

Lab Manager[®] MAGAZINE

Run Your Lab Like a Business

July/August 2010

Volume 5 • Number 6

GLOBAL MANAGEMENT

ESTABLISHING A COMMON CULTURE AMONG FAR-FLUNG RESEARCH FACILITIES



**FIELD RESEARCH
INSTRUMENTATION**

Competing Priorities:
Aligning Tasks with
Management Goals

Perspective on: A Biotech Lab

INDEPENDENT
GUIDE TO BUYING
MICROPLATE READERS
INSIDE!
WWW.LABMANAGER.COM

“Subscribe Today; if you haven’t already. Visit www.labmanager.com/subscribe.asp



At Molecular Devices, we have one focus—our customers. Understanding your laboratory workflow is our top priority, and we direct product development toward solving your unique issues. Our instruments offer a full spectrum of detec-

Your Science. Our Systems. Your Success.

tion technologies and meet all throughput needs. Our goal is to deliver highly relevant analytical products to detect biology, decode data, and drive discovery.

Analytical Systems

- Microplate Detection
- Research Imaging
- High-Content Analysis
- Automated Patch Clamp
- High-Throughput Screening
- Microarray Scanning
- Conventional Electrophysiology
- Label-Free Analysis

Target Applications

- Screening
- Safety / Toxicology
- QA / QC
- Cancer Biology
- Neurobiology
- Stem Cells
- RNAi
- GPCRs
- Ion Channels
- Kinases
- Transporters
- And More

Contact us today to learn how we can support your scientific success.



www.moleculardevices.com

1311 Orleans Drive, Sunnyvale, CA 94089-1136 USA

Phone: 1 408 747 1700 | Fax: 1 408 747 3601

Toll Free: 1 800 635 5577

Email Contacts

Info@moldev.com
Sales@moldev.com
Support@moldev.com
Service@moldev.com

Sales & Support

United States & Canada
1 800 635 5577
Brazil: +55 11 3616 6607
United Kingdom: +44 118 944 8000
Germany: +49 89/96 05 88 0

China

+86 10 6410 8669 (Beijing)
+86 21 6887 8820 (Shanghai)

Japan

+81 6 6399 8211 (Osaka)
+81 3 5282 5261 (Tokyo)

South Korea: +82 2 3471 9531

For Research Use Only. Not for use in diagnostic procedures.

©2010 Molecular Devices, Inc. All Rights Reserved. Molecular Devices, the Molecular Devices logo, and all other trademarks are the property of Molecular Devices, Inc.



NO MATTER WHAT YOUR PURIFICATION SCALE, WATERS HAS YOUR SOLUTION.

**End-to-end, scalable purification systems.
HPLC and SFC. Only from Waters.**

[SEMI PREPARATIVE SCALE HPLC]



HPLC/UV or mass-directed purification to meet varying workflow demands, with the accessibility of Empower™ or MassLynx™ Software control.

[PREPARATIVE SCALE SFC]



The leading separations technology for purification laboratories with SFC systems, yielding up to 90% gains in solvent savings and throughput.

Find the solution for your application at waters.com/prep

©2010 Waters Corporation. Waters, Empower, MassLynx, and The Science of What's Possible are trademarks of Waters Corporation.

Waters
THE SCIENCE OF WHAT'S POSSIBLE.™

HUMAN HEALTH

ENVIRONMENTAL HEALTH



NOW EVERYONE'S
RESEARCH CAN GO
FIRST CLASS.

© 2010 PerkinElmer, Inc. 400176_02. All trademarks or registered trademarks are the property of PerkinElmer, Inc. and/or its subsidiaries.



Your ticket to performance is here. Built on the best-in-class technology of the EnVision® Multilabel Plate Reader, the performance and flexibility of EnSpire™ can help drive your cutting-edge research. Whether you're dealing with low transfection rate assays, limited cell supplies, time constraints or tight budgets, you'll get the most from your precious resources. With ultra-sensitive luminescence, Alpha-technology, and fluorescence and absorbance using quad-monochromator technology, EnSpire is the platform to have when your research is going places.

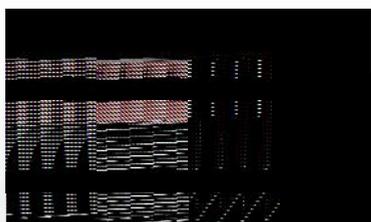
www.perkinelmer.com/catchthewave2



Add ultra-sensitive luminescence detection to your EnSpire order for FREE.
See www.perkinelmer.com/catchthewave2 for details.



