat and chill laboratory processes. For example, the new High Temperature Circulator Forte HT was introduced in 2001, followed by the new High Dynamic Temperature Control Systems Presto LH. In 2003, the company developed three new new circulator/bath product lines, and in 2004 they introduced new calibration circulators. The EH circulator series was launched in 2005, followed by the FL Chiller and CF Cryo-Compact series of circulators in 2006. These innovations helped make circulators a viable alternative to more traditional methods for controlling the temperature of water baths and chillers.

In **2011**, PolyScience introduced its latest generation immersion circulator, the MX Immersion Circulator. This instrument occupied a minimum of reservoir space, providing more room for samples and glassware. In the same year, PolyScience also launched a line of circulating water baths designed to be both lab- and operator-friendly. Innovative features included a swiveling control head that permits viewing of the temperature display anywhere within a 180° viewing radius, an integral lid docking system for no-mess reservoir cover storage, and a corrosion and chemical resistant top plate that dampens noise and remains cooler at high temperatures.

1990

2000



In **2009**, Torrey Pines Scientific released the EchoTherm SC20XR and SC20XT digital orbital mixing chilling/heating dry baths. These instruments offered extended temperature range and power and were able to move from one temperature to the next more quickly than previous models.

2010

In **1999**, Julabo released a series of water baths and shaking water baths that offered splash-water protection to protect the user and samples during use. Also in this year, Julabo launched the Economy series of circulators featuring LED displays for increased energy efficiency and improved ease of use.

In **2010**, Torrey Pines Scientific released an entire line of Peltier-driven, compact chilling/heating dry baths with one or two chilling/heating positions and an interface for use with robotic systems. These units were particularly well-suited to the molecular biology lab for performing hybridizations, sample prep for PCR, ligations, and enzyme reactions.



Also in **2010**, Lab Armor, manufacturers of lab beads, introduced a new bead bath designed solely for use with beads rather than water. This water bath delivered temperature uniformity while completely eliminating water, which is known to be a major source of contamination in laboratories. Because it relied on beads rather than water, the bead bath could be used for containers that are not watertight, and could hold samples.



Finally, in **2011**, PolyScience introduced a line of compact and affordable low-temperature chillers, the LS-Series / LM-Series / MM-Series, designed to maximize bench space. These chillers were intended for use with rotary evaporators, jacketed incubators, small reaction vessels, spectrophotometers, chromatography columns, condensers, and other devices that require robust heat removal.



SURVEY SAYS: ARE YOU IN THE MARKET FOR ION CHROMATOGRAPHY?

Ion chromatography (IC) is an instrumental technique used extensively in the environmental, pharmaceutical, life sciences, biotechnology, chemical, petrochemical, food and beverage, power generation, and electronics industries. Applications include anion and cations, carbohydrates, organic acids, amino acids, proteins, peptides, oligonucleotides, oxyhalides, carboxylates, polysaccharides, polyphosphates, fatty acids, metals, phenols, surfactants, and ethanolamines.

As IC continues to develop, the number of ion-exchange materials developed for IC has increased, facilitated by the understanding of the process taking place at the surface of the stationary phase.

IC is evolving to meet the analytical demands for more rapid analyses using significantly smaller sample volumes. When analyzing samples at such trace levels, the only way to ensure confidence in the data is to have a reliable IC instrument, high-quality reagents and, especially, pure water. Water is used in all aspects of IC, including the dilution of samples, sample preparation or pre-treatment, preparing blanks and standards, the rinsing of equipment, and as an eluent. In reagent-free ion chromatography (RFIC) systems, the only flow stream is water, therefore, any impurities present in the water can interfere with the analysis in a number of ways. So, a reliable source of water that is free of contamination is essential for reproducible results.

Depending on the separation mode (ion exchange, ion exclusion or ion pair), different types of stationary phases are used.

Ion-Exchange Chromatography—is used for the separation of both inorganic and organic anions and cations.

Ion-Exclusion Chromatography—is used for the separation of weak inorganic and organic acids from completely dissociated acids that elute as one peak within the void volume of the column. In combination with suitable detection systems, this separation method is also useful for determining amino acids, aldehydes, and alcohols.

Ion-Pair Chromatography—is used for the separation of surface-active anions and cations, sulfur compounds, amines, and transition metal complexes.

Separation method for the ion chromatography system respondents are currently using or planning to use:

Chemical suppression detection	33%
Electrolytic suppression detection	19%
Ion suppression chromatography	39%
Electronic suppression detection	7%
Other	2%

Ion chromatography instruments closely resemble conventional HPLC, where typical components include an autosampler, a high pressure pump, an injection valve with a sample loop of suitable size, a guard column, an analytical column, a flow-through detector, and a data system, which can be of varying complexity.

Respondents selected the following components with their ion chromatography system.

Chromatography software	40%
Automatic sampler	30%
Chemical suppressor	21%
Automatic dilution/filtration/dialysis	9%

With a sensitive technique such as IC, the effects of contamination have serious consequences, with the potential to negate experimental results. The effects of contamination from ions, organics, colloids, bacteria, and gases can all impact sensitivity and reproducibility to some degree. Contaminating ions tend to have a significant but short-term effect, producing high blanks, high background, and chemical interferences that directly degrade results and reduce sensitivity. Varying levels of contaminating ions would result in higher variances in the observed results. While organics, colloids, and bacteria will also affect background/blanks, they also tend to have a long-term impact through media fouling and surface coating that can affect parts of the instrumentation, such as the chromatography column, the detector, or inner surfaces of the system itself. The net effect of this type of fouling is anomalous baseline shifts, unknown peaks on the baseline, high noise etc.

When choosing a laboratory water purification system for analytical applications such as IC, it is essential to consider systems that combine such technologies and incorporate real-time monitoring of water purity in order to have confidence in the water and confidence in the experimental results.

According to the respondents, ionic and organic are the most common types of contaminants experienced in their IC applications.

Ionic	29%
Organic	23%
Particulate	11%
Strong acid or base	10%
Bacterial	4%
Gaseous	4%
Don't know	8%
Other (please describe):	1%

Dionex is the marketshare leader in IC, but there are a few other choices to consider — Metrohm, Waters, Shimadzu, Cecil Instruments, and Bio-Rad. The most important consideration in the purchase of an IC is making sure that the system you are looking at has a proven track record for the analysis you want to do.

IC systems offer a number of advantages that are important to respondents in their purchasing process: quality of data, speed, sensitivity, and increased lab throughput. With the introduction of high efficiency separator columns for ion-exchange, ion-exclusion, and ion-pair chromatography, the average analysis time could be reduced. Therefore, quantitative results are obtained in a fraction of the time previously required for traditional wet-chemical methods, thus increasing the sample throughput.

Top 12 features/factors that influence the buying decision

Accuracy/Quality of data	94%
Sensitivity	89%
Speed	85%
Ease of maintenance	85%
Increase lab throughput	83%
Resolution	83%
Service and support	79%
Safety	72%
Warranties	72%
Easy transfer of methods	70%
Price	70%
Training	70%



For more information on Ion Chromatography, visit www.labmanager.com/IC

COMPLETED SURVEYS: 173

www.labwrench.com

Ask
Questions

Post
Answers

*Lab Equipment Troubleshooting,
Recommendations, Tips and Tricks*



LabWrench

Lab Equipment Information and Discussions.



SURVEY SAYS: ARE YOU IN THE MARKET FOR A MICROPLATE READER?

Microplate readers are widely used in research, drug discovery, bioassay validation, QC, and manufacturing processes for the detection of biological, chemical, or physical processes in samples contained in microtiter plates. There are a wide variety of microplate readers on the market, offering different capabilities and functionalities.

A number of criteria need to be considered before purchasing a microplate reader in order to ensure that the instrument chosen is appropriate for its intended purpose. When purchasing a microplate reader, the first consideration should be whether the reader will be needed to perform only one type of assay, or whether it will be required for multiple assays. If only one type of assay needs to be performed, a single-mode detection instrument should be purchased. However, if performing a variety of different assays is required, a multi-mode instrument should be purchased.

HTStec (Cambridge, UK) estimates market growth of microplate readers at about six percent per year, with an average high-throughput system costing between \$65,000 and \$110,000. Large pharmaceutical and biotech companies purchased 23 percent of systems, academic labs 25 percent, and small pharma/biotech companies purchased 52 percent.

Microplate reader detection modes define the instrument's experimental capabilities, while the optics determine spectral selectivity. Detection modes include top- and bottom-read fluorescence, fluorescence polarization, time-resolved fluorescence (TRF), time-resolved fluorescence energy transfer (TR-FRET), AlphaScreen, absorbance, and luminescence. Absorbance and fluorescence intensity are the most widely used detection techniques, constituting more than half of all applications.