MERCURY ANALYZERS



MA-3000 Direct Mercury Analysis

NEW NEW NEW NEW NEW

- » Direct Mercury Analysis with No Sample Preparation
- » Lowest Detection Limits Available!
- » Widest Linear Range Available!
- » A Single Calibration Curve for Entire Analytical Range
- » Solids, Liquids, and Gases on One Analyzer

IS YOUR
**MERCURY
ANALYZER**
MEETING YOUR
EXPECTATIONS?

hg-nic.us

Nippon Instruments North America
1.877.247.7241

Lab Manager[®] MAGAZINE

Run Your Lab Like a Business

ASK THE EXPERT 30

How to Overcome Challenges with Microscopy

Dr. Rebecca Williams, director of the Microscopy and Imaging Facility at Cornell University, talks about her role in overseeing the imaging laboratory while pursuing independent research in the field. **Tanuja Koppal, Ph.D.**

LAB MANAGER ACADEMY 20

Tips for Setting and Achieving Goals for Yourself and Your Lab **Karla Brandau**

SCIENCE MATTERS 44

Staffing Companies: Perception versus Reality **Alan Edwards**

SURVEY SAYS 60

What Goes into Buying a Titrator

PRODUCT FOCUS

Microplate Readers	54
Microscopes	55
Low-Temperature Freezers	56
Clean Room Furnishings	58

EVOLUTION OF 46

Water Purification Systems

TECHNOLOGY NEWS 78

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

APPLICATION NOTES 81

HOW IT WORKS

High-Speed Microplate Moving	96
Verifying Liquid Handling Instrumentation Performance	98
Fluorescence Mix-And-Read Assays For Antibody Discovery	100
Moisture And Ash Analysis	102

MARKETPLACE 105

ADVERTISERS INDEX 104

PARTING POINTS 106

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.

©2009 *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



A Break Through In Sample Preparation

METTLER TOLEDO is introducing the all new OneClick™ Standard Solutions Preparation powered by LabX Software. Shatter your concept of what it takes to do standard solutions preparation—the traditional process of tediously weighing the correct amount, working through calculations, and documenting every sample. With OneClick you accelerate the process with a balance that guides you step-by-step through your SOP with precise weighings, automatic calculations, and complete data recording.

It's about time—yours. Call 1-800-METTLER to set-up a free lab demonstration, or visit www.mt.com/one-click-weighing to see the details of a balance accelerated beyond weighing.

► www.mt.com/one-click-weighing

METTLER TOLEDO



Adjusting to a Flat World

In Thomas Friedman's *The World Is Flat: A Brief History of the Twenty-First Century*, the author examines the impact of the "flattening" of the world, and argues that globalized trade, outsourcing, supply-chaining and political forces have changed the world permanently, for both better and worse. He also argues that the pace of globalization is quickening and will continue to have a growing impact on business organization and practice.

This month's cover story looks at the flattening world from the perspective of the lab manager struggling to stay on top of projects and teams located far away from his or her facility. According to author John Borchardt, complexities of the problem include various cultural attitudes toward deadlines and punctuality as well as differences in language, age and time zones. He credits technology such as e-mail, long-distance conference calls and videoconferencing with making global management even remotely (no pun intended) possible, but also points out their limitations. Those technologies "are not conducive to relaxing and engaging in the informal conversations that build familiarity, trust and a sense of common purpose between managers and their staff members and between staff members themselves." Turn to page 10 to learn some good, basic management techniques that can go far in smoothing out some possible spikes in this new flattened world.

John Borchardt also contributes this month's Leadership & Staffing article, "Competing Priorities" (page 16). In the piece he discusses the critical importance of making sure your efforts in the lab are in line with those of the larger organization. He offers up practical tips for keeping your priorities straight, your lab more competitive and, perhaps in doing so, your job better protected.

In this month's Technology & Operations article, "Into the Field," Angelo DePalma explores the latest in field instrumentation and the technologies and demands that are driving its evolution. Though the need for real-time, actionable analytics that the instrumentation offers is great, DePalma says that many of these portable instruments "lack the dynamic range, sensitivity, resolution, automation capability, and interoperability of their benchtop counterparts." Turn to page 22 to learn more.

This month we are proud to introduce two new features to the magazine. The first, Lab Manager Academy, introduces the topic and the presenter of our next Lab Manager Academy webcast. Turn to page 20 to meet Karla Brandau who, here and in her webcast on September 1, shares her insights into the importance of setting crystal clear goals for your lab. Visit www.labmanager.com/academy to learn more and register.

We also introduce our first Lab Product Surveys results. Based on your participation (www.labmanager.com/articles.asp?ID=407), turn to page 60 to learn what your peers say goes into purchasing a titrator.

And speaking of surveys, if you haven't already, expect to receive this year's *Lab Manager Magazine* Salary and Job Satisfaction survey in your e-mail inboxes soon. Please take a minute to share your story so that we can get a clearer picture of what, if anything, has changed over this past year of economic changes and challenges. The results will be published in the October issue. Make sure you're included.

Lastly, I hope you will be taking some time away from the lab this summer to relax and recharge your batteries. Enjoy yourself and don't forget the sunscreen!

Pamela Ahlberg - Editor-in-Chief

In the "Ask the Expert" article in the June issue of the magazine (page 68), the subtitle should have read: "How to Overcome Challenges with Chromatography."

Also in the June issue, in the second column on page 71 of the HPLC Systems Product Focus, "Increasing pressure from 1000 to 12000 psi..." should have read: "Increasing pressure from 1000 to 12000 bar..."

We apologize for any confusion this might have caused.

Publisher Mario Di Ubaldi
mariod@labmanager.com
203.227.1390

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

Assistant Editor Katia Caporiccio
katiac@labmanager.com
888.781.0328 x233

Contributors John K. Borchardt, Ph.D.
John Buie
Richard Daub
Angelo DePalma, Ph.D.
Sara Goudarzi
Tanuja Koppal, Ph.D.
Vince McLeod, CIH
Gloria Metrick
Rich Pennock
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

M I C R O P L A T E I N S T R U M E N T A T I O N

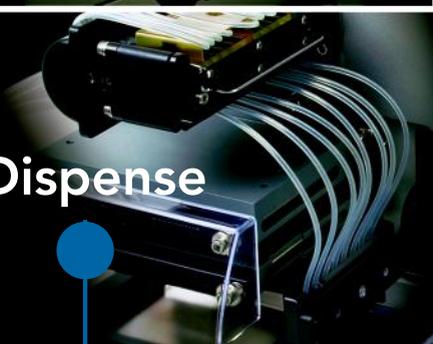
Read



Wash



Dispense



Automate



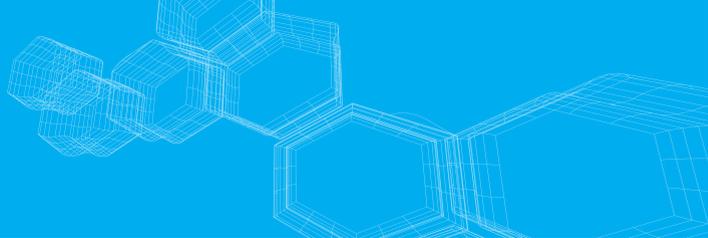
Bringing It All Together

Are you reading, washing, dispensing or automating a microplate-based process?
If so, we have the instrumentation and expertise to help.

 **BioTek**[®]
Get a Better Reaction.

www.biotek.com

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



GLOBAL MANAGEMENT

COMMUNICATION TECHNOLOGY AND SOUND MANAGEMENT SKILLS PROVIDE HOPE FOR MANAGERS by John K. Borchardt

An increasing number of lab managers now supervise people working hundreds or even thousands of miles away. This is nothing new, but the practice is now more common than ever due to globalization of R&D and modern communications technology. Why establish remote laboratories in other countries? These laboratories can foster success in the global marketplace.

DuPont provides an interesting example of why companies establish R&D centers around the world. In discussing the expansion of DuPont's Knowledge Center in Hyderabad, India, last February, Mark Vergamamo, DuPont executive vice president, explained his firm's rationale for building laboratories around the world: "The expansion at the DuPont Knowledge Center demonstrates DuPont's focus on growing in emerging markets, such as India, by addressing local market needs. The goal is to help us better understand the unique market needs here and develop solutions tailored to these needs."



▲ *DuPont Knowledge Center, Hyderabad, India.*

PHOTOGRAPH COURTESY OF DUPONT COMPANY.

Also, markets in some developing countries are growing more rapidly than markets in developed countries. "The establishment of the DuPont Knowledge Center in India is consistent with our company's strategy of going where the growth is," said Balvinder Singh Kalsi, president, DuPont India. Uma Chowdhry, DuPont's senior vice president and chief science and technology officer, explains, "We have seen time and again that we accelerate revenue growth in a region when we augment our sales presence by strengthening local technical expertise."

Management challenges

Forming and managing effective global research teams with members located in far-flung countries and different time zones is a major challenge for lab managers at multinational companies and at companies outsourcing lab work overseas. It is also a challenge for lab managers working with their employers' other remote personnel, such as sales representatives.

Establishing a common laboratory culture among labs in different countries and continents is a huge challenge. Several factors contribute to the complexity of the problem. One is differences in the countries' cultures. For example, some cultures have particular concepts of time that can foster varying attitudes toward deadlines and punctuality.

Language differences are often a barrier to effective communication. Age is another. At many firms, employees at Asian labs are substantially younger than employees in U.S., European and Japanese labs. These younger employees have different outlooks on R&D and life in general.