Currently Using

Absorbance	90%
AlphaScreen	77%
Fluorescence polarization	74%
Time-resolved fluorescence (TRF)	62%
Time-resolved fluorescence energy transfer (TR-FRET)	83%
Luminescence reader	73%
Multi-mode reader	75%
Microplate spectrophotometer	63%

Labs have added components to their microplate instruments that are designed to perform specific functions, such as plate piercing, sealing, barcoding, and centrifugation. The top two components used in the labs of the respondents are centrifugation and microplate washers. Centrifugation is used for filtration purposes, air bubble removal in high density microplates, cellular debris, and spin downs. Microplate washers, on the other hand, are used to remove reagents from sample wells on microplates and to prepare them for the next step in an assay or procedure. Barcode scanners, the fourth most popular component, are used to recognize the code on the source microplate; along with barcode scanners, labs are purchasing labeling and sealing equipment.

Centrifugation	36%
Microplate washers	36%
Microplate sealers	18%
Barcode scanner	13%
Additional stacker cassettes	11%
Microplate robotics	11%
Bulk dispensing	10%
Microplate handlers	8%
Labeling and sealing	7%
Microplate stackers	6%
High-speed robot	5%
De-lidding stacker cassettes	4%

Respondents identify flexibility (available detection modes), performance (sensitivity, throughput), and cost as prime considerations in microplate readers' selection. However, the order of preference may differ for each market; for example, pharmaceutical screeners typically value throughput as their top criterion, while academic researchers may be more satisfied with a lower throughput but high flexibility, particularly if it means a lower overall cost. Other desirable features include a full complement of detection modes, sample throughput, advanced optics, additional photomultiplier tubes for reading two wavelengths simultaneously (useful in FRET, TR-FRET, and fluorescence polarization), charge-coupled device cameras for imaging portions of plates or whole plates, and application-specific light sources such as pulsed lasers.

Microplate readers with integrated computer and software capability allow the user to record and analyze data, however, the range of applications and analyses available may be a little more limited than the options available on an external PC. Those microplate readers that do not have integrated computer and software capabilities must be connected to an external PC for analysis of the data. While this may not be as convenient as an integrated system, it may ultimately create more options for the analysis and manipulation of data through a familiar Windows interface. Software packages sold by other vendors are proprietary, but workarounds exist that permit software and systems from different vendors to coexist.

Top 12 most important features/factors in the decision-making process

Software for data collection/analysis	94%
Sensitivity	91%
Ease-of-use	89%
Product performance for intended application	87%
Low maintenance/operating costs	85%
Warranty	85%
Service and support	84%
Price	79%
Resolution	79%
Add-on functionality and upgrade capability	75%
Flexibility (available detection modes)	75%
Ease of installation	66%



For more information on Microplate Readers, visit www.labmanager.com/readers

COMPLETED SURVEYS: 155

NEW
**HYBRID
ON BOARD**



I n t r o d u c i n g
Synergy™ H1
Multi-Mode Microplate Reader

Born as a Monochromator System with Hybrid Potential.

Today's monochromator solution can be transformed into tomorrow's versatile, flexible Hybrid System with monochromators and filters in one unit. The new patent-pending Synergy™ H1 System is the perfect solution for most life science applications. It's a cost-efficient, proven monochromator system right out of the box, and is also upgradable to incorporate BioTek's advanced, patent-pending Hybrid Technology™.

Learn more about Hybrid Technology at www.hybridreader.com

Check out our latest
Synergy H1 video!



China • France • Germany • India • Singapore • Switzerland • United Kingdom • United States





SURVEY SAYS: ARE YOU IN THE MARKET FOR A pH METER?

The pH meter is an essential piece of equipment in most laboratories, vital for many analytical and synthetic processes. Typical pH meters consist of a glass electrode connected to an electronic meter. The electrode produces a small voltage, which is converted to and displayed in pH units by the meter.

pH meters are used in many industries: chemical, biological, environmental, forensics, consumer products, foods, and many others for which acidity measurements are required. A significant application is monitoring titration, a lab method that quantifies the concentration of an analyte in solution. Acid-base titrations measure concentrations of an acidic or alkaline substance. From the quantity of neutralizing species (acid or base) – added at the point where pH is 7, or neutral – one can calculate the original concentration of the acid or base in the solution.

Like many laboratory instruments, pH meters have evolved beyond all recognition over the last several decades. However, experts predict a gradual evolution rather than a revolution in the design of pH meters during the coming years. It seems likely that the product hardware will continue its trend towards miniaturization, while software will undoubtedly become easier to develop and use. Although its form and function may change little in the immediate future, it seems certain that the pH meter will continue to enjoy its status as one of the most ubiquitous pieces of laboratory equipment.

Close to 90 percent of the respondents have either a benchtop or portable handheld pH meter. Benchtop pH meters offer the greatest versatility and, depending on which one you choose, there are flexible models that can provide the option to add built-in printers, data loggers, many different probe arms, and accessories. Portable handheld pH meters in the past lacked some of the sophisticated features of their benchtop counterparts, but many of the portable models on the market today are nearly as advanced. The new generation of portable meters can be a very attractive, if not required, option for lab or field use.

Type of pH meter respondents are using or planning to purchase.

Benchtop pH meter	58%
Handheld pH meter	29%
Tester pH meter	6%
In-line pH meter	6%
Other	1%

A team at Oxford University in the UK patented a revolutionary type of pH meter – the solid state sensor pH meter. This pH meter replaces sensitive glass electrodes with a solid-state sensor that is insensitive to temperature changes and may be sterilized. According to respondents who purchased this pH meter, the device provides robustness and miniaturization and never requires calibration.

Twenty four percent of the respondents have or are planning to purchase a solid state sensor pH meter.

Yes	11%
No, but planning to purchase	13%
No, and no plans to purchase	76%

The methods for measuring pH fall roughly into the following categories: glass-electrode methods; indicator methods; metal-electrode methods (including the hydrogen-electrode method, quinhydrone-electrode method, and antimony-electrode method).

Over 50 percent of the respondents use the glass-electrode method. In this method, the known pH of a reference solution is determined by using two electrodes, a glass electrode and a reference electrode, and measuring the voltage (difference in potential) generated between the two electrodes. The difference in pH between solutions inside and outside the thin glass membrane creates electromotive force in proportion to this difference in pH. This thin membrane is called the electrode membrane.

Measuring pH using an indicator includes two methods: one involves comparing the standard color corresponding to a known pH with the color of an indicator immersed in the test liquid using buffer solution; the other method involves preparing pH test paper that is soaked in the indicator, then immersing the paper in the test liquid and comparing its color with the standard color. This method is simple, but prone to error. A high degree of accuracy cannot be expected.

Metal-electrode methods – A hydrogen electrode is made by adding platinum black to platinum wire or a platinum plate. It is immersed in the test solution and an electric charge is applied to the solution and platinum black with hydrogen gas. The hydrogen-electrode method is a standard among the various methods for measuring pH. However, this method is not appropriate for daily use because of the effort and expense involved, with the inconvenience of handling hydrogen gas and the great influence of highly oxidizing or reducing substances in the test solution.

Glass-electrode method	54%
Indicator methods	21%
Metal-electrode methods	11%
Hydrogen-electrode method	10%
Quinhydrone-electrode method	1%
Antimony-electrode method	1%
Other (please specify):	2%

Over the years, lab workers have come to expect more from instrumentation and pH meters are no exception. There are many different features of a laboratory pH meter to take into account before making your purchase, including accuracy, calibration type and number of calibration points, intuitive operation, expandability, reliability, and value. There are three main selection criteria respondents recommend purchasers to consider before buying a pH meter: look at where you will be using your pH meter – in the field, around your lab, or sitting on your benchtop; pH detection range; and pH resolution. Other factors to take into consideration in purchasing a pH meter are the instrument's resolution and accuracy, probe type (detachable or integrated), electrode type (sealed or longer-lived refillable), auto-calibration with temperature compensation, automated uploading, and operational modes for specific industries or situations. Users are also looking for broader functionality, such as conductivity and ion selectivity in one instrument.

The number one feature is ease of use with auto calibration a close second. Respondents recommend that purchasers take a hard look at ease of calibration, because there's a wide spectrum of technical astuteness among users. Some methods, particularly in regulated industries or engineering, may call for a three-, four-, or five-point calibration; others are conducted in extreme environments. Hence, end users are looking for a pH meter they can calibrate easily within their application's operating range.

Top 10 factors/features that influence the buying process.

Ease of use	95%
Auto calibration with temperature compensation	93%
Low maintenance/easy to clean	92%
Resolution and accuracy of the meter	89%
Availability of supplies and accessories	82%
Detachable electrode probe	79%
Service and support	71%
Longer-lived refillable electrode type	70%
Multi-level LCD display; display the current measurement simultaneously with the current temperature.	68%
Heavy-duty and waterproof	54%



For more information on pH Meters, visit www.labmanager.com/ph-meters

COMPLETED SURVEYS: 354

SEE WHAT EVERYONE IS TALKING ABOUT...

Two Channel, pH/ORP/ISE,
EC/TD/NaCl/Resistivity
Benchtop Meter

HI 3512

List price

~~\$875~~

\$650



Features

- Up to 5 point pH calibration with 7 standard and 2 custom buffers
- Automatic temperature compensation
- Log on demand for up to 400 samples

Hurry!!!

The first 5 people to purchase a HI 3512
on hannaoverstock.com receive a

FREE Magnetic Stirrer



Got a smart phone?
Snap this to get
more information

HANNA® OVERSTOCK .com

Our surplus is your savings.





SURVEY SAYS: ARE YOU IN THE MARKET FOR qPCR?

Within a decade of its discovery in 1983, Real-Time PCR — also called quantitative polymerase chain reaction (qPCR) — evolved into one of the most powerful and sensitive gene analysis techniques available. Real-time PCR measures PCR amplification as it occurs, so that it is possible to determine the starting concentration of nucleic acid. This completely revolutionizes the way one approaches PCR-based quantitation of DNA and RNA.

In traditional PCR, which is based on end-point detection, results are collected after the reaction is complete, making it impossible to determine the starting concentration of nucleic acid. Every real-time PCR contains a fluorescent reporter molecule — a TaqMan® probe or SYBR® Green dye, for example — to monitor the accumulation of PCR product. As the quantity of target amplicon increases, so does the amount of fluorescence emitted from the fluorophore.

Advantages of real-time PCR include:

- Generation of accurate quantitative data
- Increased dynamic range of detection
- Elimination of post-PCR processing
- Detection down to one copy
- Increased precision to detect smaller fold changes
- Increased throughput

Used for a broad range of applications, the most common uses of quantitative PCR are gene expression analysis, genotyping, SNP analysis, pathogen detection, drug target validation and for measuring RNA interference.

Gene expression	31%
Diagnostics	22%
Copy number analysis	12%
SNP genotyping	10%
Microarray/miRNA / RNAi validation	10%
DNA sequencing	9%
Microsatellite analysis	4%
Site-directed mutagenesis	3%
Other	2%

PCR reagents are sold individually or as “master mixes.” The most purchased qPCR assay reagent format among respondents was individual reaction components sold separately in different tubes. The separate purchase route allows end-users to fine-tune PCR reactions with favored (or less expensive) reagents, but this requires a fair degree of expertise. While more expensive, master mixes are a good deal because they contain all PCR reagents except the primers and, of course, the template — as a result, they save the lab time. Master mixes are gaining in popularity, especially among non-expert users.

Experts suggest that if you are operating small, then you may want to buy individual reagents and save money by making your own master mixes. However, if you are brand-new to the game, it's highly recommended that you start with a kit, because you don't want something going wrong because of the reagents.

Average reagent cost per qPCR well. (reagents only)

Less than US\$ 0.25 per well	10%
Between US\$ 0.25 - 0.50 per well	17%
Between US\$ 0.51 - 0.75 per well	7%
Between US\$ 0.76 - 1.00 per well	17%
Between US\$ 1.01 - 1.50 per well	10%
Over US\$ 1.50 per well	12%
Don't know	28%
Other	1%

The number one factor in buying qPCR reagents is performance / quality of reagent (speed of analysis, fidelity of DNA-copying). Experts suggest first talking to vendors and getting them to send your lab a small aliquot to try. Then do some side-by-side comparisons with your old and new reagents, using the standards that you use for all your assays, and see if the new reagent works better or at least as well. If it has a better price, then it's worth considering. Experts also recommend that labs should always determine the exact amount of what is in the tube by looking at the optical density of the primers and probes and use what's on the label only as a guide. There are also some problems with contamination. For instance, every primer and probe has some slight DNA contamination, which you can pick up with assays that are very sensitive. Thirty-nine percent of the respondents purchase kits and reagents for qPCR from both their instrument's manufacturer and reagent companies, while 38 percent purchase just from reagent companies, and 24 percent buy only from instrument manufacturers.

Better quality reagents	93%
Lower prices	57%
Better technical support/customer service	43%
Wider selection of novel kits	17%
Faster delivery	15%
Other (please specify):	5%

Singleplex is a reaction in which a single target is amplified in the reaction tube or well. Running both assays in a single tube reduces both the running costs and the dependence on accurate pipetting when splitting a sample into two separate tubes.

Multiplexing is generally more complicated than simply adding additional primers and probes to a singleplex qPCR. Additional consideration must be given to the selection of primers, probes, cycling conditions, and reaction formulation. Multiplex qPCR is a technique that simultaneously amplifies two or more target sequences in a single reaction. Analysis of multiple targets per sample allows for conservation of limited starting materials, the ability to run an internal control, and increased sample throughput. Multiplex qPCR is not possible when using SYBR Green chemistry.

Currently Doing	Planning	To Do
Single-Plex qPCR (using just one channel)	56%	28%
Multiplex qPCR	19%	41%
Both systems	25%	31%

Data quality expectations were rated as the factor most influencing respondents' purchase of a qPCR instrument. Experts advise that if you are buying a new instrument, you can get the manufacturer to bring the machine in for a week or so, to see how it works. Sometimes, people buy new PCR machines with a certain project in mind, but what you really have to do is think ahead. Comments from some respondents were: if you buy an inexpensive instrument or don't buy the various software modules, then you may not be able to do certain things like run 384-well plates, multiplex, or HRM. Spend a little more of your project dollars to get a real-time PCR machine that has all the flexibility you need in the thermal cycling programming, detection formats, and data analysis.

Forty percent of respondents have selected automation of qPCR assays as an important factor. With continuous improvements in automated platforms, automation of qPCR assays is expected to increase in the future and have the greatest impact in advancing qPCR.

Top ten factors in the decision to purchase a qPCR instrument

Consistent quality of data	93%
Sensitivity	91%
Service and support	88%
Ease of use	86%
User-friendly controls/software interface	84%
Price	82%
Multiplexing capability	77%
Warranty	75%
High-throughput ability	61%
Linear dynamic range	61%



For more information on qPCR, visit www.labmanager.com/qPCR

COMPLETED SURVEYS: 194

ANALYTICAL BALANCES

by Lee Denton

Analytical balances are used to measure mass with a high degree of precision. These electronic instruments have the ability to record the mass of an object to 0.0001 grams and to express any changes in mass that may occur due to factors such as evaporation. The high sensitivity of analytical balances requires a glass enclosure be used to surround the sample area. This is done so that contaminants or air currents do not affect the sample as it is being measured. Errors in testing can also be caused by static electricity, vibrations, and changes in sample or room temperature. To ensure the equipment is performing accurately, regular calibration is needed. Calibration should be performed any time fluctuations in measurement occur or the balance is moved or unplugged. Analytical balances also offer built-in software that can be used to perform calculations and record results; this is a valuable time saver for lab professionals. Depending on your application and desired outcome, one balance may be preferred over another. We suggest you speak with your analytical balance supplier in order to make the right choice for your research requirements.

APPLICATIONS

ANALYTICAL BALANCES APPLICATIONS

- Ideal for weighing small samples where results are needed to 0.1mg or better
- Frequently, an application involves weighing a sample, then processing it to change its properties, then weighing again
- Repeatability is a critical factor in using analytical balances
- Used in laboratories for formulation, analytical chemistry, material testing, quality assurance
- Found in industries such as food, pharmaceutical, plastics, chemical, and environmental

A&D WEIGHING GH SERIES ANALYTICAL BALANCES

WWW.ANDONLINE.COM

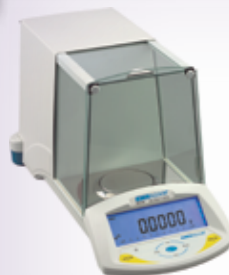


◀ The GH series analytical balances from A&D are for users who demand high performance from an analytical balance. Our rear-mounted weighing cell offers the ultimate in stability and protection from static and magnetic samples.

- Anti-static glass draft shield
- 5 models to choose from – 0.1mg and 0.01mg resolution
- RS232C and WinCT software included as standard
- 5-year warranty
- GLP/GMP/ISO compliant

ADAM EQUIPMENT PW ANALYTICAL BALANCES

WWW.ADAMEQUIPMENT.COM



◀ The PW delivers speed and accuracy in an easy-to-use, reliable device. Functional design and advanced features make the PW series optimal for laboratory balances. Perform simple or advanced weighing applications without complicated calculations. Durable metal construction and a large backlit dual display give the right balance of speed, performance and value.

- Three models with 120g to 250g capacities
- 1mg/0.0001g readability
- Internal motorized calibration standard
- RS-232 interface
- 16 weighing units and eight weighing modes

METTLER TOLEDO XS205 ANALYTICAL BALANCE

WWW.MT.COM



◀ The Excellence XS analytical balance sets new standards in weighing performance. SmartGrid, the revolutionary grid weighing pan, successfully minimizes the effects of turbulence in the weighing chamber. Results are more accurate and stabilization times dramatically shorter.