Accepting such diversity and even embracing it is important. The members of a diverse laboratory workforce



POST A 24/7 SENTRY OVER YOUR CRITICAL SUBSTANCES

- Dependable
 - Stable Temperatures
 - Available with Locks
- Interior mounted electronic controls with temperature display for convenient monitoring.
 - User-programmable temperature set point, high/low alarm values and alarm delay period.
 - Integral remote alarm interface.
 - High/low temperature history record, periodic maintenance notifications and built-in diagnostics.

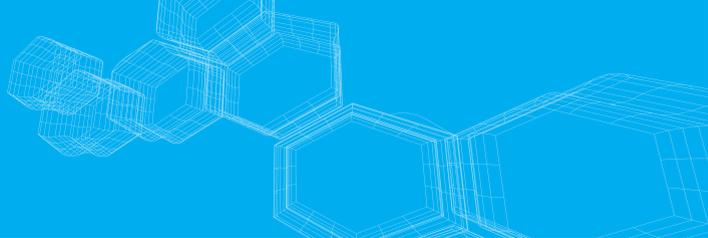


With the **MicroSentry™ Scientific** refrigeration control, you have the ability to control, confirm and capture temperature performance, giving you the ultimate confidence in your refrigeration.



MicroSentry™ Scientific controls enhance what are already high-performance products. Each general purpose, FMS and EP Marvel Scientific refrigerator has been designed specifically for the lab with a **Commercial UL Listing** for your peace of mind. To learn why Commercial UL is so important, visit: www.marvelscientific.com/standards





approach problems in different ways and will generate a broader array of potential solutions than a more homogeneous workforce can.

Communications

Effective communications are essential in understanding and accommodating these differences. English is the common language of international business and science. However, for most workers in international laboratories, English is their second language. Your ability to understand them may be hampered by their accents when speaking English. Of course, communication is a two-way street. Staff members of an international laboratory will appreciate your efforts to speak their language. However, when doing so you will have an accent as well. And of course, when speaking a second language, one's vocabulary is often limited.



▲ *AstraZeneca Laboratory, Hyderabad, India*

PHOTOGRAPH COURTESY OF ASTRAZENECA INTERNATIONAL.

Even when countries share a common language, different cultures can result in different meanings for the same words and result in miscommunication. While some argue about the attribution, it was supposedly Winston Churchill who said, "Britain and America are two nations divided by a common language." For example, what Americans would call the trunk of a car their British cousins would call the boot.

Most companies rely on more than just written reports to promote technology exchange between their employees located in far-flung laboratories. For example, Procter & Gamble organizes an annual analytical laboratory conference for managers and staff members. Ana-

lytical chemists from around the world come to P&G research centers in Cincinnati to attend this conference and interact with their peers. Besides research topics, they also discuss corporate issues. For instance, when P&G acquired Gillette a few years ago, I gave a workshop on new human resources policies to be instituted as part of laboratory consolidation.

When communicating through conference telephone calls and videoconferencing, time zone differences can be a challenge in scheduling and conducting these calls. For example, one lab manager I know has monthly calls with team members located in Houston, Kuala Lumpur (Malaysia), Bangalore (India) and The Hague (the Netherlands).

Videoconferencing between groups

While e-mail and long-distance conference telephone calls still dominate oral communications between project teams working at research centers in different countries, videoconferencing is now often used, particularly in larger companies. Videoconferences permit virtual group and team meetings that bridge multiple locations. Members of project teams located at two or even three laboratories will meet with their images being displayed on large monitors set up in conference rooms. Videoconferencing technology has improved; projected images are clearer and delays in the transmission of images and sound have become shorter. While conversation is often stilted initially, after two

or three group meetings, team members become more natural and relaxed when speaking to each other.

Makers of videoconferencing gear, such as U.S.-based Cisco Systems Inc. and Polycom Inc., are likely to see a long-term increase in equipment sales according to telecom analyst Aapo Markkanen at IHS Global Insight. Polycom's Robert Stead said the videoconferencing market could grow at a compound annual rate of around 17 percent in the coming years, to reach some \$8.6 billion by 2013.

Videoconferencing can serve as a backup to face-to-face meetings when weather conditions close airports. For example, when many European airports were closed for an extended period in April 2010 by the volcanic eruption in Iceland, videoconferencing experienced significantly increased use.



▲ Polycom videoconferencing station.

PHOTOGRAPH COURTESY OF POLYCOM.

Communicating via the Internet

More recently, the combination of Web cameras and voice over Internet protocol (VoIP) has made it common for people located many miles apart to communicate while seeing each other's images and trading images sent over the Internet and displayed on computer screens. Staff members can make reports to their supervisors and managers can conduct performance reviews using these technologies. For example, team members located around the globe can present oral reports and show slides during webinars.

“Praise and recognition for work well done is even more important when working with long-distance teams ...”