- Innovative SmartGrid weigh pan for reduced stabilization times
- Green Ergoclip accessories to secure any tare container and allow for direct dosing without weigh paper
- MonoBloc weighing cell provides outstanding measurement precision
- Rugged design with overload protection as well as easy clean surfaces

ANALYTICAL

Nano Particle Analyzer

SZ-100

- Analyzes key particle physical properties including size and zeta potential
- Capable of performing size measurements at both right angle (90°) and backscatter (173°)
- Allows particle size measurements with a variety of cells and sample volumes down to 10 μ L
- Unique semi-disposable zeta potential cells can typically measure hundreds of samples before requiring replacement



Horiba Scientific

www.horiba.com

ICP-OES Spectrometer

SPECTROBLUE

- Generator design packs an ample power reserve that can handle extreme plasma loads
- Sealed optic system abolishes gas purging for a lifetime savings totaling up to one-third of the instrument's purchase price
- Permits a direct, high-luminance path for maximized light throughput
- Comes with easy-to-use SMART ANALYZER VISION software



Spectro

www.spectro.com

Tandem Quadrupole MS Detector

Xevo® TQD

- Enables the collection of highly specific quantitative data for target compounds, while providing the ability to simultaneously visualize all other components
- Features a wide range of ionization capabilities today, future-proofing for the innovations of tomorrow
- Designed to reduce complexity, increase ease of use, and ensure correct result is delivered every time.



Waters Corporation

www.waters.com

BASIC LAB

Rotational Viscometer

Black Pearl

- Performs both routine rheological tests and complex rheological evaluation
- Comes standard with built-in Peltier temperature control for all measuring systems
- Measuring systems employ novel "Quick Capture" mounting technology
- Features an angular velocity range from 0.01 to 200 rad/s, a torque range from 0.005 to 20 mNm and a temperature range from -10° to 120° C



ATS RheoSystems

www.atsrheosystems.com

Environmental Simulation Chamber

MKFT

- Designed for alternating-climate profiles at temperatures between -70 °C and +180 °C
- Provides an interior volume of 8.1 cu/ft and includes an integrated LCD screen
- electronically controlled APT.line™ preheating chamber ensures temperature accuracy and reproducible results
- Without humidity, the MKFT offers a temperature range of -70 °C to +180 °C; with humidity, the temperature range is 10 °C to 95 °C



Binder Inc.

www.binder-world.com

PRODUCT SPOTLIGHT

MORE ELEMENTS, HIGHER RESOLUTION MICROSCOPE'S SENSITIVITY, SPEED, AND 3D ANALYTICAL CAPABILITIES HELP USERS INNOVATE

FEI Company hopes to enable breakthroughs in many key customer areas with the release of its Titan™ G2 80-200 with ChemiSTEM™ technology, a new member of the Titan G2 series of S/TEM (scanning/transmission electron microscopes).

"By combining the Titan platform's latest generation of electron optics with the revolutionary analytical sensitivity of ChemiSTEM™ technology, we have created a microscope that can deliver atomic resolution elemental maps in minutes and adds new capabilities in addressing our customer's applications in materials science, chemistry, and nanotechnology," said Trisha Rice, vice president and general manager of FEI's research business unit.

Dr. Paul Kotula of Sandia National Laboratories said that his institute chose the new Titan because of its combination of the latest in probe-correction technology and large solid-angle, windowless silicon-drift x-ray detectors (SDD's).

"We estimate that we will gain a factor of 50 to 100 in terms of analytical sensitivity, speed, and spatial resolution combined, over our existing FEG analytical electron microscope," Dr. Kotula said. "It is already clear that atomic resolution x-ray microanalysis is not only possible but practical with this new microscope."

Rice added the new microscope has all the features unique to the Titan G2 series including the X-FEG high brightness gun and the next-generation DCOR probe corrector. Those features, along with the instrument's ChemiSTEM™ technology, will allow users to do some very cool things, she said.

"Due to these innovations, this new microscope has the potential to solve problems in material science research that have previously been difficult or impossible to address," Rice said.

For more information, visit www.fei.com/chemistem.



CHEMICALS, KITS & REAGENTS

qPCR Assays

PrimeTime®

- Available in three different sizes (mini, standard, and XL)
- Provide the forward and reverse primers as well as a hydrolysis probe in a single tube
- Allow users to select from multiple dye-quencher combinations
- Pre-designed assays are now offered which stress accurate Tm prediction and protection against off-target amplification

Integrated DNA Technologies (IDT)

www.idtdna.com



Good for you, good for the environment.

Find out why thousands of laboratories worldwide agree that the Thermo Scientific brand is their only choice for biological safety cabinets:

- **Reduces operating costs up to 75%** over traditional biological safety cabinets with AC motors
- **Increases comfort and encourages safe working habits** with the sloped front, bright workspace, and low noise level
- **Maximizes safety** through our innovative SmartFlow™ design with Digital Airflow Verification

Choose the cabinet that is good for you and the environment!
www.thermoscientific.com/bsc



Visit www.thermoscientific.com/bsc to learn more about the broadest selection of energy saving biological safety cabinets for any application or budget.

Solid Phase Extraction Sorbent

Strata-X-Drug N

- Specially designed for the extraction of drugs of abuse in forensic toxicology
- Targets neutral drugs such as barbiturates and benzodiazepines
- Saves time and reduces solvent expense because it does not require conditioning or equilibration
- Each batch is tested by extracting lorazepam and temazepam from actual urine samples
- Samples prepared using Strata-X-Drug N are ready for LC or GC analysis



Phenomenex

www.phenomenex.com

Nucleic Acid Purification Kits

KingFisher

- Feature strong performance and consistency of results — optimized to produce high yields of quality DNA
- Suitable for wide range of sample materials from cells to tissues
- Provide flexible throughput from one sample to up to 96 samples per run
- Minimized hands-on time increases the efficiency
- Compatible with most common downstream analysis and applications



Thermo Fisher Scientific

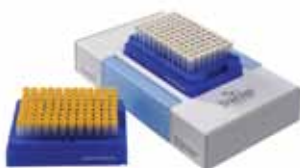
www.thermofisher.com

LAB AUTOMATION

Coded Tube Reader

Tracxer RS210

- Fully compatible with all SBS standard storage racks, which enables the reading of 24-, 48-, 96- and even 384-well formats
- Compact A5 size a good fit for use in robotic liquid handling and storage systems
- Tracxer software allows users to scan 96 coded tubes in less than 5 seconds
- Software also includes a rack decoding feature that is able to distinguish between 2D codes that are not recognised and empty storage positions



Micronic Europe BV

www.micronic.com

Integrated Flow Chemistry System

Asia 330r

- Collects and analyses each reaction automatically
- Enables hundreds of solutions or phase experiments through the automatic control of syringe pumps, injection reagents, synthesis, and waste diversion
- Includes the FLLEX module for flow aqueous work-up and the Asia Sampler and Dilutor, which allows the integration of analytical devices
- Features easy-to-use Asia Master PC software



Syrris

www.syrris.com

Microplate reader

Infinite M1000

- Offers luminescence scanning to complement its existing 3D and fast absorbance and fluorescence scanning capabilities
- Allows the emission spectra of stable luminescent signals to be recorded at 1 nm resolution using the instrument's emission monochromators
- Format flexibility allows Tecan's NanoQuant Plate™ for very low volume absorbance measurements to be used alongside virtually all 6- to 1,536-well plate formats
- Features double orbital shaking for more efficient reagent mixing, an Opitmal Read (OR) function for reliable cell-based measurements, and precisely controlled pipetting



Tecan

www.tecan.com

LIFE SCIENCE

Plasma Thawing Systems

QuickThaw®

- Reduce thaw times while ensuring the safety of your plasma
- Available in 2, 4, and 8 bag capacities
- Automatic baskets lift out of the water at the end of each cycle, when a high temperature alarm is activated, or on customer demand
- Rapid thaw times reduce the amount of plasma that must be thawed in advance
- Allow you to load, program, and walk away through easy, convenient operation



Helmer

www.helmerinc.com

PRODUCT SPOTLIGHT

FASTER SETUP, EASIER OPERATION COMPANY ADDS TOUCHSCREEN TO ITS PCR SERIES

Bio-Rad has introduced a touchscreen interface to its line-up of PCR instruments, including its real-time detection systems, allowing users to watch amplification traces in real-time without an attached computer — an industry first.

"Researchers really wanted to have the ability to immediately see their data during a real-time PCR run to determine whether they should proceed to the next experiment," Richard Kurtz, Bio-Rad Laboratories' senior marketing manager, said.

"On the old versions of the real-time PCR instruments (CFX96 and CFX384), researchers needed to purchase an extra computer and find space for it on the bench to view these curves during the run."

The updated products include: the C1000 Touch, the CFX96 Touch, and the CFX384 Touch.

Kurtz added the screen simplifies the running and set up of the PCR instrument and data display in qPCR experiments.

"This makes it easier for new users to start a run right away, without needing to get any training or help from someone in the lab," Kurtz said, adding the C1000's Autowriter feature has been further simplified by a touchscreen. The feature allows researchers to create a new protocol by entering three variables.

"Previously, setting up the Autowriter on the C1000 required the researcher to go through multiple screens to enter in each of these variables," Kurtz said. "Now all three variables can be inputted on one screen."

He added that, before the touchscreen, inputs were made on a cell phone-like keypad, which had several buttons for different screens. However, the new Touch systems feature a full QWERTY keyboard and a cleaner, more dynamic interface for researchers.

For more information, visit www.bio-rad.com



Submarine Gel Electrophoresis Unit SUBHT

- Runs an entire 96-well plate of samples (plus up to 24 control or marker lanes) in 30 minutes
- Multi-channel pipette compatible
- Well spacing and labeled gel running tray ensure positive ID of loaded samples
- A large selection of different combs and accessories allows you to optimize this unit for your particular application



Hoefer, Inc.

www.Hoeferinc.com

LIMS & SOFTWARE

Life Sciences Digital Imaging Software QCapture Pro 7

- Enhanced Auto Contrast mode available for low light and fluorescent microscopy enables researchers to quickly visualize images at varying exposure times
- Supports Windows 7 32-bit & 64-bit operating systems
- Snap and Save allows for streamlining and simplifying image acquisition
- Automatically sets the optimal contrast levels and dynamic range for each image preview

QImaging

www.qimaging.com

Materials Management Software Qualoupe

- New materials manager capability enables users to easily define the wide variety of materials that they test in their organisation
- Allows manufacturers to manage data relating to raw materials, finished products, and intermediate products
- For commercial contract labs, improves the handling of data from routine samples sent to them for testing by their customers



Two Fold Software Limited

www.twofold-software.com

SUPPLIES & CONSUMABLES

Silicone Tubing Silcon® Med-X

- Platinum-cured version offers the fewest number of extractables or plasticizers, which can both adversely affect performance
- Elastomer meets USP (United States Pharmacopoeia) Class VI requirements and the tubing is produced in a controlled environment
- Available in 17 sizes ranging from .030" through .625" (5/8") I.D. Other sizes, durometers, and colored tubing are available through custom order



NewAge Industries

www.newageindustries.com

Metal GC Columns TraceGOLD™

- Resistant to column breakdown and bleed often caused by repeated sample runs
- Available in three stationary phase formats: TG-1MT, TG-5MT and TG-WAXMT, with a range of column lengths, internal diameters, and film thicknesses
- Designed for higher temperature ranges than standard GC columns and can process highly active samples and analytes without incurring any damage



Thermo Fisher Scientific

www.thermoscientific.com

Cell Culture Dishes CytoOne

- Sturdy, flat bases resist bowing and warping even growth
- Optical clarity provides distortion-free microscopy
- Secure handling grip features on small and large dishes
- Certified DNase, RNase, DNA, and pyrogen free
- Gamma sterilized
- Available in 35 x 10 mm, 60 x 15 mm, 100 x 20 mm, and 150 x 20 mm sizes



USA Scientific

www.usascientific.com

PRODUCT SPOTLIGHT

THE 'NEW CLASSIC' IN LABORATORY GLASSWARE STORAGE/MEDIA BOTTLES OFFER A COMBINATION OF DESIGN, QUALITY, AND MATERIALS

Researchers who frequently use glass bottles to store and dispense media, reagents, and samples depend on a quality product for safety and convenience. Kimble Chase, the largest manufacturer of laboratory glassware products in the world, now offers KIMAX® GL 45 Storage/Media bottles, a product line that combines design, quality manufacturing, and superior materials to meet the needs of the global research community.



One thing that makes this glassware line stand out is its safety, as the bottles can be treated with KimCote®, a plastic coating applied to the outside of the laboratory glassware in order to resist breakage and contain leaking.

"Should a break occur, KimCote will reduce the hazards of shattered glass and leakage of toxic or corrosive chemicals," said Maryanne Gasparo, reusable glass product manager at Kimble Chase, adding that the coating's unique texture also provides a non-slip handling surface whether it's wet or dry. "The ultra-clear plastic coating contains spills in the event of breakage, has improved sample viewing, is repeatedly steam autoclavable, and it's chemical resistant and odor free."

As well as being great for biohazardous materials, the glassware is also well suited to light sensitive compounds as it can be treated with RAY-SORB® to protect such substances.

The bottles are available in sizes from 100mL to 10,000mL and are manufactured with Type 1 Class A borosilicate glass for durable performance and resistance to thermal stress. Linerless, autoclavable (to 140° C maximum) polypropylene GL 45 caps with an internal seal are also available for the bottles. For easy identification, researchers can specify blue, white, or orange caps.

For more information, visit www.kimble-chase.com

COMPARING MICROVOLUME AND CUVETTE BASED MEASUREMENTS OF MICROBIAL CELL CULTURES

ABSTRACT

Microvolume assessment of bacterial culture growth was found to facilitate measurement of undiluted cultures. Comparison between microvolume and cuvette-based data requires the use of a conversion factor, which can be simply determined.

Thermo
SCIENTIFIC

www.thermoscientific.com/nanodrop

INTRODUCTION

Use of an absorbance spectrophotometer to monitor growth of bacterial cultures by measuring optical density at 600 nm (OD₆₀₀) is a central technique in microbiology. A common problem, however, is that cultures must be diluted prior to measurement in order to remain within the linear dynamic range of the instrument. The increasing adoption of microvolume spectrophotometers such as a Thermo Scientific NanoDrop 2000c has raised the question of whether the shorter pathlength used in these instruments facilitates measurement of undiluted cultures.

When measuring OD₆₀₀ of microbiological samples using a spectrophotometer, it is necessary to first determine the linear dynamic range for that culture. This is because in many cases the OD₆₀₀ of the culture exceeds the linear range of the instrument prior to reaching the stationary phase, resulting in an inaccurate assessment of culture growth. This experiment evaluated microvolume OD₆₀₀ performance, and also tested to see whether a conversion factor could be applied to data gathered using the NanoDrop 2000c™ pedestal in order to compare with a cuvette based measurement, in this case, the cuvette capability of the same instrument.

EXPERIMENTAL CONDITIONS

An overnight culture of *E. coli* JM109 was grown for 16 hr at 250 rpm, 37 °C in Luria Bertani Broth. A series of dilutions were prepared from this; each was measured using both cuvette (3 ml) and pedestal (2 µL) on a NanoDrop 2000c.

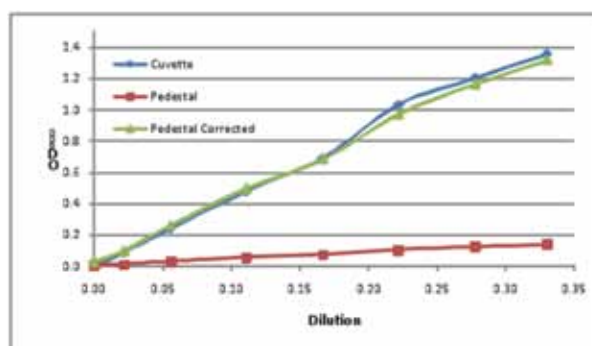
RESULTS

The upper limit of detection was determined by identifying the OD₆₀₀ at which there ceased to be a linear correlation between the dilution factor and the measured OD₆₀₀. This was found to be at an OD₆₀₀ of approximately 1.4 when using a cuvette. In the case of the NanoDrop 2000c pedestal, the linear dynamic range exceeded the highest concentration of the culture; meaning that no dilution of the culture was necessary before measurement.

To compare OD₆₀₀ readings between the pedestal and cuvette systems found on a NanoDrop 2000c, a conversion factor was calculated as follows:

$$\frac{\text{Cuvette OD}_{600}}{\text{Pedestal OD}_{600}} = \text{Conversion Factor}$$

This conversion factor was then be used to compare measurements using cuvette and pedestal (fig. 1).



▲ Figure 1: A dilution of a 16 hr overnight culture of *E. coli* measured using the NanoDrop 2000c pedestal option (red) and cuvette option (blue). Applying the conversion factor to the pedestal data (green) facilitates comparison between the two measurement methods.

CONCLUSIONS

It is common for cultures to exceed the linear dynamic range of a spectrophotometer, therefore the use of a microvolume format such as the NanoDrop 2000c pedestal may present time savings and also reduce the risk of dilution error or inadvertently exceeding the instrument's range.

The conversion factor between cuvette and microvolume formats was found to be constant throughout the linear dynamic range of the instrument, and facilitated the calculation of target OD₆₀₀ values for the pedestal based on those previously established for the cuvette format.

Register for Free at www.BioConferenceLive.com



The Online-Only Conferences for
Life Sciences & Clinical Diagnostics
Life Sciences | October 26-27, 2011



BioConference Live is a series of **Free** online-only conferences focused on the life science and clinical diagnostic community. BioConference Live brings together research scientists, medical experts and professionals from around the world to watch live educational sessions from industry experts, network with peer professionals and respective thought leaders in real time, and explore a virtual exhibit hall showcasing advances in life sciences and clinical diagnostic technologies.



Robotic Personal Workstations

Problem: With the rapid pace and high demands of research that dominate today's research laboratories, scientists require faster, more dependable, and safer means of accomplishing detail-oriented and potentially tedious liquid handling tasks, while producing reliable results that do not waste expensive reagents.