While communication is still usually more effective face-to-face, videoconferencing and Internet technologies are increasingly used to reduce the expenses associated with business travel. Many laboratories have substantially reduced their travel budgets as a result of the recent recession. Reducing business travel also increases managers' productivity, since time spent in airports and on airplanes is seldom as productive as time spent working in a laboratory office or a home office.

For example, a former manager of mine later supervised all surfactants-related research conducted at three laboratories located in the U.S., the Netherlands and the United Kingdom. She spent at least half her time traveling and often sacrificed part of her weekends traveling to Europe for Monday meetings. Eventually she and others made the transition to conducting much of this communication by videoconference.

Building teams

In terms of managing people located in distant laboratories, the challenge of videoconferencing and other communications technologies is getting to know what makes people tick, what motivates them, while being many miles apart. The various technologies discussed above are not conducive to relaxing and engaging in the informal conversations that build familiarity, trust and a sense of common purpose between managers and their staff members and between staff members themselves.

Gloveboxes



Economical plastic chambers start at \$819

Complex System Integration (shown: anaerobic test chamber)

Hundreds of standard enclosures

- Acrylic
- Dissipative PVC
- Polypropylene
- Polycarbonate
- Stainless Steel
- More!

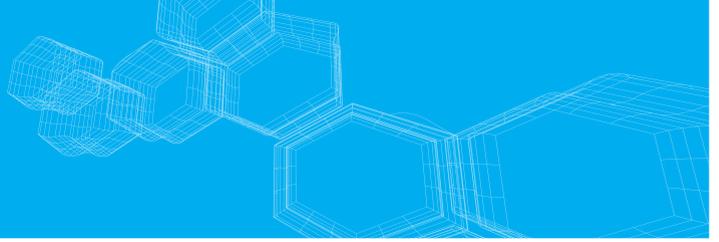
Mix and match standard process controls for

- Temp. (-40° to 300°C)
- Fume removal
- Particle filtration
- Process gas generation & mixing
- Vacuum
- High/low humidity
- Static control

TERRA UNIVERSAL.COM
Critical Environment Solutions

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

Low-Cost Solutions for High-Tech Industries



Trust and a sense of common purpose are essential to having effective teams whose members work well together. The cultural differences and communications challenges discussed above make building long-distance teams both more difficult and more rewarding than when all team members have similar backgrounds, outlooks and work habits. The reduced effectiveness of communications technologies—compared to routine, very frequent face-to-face contact—adds to the challenge of building effective teams.

To compensate for this, managers have to frequently remind team members of how each person's work plays an important role in achieving the common mission of the team. Praise and recognition for work well done is even more important when working with long-distance teams than when team members are all located in the same laboratory.

PROJECT MANAGEMENT SOFTWARE

By John K. Borchardt

Managing projects, particularly large projects with many team members, can be challenging. It is even more so when project team members work in two or more laboratories and seldom, if ever, all meet in face-to-face meetings. Judicious use of project management software can enable lab managers, team leaders and team members to keep informed on all team members' progress in meeting their goals. There are a large number of programs, some of them free, to help managers plan and organize projects and stay on top of progress once work begins. These can be shared via the Internet or a company intranet.

TYPICAL CONTENT INCLUDES:

- An overview of the project and a description of its goals and justification
- Information on each team member's assigned tasks and workload; this can be used in scheduling vacations, training and conference attendance
- A list of important project milestones and target dates for completion
- Task lists for each team member and deadlines for completion of each task
- Information to be shared among team members
- Information on similar projects

Managers should guard against focusing too much on the planning phases and not enough on project tracking and adjustments to the plan or schedule as they become necessary. The software employed should be as simple and easy to use as possible. Some software comes with many options that are time-consuming to learn and offer little information-sharing and time-management advantages. Other features can be very useful, particularly in complex projects involving several phases proceeding in parallel. For example, there is often a critical path. Its duration and milestone definition can determine the length and cost of the entire project.

To help build a sense of common purpose and trust between team members, managers should design small projects within large ones in which two or three team members from distant laboratories will work together to achieve a goal. Such "mini-projects" could include having team members jointly write research reports, articles for trade magazines or research papers. Other joint activities could include working with patent attorneys on preparing patent applications or planning the next phase of a project. Managers could assign two or three team members to develop solutions to potential problems, identify toll manufacturers or handle other project-related activities.

"Some cultures are more task oriented while others are more relationship oriented."

Managers should work with each team member to set both individual and team goals. These goals should have mutually agreed-upon deadlines. Be sure every team member knows the others' goals and deadlines and how each person's tasks contribute to achieving overall project goals. Monitor progress in an effective way without implying a lack of trust or respect for team members.

Frequent and effective communication, particularly by the manager, is essential to establish a clear sense of common purpose between team members located long distances from each other. Distance reduces team cohesion. Managers should encourage team members to communicate using the technology best for the immediate purpose: e-mail, VoIP telephone calls, etc.

Lab managers should work with team members to decide the most effective means of communicating with each other. Keep your oral and written communications clear, concise and straightforward. In oral communications, pause frequently to conduct a process check to be sure everyone understands what has just been discussed or agreed to. Accurate e-mail summaries of the key points of meetings are another way of ensuring that everyone understands what has been agreed upon during oral discussions.

Develop cultural sensitivity. Some cultures are more task oriented while others are more relationship oriented.

As always, managers must lead by example. Say what you do and do what you say. Communicate clearly

and concisely. Meet commitments you make to team members. Don't have hidden agendas; team members will usually sense this if you do. Demonstrate respect for every team member. Don't let them see or hear you become angry or frustrated. These emotions are counterproductive in terms of building effective work teams.

New international laboratories

Establishment of new laboratories overseas can create major communications and trust issues, particularly if laboratory employment is stagnant or declining in your company's home country. For example, robust economic growth in China, India and elsewhere has led chemical, oil and pharmaceutical companies to establish new laboratories in these countries. These new laboratories are often quite large. Deciding what projects should be transferred to new laboratories in China and India is an important issue currently being faced by laboratory managers at large chemical and oil companies.

The challenges of efficiently managing laboratories located many miles apart will confront lab managers for a long time to come.

References

1. J.K. Borchardt, "Project Management for Teams," *Lab Manager Magazine*, November 2005 (<http://pubs.acs.org/subscribe/journals/tcaw/11/i05/html/05work.html>).
2. J.K. Borchardt, "Staying on Schedule," *Lab Manager Magazine*, August 31, 2009 (<http://labmanager.com/articles.asp?ID=332>).
3. K. Williams and P. Hughes, "Validating Processes," *Lab Manager Magazine*, February 23, 2009 (<http://labmanager.com/articles.asp?ID=217>).

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



The Next Generation of Microplates

Introducing the Optimiser™, a revolutionary breakthrough in microtiter plate technology from Siloam Biosciences, Inc. The Optimiser™ provides the versatility to extend the value of your samples, maximize the sensitivity of your assays and increase the throughput of your lab with decreased assay time.

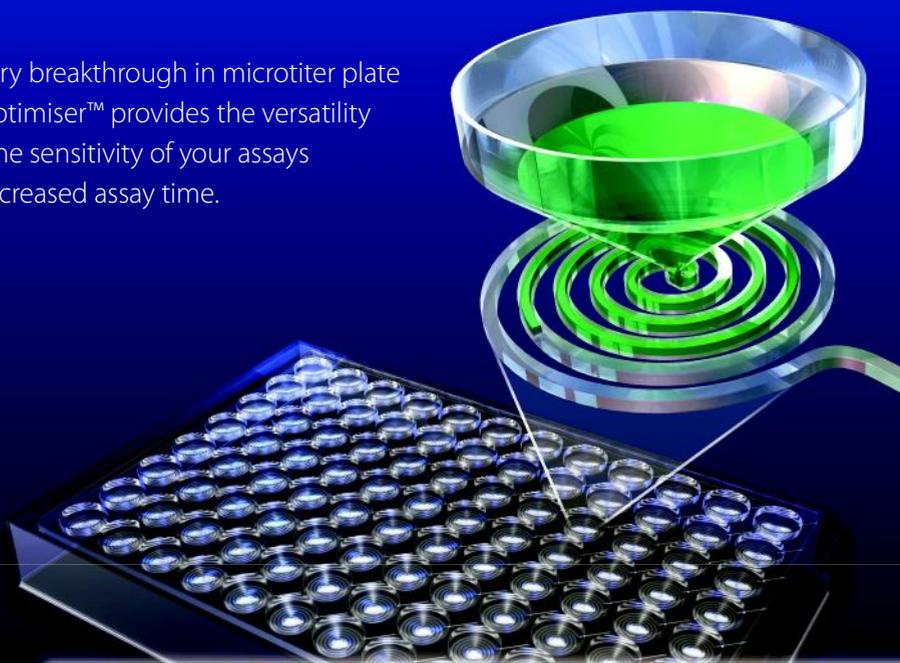
Compare Optimiser™ to Traditional 96 Well Plates

	Optimiser™	96 Well
Sample volume*	5 µl +	50-300 µl
Assay time	< 30 min	4-12 hrs
Sensitivity**	< 10 pg/ml	~150 pg/ml
Wash cycle	NO traditional wash	3x wash/step
Assay reagent cost***	\$5.38/plate	\$71/plate

* Min vol is 5 µl; extra vol for high sensitivity mode

** For "off-the-shelf" IL-6 assay with 100 µl sample volume

*** For sandwich assay with chemiluminescence detection



Siloam Biosciences, Inc.
417 Northland Blvd
Cincinnati, OH 45240 USA
PH 513.429.2976 Fax 513.429.2946



COMPETING PRIORITIES

TECHNIQUES FOR PRIORITIZING AND MANAGING TASKS IN ALIGNMENT WITH YOUR ORGANIZATION'S GOALS

by John K. Borchardt



In private-sector laboratories, the managers' goal is to maximize long-term revenues while minimizing costs. To do so, one can use a variety of methods to establish priorities and ensure that the most important projects receive the resources needed to be completed in a timely fashion. This requires establishing priorities, since lab managers' resources of their own time, staff time and money are limited.