As research becomes more sophisticated and the need for researchers to be more efficient rises, robotics have been lending a hand and gaining popularity in the laboratory. While some laboratory tasks can be accomplished through the use of handheld liquid handling instruments and some higher throughput tasks require the use of large robotic systems, there is a growing need for personal workstation platforms that perform at a higher and more efficient level than handheld instruments. Another requirement of such a platform is protecting the user from hazardous material and decreasing a scientist's risk for Repetitive Strain Injury (RSI) without the hassle and complication of a larger robotic system.

Solution: A liquid handling personal workstation is a good solution to automating your pipetting work, including but not limited to cherry picking, reagent aliquoting, viral studies, dilution series, and lipid accession. An automated workstation has the ability to complete pipetting tasks while researchers are free to use their time elsewhere and saves the laboratory as a whole both money and time. Automated workstations also ensure the accuracy and precision of the laboratory results. Additionally, personal workstations can reduce or eliminate Repetitive Strain Injuries and decrease exposure to harmful or toxic solutions, making liquid handling safer.

An automated workstation can also enhance the liquid handling capabilities of laboratories. Biohit has developed a small, quiet, and compact system (347 mm D x 346 mm W x 381 mm H; 13.7" D x 13.6" W x 15.0" H) called the Roboline™ that is a good fit for anywhere in your laboratory, with the ability to automate a single task or an entire application for research needs. Their wide range of applications and ease-of-use, make automated workstations useful for many research environments. In particular, the system's dispensing module has been engineered

to produce accurate and precise results without human error, in a streamlined and efficient manner.



▲ *Cutline: Biohit's Roboline™ workstation with software.*

The easy programming and fast drag-and-drop function is simple and can be learned in 15 minutes, allowing users to load their work and move on to other tasks quickly. An easy-to-use loading tray also provides easy access to loading and unloading the instrument. Loading trays on instruments such as the Roboline are capable of handling a wide variety of vessels, including: SBS-format deep-well and normal 96-, 48-, 24-, 12- and 6-well plates; laboratory

tubes with height 30-95 mm (1.18-3.74") and width 8-24 mm (0.31-0.94"); 1.5 and 2.0 ml microtubes, with any combination of tips, plates, tubes; and capillaries with a maximum capacity of 4 full SBS plates and 2 half SBS plates.

Much like a standard pipette, the Roboline can pipette any combination of columns, rows, single wells, or entire plates. Additionally, the closed environment of an automated workstation protects reagents and samples from contamination, and the fully electronic air displacement pipetting operation minimizes error and produces error-free results. The system is capable of

forward pipetting, reverse pipetting, multiple dispensing, and diluting volumes from 5 to 200 µL, using liquid level sensing for error-free, small volume pipetting. The Roboline is also environmentally friendly with low energy consumption and a durable design.

For more information about the Roboline, visit www.biohit.com/Roboline or contact richard.miceli@biohit.com with any inquiries.



GET Connected



PITTCON
CONFERENCE & EXPO
ORLANDO • MARCH 11-15 **2012**

PITTCON,
the world's largest annual
conference and exposition
for laboratory science...

Offers a unique opportunity to get a hands-on look at the newest instrumentation from nearly 1,000 exhibitors. Get connected with experts in your field while learning about the latest scientific developments presented in a diverse Technical Program, high-quality Short Courses, and interactive Conferee Networking Sessions.

**Orange County
Convention Center
Orlando, FL, USA**

Visit www.pittcon.org.



Micro-Volume Quantification

Problem: Highly concentrated nucleic acid and protein samples must be diluted before they can be read on most absorbance-based spectrophotometers, and conversely, diluted samples must be concentrated to within the spectrophotometer's dynamic range before reading. In addition to the extended time needed for these sample corrections, if not precisely calculated and carefully performed, they can lead to incorrect sample results and skew downstream processes.

Solution: Micro-volume quantification using an accessory such as BioTek's Take3™ micro-volume plate (Figure 1), along with its complementary microplate spectrophotometers, reduces operator error while offering simple and efficient micro-volume readings. A nominal 0.5 mm optical pathlength obviates the need for sample dilution or concentration, and low 2 μ L sample volumes conserve precious sample and reagents.



▲ Take3™ Trio Micro-Volume Plate from BioTek Instruments, Inc.

BioTek offers two versions of the Take3 micro-volume plate. The Take3 and Take3 Trio both use paired custom silica glass slides. The bottom slide(s) is coated with a hydrophobic stencil, forming 16 sample "microspots." The Take3 plate has one sample slide, while the Take3 Trio bundles 3 slides to accommodate up to 48 uniform 2 μ L samples and blanks to be read at one time. When the top plate(s) is lowered onto the droplets, they are sandwiched between top and bottom, creating a fixed vertical optical path. After mea-

surement in the microplate reader, the aliquot may be removed and returned to the original vessel, or the device may be simply wiped clean as the surface generally resists binding.

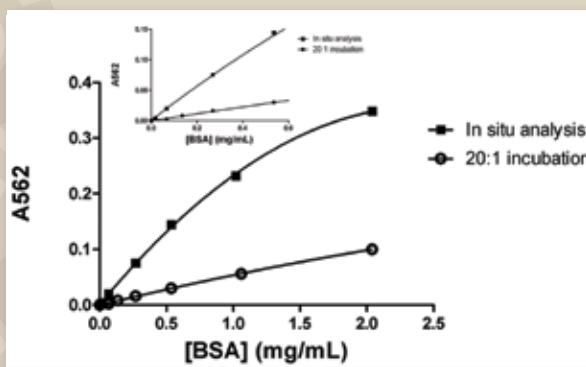
Since multiple microspots may be measured at one time, blanks, calibration curves and unknown samples may be simultaneously read for highly accurate results without variability from incubation time, temperature, and sample manipulation. Rapid measurements

and results display are provided through pre-programmed protocols in the reader's software. Colorimetric (Figure 2) and fluorometric measurements can be performed with Take3 plates, along with spectral scans and other micro-volume analysis.

In addition to microspot measurements, both accessories offer measurements via an optional, proprietary quartz vessel called BioCell. The BioCell offers a fixed, vertical 1 cm pathlength and uses less sample volume than traditional cuvettes. The pathlength is automatically normalized for each measurement type using the reader's software so that results may be compared to those obtained via cuvette-based spectrophotometers.

Application bottlenecks and related sources of error due to concentrated or dilute samples can be avoided through the use of micro-volume quantification without sample dilution. Additionally, micro-volume quantification can reduce sample and reagents costs associated with most common absorbance-based molecular biology procedures and some fluorometric procedures.

For more information, visit www.biotek.com



▲ Take3 micro-volume analysis comparison between an in-situ assay and one conducted in a microtube using a 20:1 volume ratio of BCA working reagent to protein standard.



An Energy Efficient Laboratory Oven

Problem: The global energy crisis is growing and is driving the costs of energy higher, making energy consciousness not only a necessity in terms of the environment, but also important for cost savings. Laboratories of any discipline are extremely energy intensive, with processes and experimental instruments running around the clock. The US Environmental Protection Agency's (EPA) 5 Star initiative estimates that the energy consumption in a laboratory setting is five to ten times that of a normal office building [1]. Essential safety equipment which runs continuously is a major contributor to overall energy use, with ventilated cabinets running 24 hours a day consuming three to four times as much energy as an average house [1].

The laboratory energy consumption most easily reduced by the individual is from plug-based instruments. This makes up 23 percent of total use in the laboratory and it is essential that individual users are made aware of the efficiency features of equipment before use or purchase [2].

Laboratory ovens, used for heating and drying processes, frequently run for lengthy, high temperature protocols and use large amounts of electricity. Some units run 24/7 to be prepared for rapid testing. Selection of an oven based on the energy footprint within the laboratory can provide significant cost savings over time.

Solution: The Thermo Scientific Heratherm ovens provide an efficient approach to laboratory heating and drying applications with savings in energy consumption of up to 39 percent compared to conventional instruments [3]. At energy costs of \$0.2 per kWh, this translates into savings of \$409 per year, when running the oven at 150 °C, 24 hours a day. Designed to incorporate a number of control options and energy efficiency features, these ovens provide an excellent solution to reduce the consumption of electricity.

Perhaps the simplest method of saving energy within heating and drying applications is to select an oven with effective use of the internal chamber space. It is crucial that the design of the shelving system provides space advantages, eliminating the need for a second oven unit.

Insulation is vital in any heating application, as energy transfer to the surrounding environment not only increases the energy consumption of the oven unit, but places additional strain on the temperature control systems for the laboratory space. The special insulation and heat decoupled doors of the

Heratherm® range are engineered to minimize energy wastage through heat loss.

It is important that a laboratory heating and drying oven is capable of meeting specific application needs and the platform is flexible enough to provide a resource for a number of methods. The Heratherm General Protocol, Advanced Protocol and Advanced Pro-

tol Security models form an oven range with a focus on energy efficiency and sample protection. Advanced Protocol instruments incorporate controllable temperature cycles, fan speeds and damper positions to provide more energy efficient heating and cool down processes. The Advanced Protocol Security models incorporate an auto-dry function that shuts the oven down when the sample is dry, reducing energy wastage through unnecessary operation.