Setting priorities

Lab priorities are set by the overall goals of an organization, using the principle of "cascading goals" (also called goal alignment). This means breaking down the overall goals of the organization into goals for your work group and then into individual goals for staff members. An example from my own work history is given in the sidebar and Figure 1. Priorities for different projects and activities are determined by the profit-making potential of the project, by project deadlines and by your manager.

"Priorities for different projects and activities are determined by the profit-making potential of the project, by project deadlines and by your manager."

The next step is providing the resources needed to achieve the goals of your high-priority projects. These resources include your own time; staff time; laboratory resources of equipment, instrumentation and space; and money to pay for all these.

No more than one project can be your top priority at one moment. I am still amused by a discussion of my five priorities with a supervisor more than thirty years ago. When I walked out of his office he had assigned three of my projects a No. 1 priority. The result of this discussion

was of little help to me in allocating my own time and that of my laboratory technicians.

Delegating responsibilities

Never delegate something that is a critical factor to your personal success. Do so and you risk going from managing multiple priorities to managing just one—finding another job. However, lab managers can increase the time they have available for high-priority activities by delegating lower-priority ones, particularly those that can readily be performed by others. Tasks that can be delegated include making business travel arrangements, filing, data entry and other time-consuming tasks easily completed by a staff member.

The above examples are tasks that are time-consuming but not intellectually demanding. Some intellectually demanding tasks can also be delegated. For example, managers and senior-level staff members at an increasing number of laboratories are delegating the often time-consuming responsibility of writing reports and researching technical subjects to contract technical writers. Doing so enables managers to have more time for high-priority planning and review activities. Senior staff members will have more time for actually planning and performing lab work and training others.

Delegating does not mean abandoning the responsibility to monitor progress and intervene when necessary. For example, using computer technology, Peter Gallant, CEO of Kingston, Ontario, biomedical startup Pathogen Detection Systems, tracks everything he delegates. E-mail delegating responsibilities are automatically attached to a task in Microsoft Outlook, assigned as "delegated" and filed under the name of the person to whom the task is delegated (the recipient of the e-mail). Gallant can quickly produce a list

of every item he has delegated to any of his direct reports. He gets a quick update on each item at his weekly staff meetings.

Failure to delegate lower-priority and less difficult tasks is a common manager affliction and is responsible for the phenomenon of the micromanager. Becoming overly involved in the details of your staff members' work creates huge demands on your time. It is the opposite of empowerment and slows progress as staff members feel compelled to come to you for detailed instructions and are afraid to make decisions on their own.

Triage

Triage is a concept that arose in hospitals and first aid stations to ensure that wounded soldiers and victims of mass accidents received treatment in a manner that would ensure the survival of the greatest number of individuals. It involves categorizing patients and determining which need services first. Triage can also be applied to laboratory projects and activities. It requires looking at each project and activity and asking, "Is this really necessary if the organization is to prosper?" The second question that must be asked is, "If I retain this activity, what other activities must we give up?"

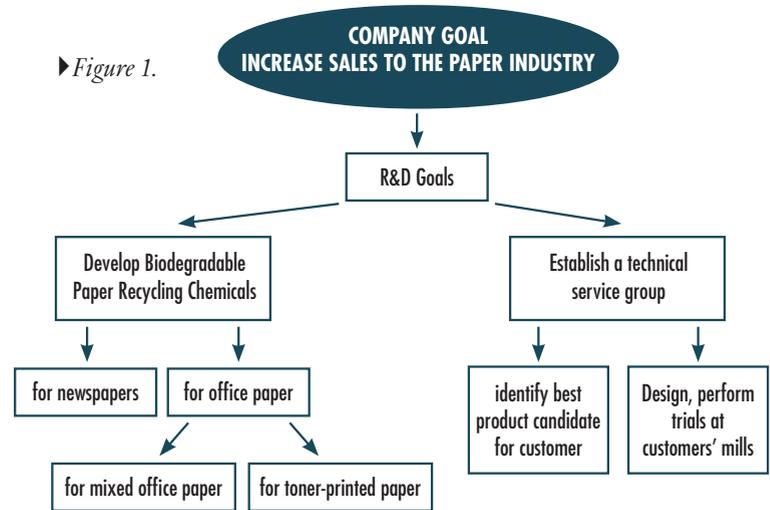
It is difficult to give up traditional activities even if they are time-consuming. They are part of the workplace culture and their familiarity is often reassuring. Hence, when the organization's business is going well and budgets aren't under pressure, triage seldom occurs. It often does occur with the arrival of a new manager without strong attachments to old ways of doing things. Other catalysts for triage are staff reductions and budget cuts. The resulting loss of resources means that those still available must be focused on the highest-priority activities.