Several design features can help prevent the oven from being run longer than is needed, reducing energy consumption even further:

- The flexible timer function enables the operator to set the operating time, automatically switching the unit on/off at specified times during a day
- The boost function reduces the heat up time of the oven by up to 46 percent, thus avoiding 24/7 operation of the unit

Selection of an appropriate oven for heating and drying, based on energy efficiency features, can help to increase the productivity of the laboratory, while decreasing the cost of running the equipment. The current economic climate makes energy efficient laboratory instruments crucially important in maintaining affordable overhead costs.

For more information on the new Heratherm ovens, visit www.thermoscientific.com/hot.

References

- [1] http://www.energystar.gov/index.cfm?c=industry.bus_labs_benchmark
- [2] http://labs21.lbl.gov/wiki/equipment/index.php/Energy_Efficient_Laboratory_Equipment_Wiki
- [3] Based on internal performance data (Comparing traditional Thermo Scientific to the new Heratherm ovens)



▲ Figure 1: Thermo Scientific Heratherm Ovens can save up to 39 percent on energy consumption



Statement of Ownership, Management, and Circulation (Requester Publications Only)

1. Publication Title LAB MANAGER	2. Publication Number 0 0 0 2 - 4 1 8 8	3. Filing Date 9/30/11
4. Issue Frequency 10 x a year; combined Feb/Mar and Jul/Aug	5. Number of Issues Published Annually 10 x a year	6. Annual Subscription Price (if any) \$120.00
7. Complete Mailing Address of Known Office of Publication (Not printer) (Street, city, county, state, and ZIP+4®) 1201 BLUFF STREET, P.O. BOX 370, FULTON, MO 65251-0370		Contact Person Greg Brewer Telephone (include area code) 705-528-6888

8. Complete Mailing Address of Headquarters or General Business Office of Publisher (Not printer)

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

9. Full Names and Complete Mailing Addresses of Publisher, Editor, and Managing Editor (Do not leave blank)

Publisher (Name and complete mailing address)
LabX (Mario Di Ubaldi)

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

Editor (Name and complete mailing address)
LabX (Pamela Ahlberg)

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

Managing Editor (Name and complete mailing address)

Lab X

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

10. Owner (Do not leave blank. If the publication is owned by a corporation, give the name and address of the corporation immediately followed by the names and addresses of all stockholders owning or holding 1 percent or more of the total amount of stock. If not owned by a corporation, give the names and addresses of the individual owners. If owned by a partnership or other unincorporated firm, give its name and address as well as those of each individual owner. If the publication is published by a nonprofit organization, give its name and address.)

Full Name	Complete Mailing Address
Geocalm, Inc.	P.O. Box 216, 478 Bay Street Midland, ON CANADA L4R 1K9

11. Known Bondholders, Mortgagees, and Other Security Holders Owning or Holding 1 Percent or More of Total Amount of Bonds, Mortgages, or Other Securities. If none, check box ☒ None

Full Name	Complete Mailing Address
-----------	--------------------------

12. Tax Status (For completion by nonprofit organizations authorized to mail at nonprofit rates) (Check one)

The purpose, function, and nonprofit status of this organization and the exempt status for federal income tax purposes:

☐ Has Not Changed During Preceding 12 Months

☐ Has Changed During Preceding 12 Months (Publisher must submit explanation of change with this statement)

PS Form 3526-R, September 2007 (Page 1 of 3 (Instructions Page 3)) PSN: 7530-09-000-8605 PRIVACY NOTICE: See our privacy policy on www.usps.com

13. Publication Title LAB MANAGER	14. Issue Date for Circulation Data Below JUL AUG 11
---	--

15. Extent and Nature of Circulation	Average No. Copies Each Issue During Preceding 12 Months	No. Copies of Single Issue Published Nearest to Filing Date
--------------------------------------	--	---

a. Total Number of Copies (Not press run)	30,437	31189
---	--------	-------

b. Legitimate Paid and/or Requested Distribution (By Mail and Outside the Mail)	(1) Outside County Paid/Requested Mail Subscriptions stated on PS Form 3541. (Include direct written request from recipient, telemarketing and Internet request a from recipient, paid subscriptions including nominal rate subscriptions, employer requests, advertiser's proof copies, and exchange copies.)	28,811	29650
	(2) In-County Paid/Requested Mail Subscriptions stated on PS Form 3541. (Include direct written request from recipient, telemarketing and Internet request a from recipient, paid subscriptions including nominal rate subscriptions, employer requests, advertiser's proof copies, and exchange copies.)		
	(3) Sales Through Dealers and Carriers, Street Vendors, Counter Sales, and Other Paid or Requested Distribution Outside USPS®	1,526	1539
	(4) Requested Copies Distributed by Other Mail Classes Through the USPS (e.g. First-Class Mail®)		

c. Total Paid and/or Requested Circulation (Sum of 15b (1), (2), (3), and (4))	30,337	31189
--	--------	-------

d. Non-requested Distribution (By Mail and Outside the Mail)	(1) Outside County Nonrequested Copies Stated on PS Form 3541 (Include Sample copies, Requests Over 3 years old, Requests Induced by a Premium, Bulk Sales and Requests Including Association Requests, Names obtained from Business Directories, Lists, and other sources)		
	(2) In-County Nonrequested Copies Stated on PS Form 3541 (Include Sample copies, Requests Over 3 years old, Requests Induced by a Premium, Bulk Sales and Requests Including Association Requests, Names obtained from Business Directories, Lists, and other sources)		
	(3) Nonrequested Copies Distributed Through the USPS by Other Classes of Mail (e.g. First-Class Mail®, Nonrequestor Copies mailed in excess of 10% Limit mailed at Standard Mail® or Package Services Rates)		
	(4) Nonrequested Copies Distributed Outside the Mail (Include Pickup Stands, Trade Shows, Showrooms and Other Sources)		

e. Total Nonrequested Distribution (Sum of 15d (1), (2), and (3))	0	0
---	---	---

f. Total Distribution (Sum of 15c and e)	30,337	31189
--	--------	-------

g. Copies not Distributed (See Instructions to Publishers #4, (page #3))		
--	--	--

h. Total (Sum of 15f and g)	30,337	31189
-----------------------------	--------	-------

i. Percent Paid and/or Requested Circulation (15c divided by 1 times 100)	100	100
---	-----	-----

16. Publication of Statement of Ownership for a Requester Publication is required and will be printed in the issue of this publication. **October 2011**

17. Signature and Title of Editor, Publisher, Business Manager, or Owner <i>Mario Di Ubaldi</i>	Date 09-14-11
--	------------------

I certify that all information furnished on this form is true and complete. I understand that anyone who furnishes false or misleading information on this form or who omits material or information requested on the form may be subject to criminal sanctions (including fines and imprisonment) and/or civil sanctions (including civil penalties).

PS Form 3526-R, September 2007 (Page 2 of 3)

Marketplace

SONNTEK – “STAY FOCUSED”

Still the *Best Selection* of Research Lamps *Anywhere!*

201-236-9300

www.sonntek.com

sonntek@aol.com





Modular Design:
A unique system that allows you to add functional space saving units now or as required.



Modular Laboratory Furniture Solutions

Phone: (905) 855-9093 • Toll Free: 1-888-755-9093
Fax: 1-866-226-8939 • Email: info@unilabfurniture.com

www.unilabfurniture.com

ADVERTISER INDEX

Company	URL	Page
A&D Weighing	http://www.andweighing.com	26
Adam Equipment, Inc.	http://www.odomequipment.com	25
Agilent Technologies	http://www.agilent.com/chem/iset	7
American Instrument Exchange, Inc.	http://www.americaninstrument.com	97
AnytimeLabTrader, LLC	http://www.anytimelabtrader.com	97
Ariel	http://www.arielusa.com	55
BEVCO Ergonomic Seating	http://www.bevco.com	75
BINDER Inc.	http://www.binder-world.us	6
BioConference Live	http://www.bioconferencelive.com	91
Biohit	http://www.biohit.com/vw-promos	19
BioSurplus, Inc.	http://www.biosurplus.com	97
BioTek Instruments, Inc.	http://www.hybridreader.com	81
BrandTech Scientific, Inc.	http://www.brandtech.com	47
Brookfield Engineering	http://www.brookfieldengineering.com	33
Buck Scientific	http://www.bucksci.com	71
Conquer Scientific	http://www.conquerscientific.com	97
Douglas Scientific	http://www.douglasscientific.com/treesample	61
Drummond Scientific Company	http://www.drummondsdci.com	37
Elgo LabWater / Veolia Water	http://www.elgolabwater.com	3
EMCO High Voltage Power Corporation	http://www.emcohighvoltage.com	46
Eppendorf North America	http://www.eppendorf.com	54 & 69
EquipNet, Inc.	http://www.equipnet.com	97
Erlab, Inc.	http://www.captain.com	29
GenTech Scientific, Inc.	http://www.gentechscientific.com	97
Gilson, Inc.	http://www.pipetmon.com	53
Globe Scientific Inc.	http://www.globescientific.com	43

Pre-Owned Equipment Marketplace

GenTech Certified

Full 1 Year Warranty
Lifetime Telephone Support
GC • LC • MS • AA • ICP



GenTech™
www.GenTechScientific.com
"DISCOVER THE DIFFERENCE"
ANALYTICAL INSTRUMENT
SALES, SERVICE, PARTS, TRAINING
585-492-1068
sales@GenTechScientific.com

Conquer
scientific

High quality
pre-owned
laboratory
instruments

877-9CONSCI
Save up to 90% on Lab Instruments
www.ConquerScientific.com

EQUIPNET

www.EquipNet.com 888.371.6555
Sales@EquipNet.com 781.821.3482

PRE-OWNED LABORATORY & ANALYTICAL EQUIPMENT

EquipNet, Inc. runs the largest online Marketplace™ for pre-owned lab & analytical equipment in the world. We provide world-class manufacturers with software, inventory and appraisal services that facilitate the management of their idle assets.



US • Canada • Puerto Rico/Latin America • Europe • India • Asia/Pacific

AnytimeLabTrader, LLC

Quality Used Lab Equipment

www.AnytimeLabTrader.com

Our Equipment Sells Itself!

Phone: 760-419-8658
Fax: 619-342-8693



ADVERTISER INDEX

Company	URL	Page
Grant Instruments	http://www.grantbio.com	66 & 67
Hanna Instruments, Inc.	http://www.hannainstrument.com	83
IAC Industries, Inc.	http://www.furnitureforlabs.com	41
Intertek	http://www.intertek.com	27
Julabo	http://www.julabo.com	34
Labconco	http://www.labconco.com	45 & PPG
LabWrench	http://www.labwrench.com	79
Mettrom USA, Inc.	http://www.mettromusa.com/oldtitrator	5
Mettler Toledo Inc.	http://www.mt.com/brainsondabrownxs	9 & 17
Miele, Inc.	http://www.labwasher.com	59
Molecular Devices, LLC	http://www.moleculardevices.com	2
Nuair, Inc.	http://www.nuair.com	70
Particle Sizing Systems	http://www.pssnicomp.com	51
Pittcon	http://www.pittcon.org	93
Proton Onsite	http://www.protononsite.com	99
Ricca Chemical Company	http://www.riccachemical.com	73
Sanyo Biomedical	http://www.greenfreezers.com	
Sartek, Inc.	http://www.sartek.com	96
Tecan US, Inc.	http://www.tecan.com/infinite1000pro	65
Terra Universal, Inc.	http://www.terrauniversal.com	31 & 100
Thermo Fisher Scientific Inc.	http://www.thermoscientific.com/polarad	15, 21, 87
Thermo Scientific NanoDrop	http://www.thermoscientific.com/nanodrop	90
Unilab Laboratory Furniture	http://www.unilabfurniture.com	96
USA Scientific, Inc.	http://www.usascientific.com/ergoone	
W.A. Hammond Driente Company	http://www.driente.com	35

AIE AMERICAN INSTRUMENT EXCHANGE

Laborator Equipment
bought•sold•exchanged

Quality lab equipment, reconditioned and guaranteed.

Working with biotech, biomedical, medical research, chemical, pharmaceutical, university and hospital research industries since 1969.

www.americaninstrument.com

1023 Western Ave. Haverhill MA 01832

E-mail: info@americaninstrument.com

Ph: 978-521-2221 Fx: 978-521-8822

SEARCH Type Your Keyword Here



**Looking for Used
Lab Equipment?**

Shop our online showroom

BioSurplus
www.BioSurplus.com
or call 858.550.0800 x201



Find over 5000 pieces
of lab equipment—
All In Stock!

PARTING POINTS

Takeaways from this month's issue:



TOP 10 MANAGEMENT SKILLS YOU NEED

To progress in their careers, lab managers, particularly those in their first management assignment, need to develop new skills. Often they had little opportunity to do this while working full time at the laboratory bench. Here are a few of the skills critical to success in a new management assignment:

- Managing budgets
- Planning and running effective meetings
- Management by walking around
- Maintaining personal integrity

10



16

THE FIFTH ANNUAL SALARY & EMPLOYEE SATISFACTION SURVEY

What has been true over the past four years of conducting this survey remains true: Those working in the scientific research field like what they do and have no plans to change careers:

- Those who said they liked the type of work they do remained at a high 90%
- The majority of the 1,050 respondents (31%) work in the R&D departments of their organizations
- Overall, respondents to this year's survey appear interested in keeping their labs viable, maintaining a capable staff, and staying relevant in the ever-changing research market



20

VISUALIZING A CAREER PATH

Lab managers are responsible for recruitment and development of chemists and other lab professionals. For lab employees, better understanding of jobs and available career paths can contribute to higher levels of job satisfaction:

- A job is not simply a set of tasks but is a part of an individual's career
- Traditional formats of job representation are acceptable but not very effective as communication tools
- A case study of refinery chemists illustrates how a new visual way of representing jobs might provide a better method for answering the question "What do the chemists do?"



24

THE PSYCHOBARBARIAN MANAGER

There are managers who have learned to use psychological techniques to confuse, contort, and control members of their staff. They are known as Psychobarbarian managers. Though you may never encounter one of these characters, here are some tips on dealing with such a manager if you do:

- First, play it straight; counter sarcasm by taking the comment literally
- Never do anything that can be perceived as disloyal
- Gain and maintain a high profile
- Keep a log; this can be a potent resource if the worst happens



68

ONE STEP AHEAD

When starting a business, an up-front investment is necessary to hire talented personnel, acquire the appropriate equipment, and secure the space required. Once the business is operating well, however, expansion can be difficult. Some things to consider:

- When planning a sustainable strategy for growth, the management team at any company should consider the value of the company's reputation
- Hire experienced scientists to develop analytical methods and oversee departments
- Anticipate clients' needs
- Evaluate new technologies to ensure a competitive edge



**WHY STORE DANGEROUS GASES
WHEN YOU CAN MAKE GAS ONSITE AS YOU NEED IT**

➤ TO FIND OUT HOW VISIT
ProtonOnSite.com



PROTON

THE LEADER IN **ON SITE** GAS GENERATION.



ProtonOnSite.com

Call us at 203-678-2000 | Sarah@protononsite.com

BioSafe™ Modular Cleanrooms



BioSafe™
Aseptic
Cleanroom

- Terra designs, builds and equips to your specs!
- Cleanliness to Class 10 (ISO 3), BioSafe™ all-steel designs
- Any size or floor plan, with pass-throughs and internal partitions
- A/C, temperature and humidity control, special lighting

Lab & Cleanroom Storage



Cleanroom supplies storage cabinets are available in several shelf and garment rod configurations, with HEPA filter module for optimal cleanliness of stored materials.

Starting at \$1,388

Vacuum Chambers



Many standard sizes and materials.

Starting at \$1,255

Low-Cost Solutions for High-Tech Industries

TERRA
UNIVERSAL.COM
Critical Environment Solutions

To order, call 714-578-6000 • Fax: 714-578-6020 Fullerton, CA

Desiccators



SmartDesiccator automates N2 flow to maintain setpoint humidity level (ambient to 0%RH). Seconds to set up and program!

Starting at \$821

Vacuum Cleaners



Many standard models, including the portable ULPA-filtered MicroVac above.

\$955

Contamination Control Hoods



Vertical Laminar Flow Station includes PLC control over motorized shield, FFU and lighting to meet Class 100 standards.

Starting at \$5,970



Model shown:
ValuLine WhisperFlow™
Polypropylene Laminar
Flow Hood

ValuLine hoods provide peak performance at lower cost! Available in 36" and 48" widths, with HEPA filtration unit and built-in spill tray.

Starting under \$2,000

- Laminar Flow Systems provide particle control to meet cleanliness standards to Class 10/ISO 4
- Ductless exhaust hoods incorporate activated carbon for safe purification of most organic vapors
- Laboratory hoods provide safe ventilation of fumes
- Benchtop models provide space-saving performance and economy
- Full range of optional features includes ionization, UV sterilization, and particle monitoring

Pass-Throughs



BioSafe™ Pass-Through Chambers feature no-lip, no-seam design for easy sterilization.

Starting at \$8,578

Garb & Parts Dispensers



Stainless steel dispenser is ideal for loose gloves, hair nets, shoe covers.

Starting at \$295



Three-bay acrylic wall-mount glove dispenser accommodates multiple glove sizes or materials.

Starting at \$235

Softwall Modular Cleanrooms



Flexible cleanroom anti-static vinyl panels and strip shield entry. Internal anteroom meets USP<797> requirement. Cleanliness to ISO 5.

Lab Apparel



Advanced Vi-Gard® I polyester/cotton lab coat combines durability, comfort and static control. Wide range of sizes and colors.

Starting at \$29