One common area for triage is meetings. The number of meetings is often excessive. Information can sometimes be conveyed more efficiently through e-mails. Another concern is minimizing the time spent in meetings by being sure they are run efficiently. A third is looking at your schedule and the meeting agenda. Is your attendance at the meeting really necessary? What is lost—and gained—if you skip the meeting?

Effective time management

None of the above measures will achieve much without effective time management. Effective time management

► Figure 1.



doesn't mean keeping busy every minute. It's using those minutes for high-priority activities that will make a difference. "Managers cannot ensure the long-term viability of their organizations by working on administrative trivia and responding to customer crises all day. That's

When it comes to
REDUCING COSTS & INCREASING VALUE

Anything is Possible.[™]

Qorpak® has been supplying labs with quality containers and closures for over 25 years.

We now offer a host of **Value Added Services** that help lab managers **improve productivity, decrease labor costs and increase profitability.**

Our Value Added Services Include:

- Label Printing and Application
- Custom Package Design
- Global Sourcing
- Precleaned Containers
- Safety Coated Containers
- UN Certified Packaging
- Inventory Management
- Just-in-Time Delivery
- Local Warehousing
- Specialized Case Pack Configurations

And more...

To Learn More Visit:

qorpak.com/value

Qorpak[®]

A Division of Berlin Packaging

1-800-922-7558 | www.qorpak.com

just treating symptoms rather than correcting underlying problems,” observes Jeff Mowatt, author of *Becoming a Service Icon in 90 Minutes a Month*¹. “As a manager, your most important priority should be working on high-payoff business-building projects.”

To achieve this goal, Mowatt advises managers to determine their top priorities and spend the first ninety minutes of the work day on these projects. This enables one to spend the rest of the work day on dealing with customer and administrative issues. This is an example of the Pareto Principle, sometimes known as the 80:20 Rule. In its modern formulation developed by quality guru Joseph Juran, most of one’s achievements (about 80 percent) are achieved through 20 percent of one’s efforts. Juran applied the Pareto Principle to focus on the most frequent and serious causes of poor product quality and fix them first. His clients, mostly Japanese firms, did so and Japan became an export juggernaut. In the case of lab management, the 20 percent of your workday you spend on strategic projects accomplishes more than the 80 percent of your day that you spend on other matters.

Mowatt advises, “The key is to ignore your e-mail, phone messages and all the other ‘urgent’ stuff until after that first hour and a half of project work. If you have an intranet calendar where other people can schedule meetings for you, make sure to get there first and block

off that first hour and a half of each working day.”

Prepare daily, weekly and monthly “to do” lists. Include both the items you have to do and the items you want to do. Don’t worry if you are moderately over-scheduled. For each item on your to-do list, ask yourself, “Is this the best use of my time?” Prioritize your list. Eliminate things that don’t really matter.

I find it helpful to schedule work backward from the project deadline. This lets me know when work on a project has to be initiated. It also provides a check on whether the deadline is reasonable or not. I always allow an additional 10 percent of my time to cope with unforeseen project delays.

There are a large number of paper and electronic time management systems commercially available. No single one is best for everyone. The trick is to experiment until you find one you like. I’ve tried several electronic systems and found I prefer a paper-based one. Avoid electronic systems that have a time-consuming learning curve.

Importance vs. Urgency

Michael Singer Dobson of the Project Management Institute and author of *The Juggler’s Guide to Managing Multiple Projects*² has emphasized the importance of balancing project importance and urgency. Often short-term projects have a lower importance but a greater urgency because they must be completed quickly.

Sales representatives and business managers can be powerful advocates for short-term projects. These projects can have a quick impact on the bottom line even if it is not a major one. The key is to accept the need for these short-term projects and work on them without letting them overwhelm your longer-term, higher-impact projects.

I use a simple spreadsheet to help establish the relative importance and urgency of projects (Table 1). These are the factors:

- Impact of the project results on the company bottom line.
- Uniqueness of the results. Will the results of the project be a unique new product or service or a “me too” one?
- Shelf life of the results. How long will the project results provide a competitive advantage to the company?
- Level of resources required to accomplish these results. In essence this is the cost of the completed project.
- Score—arrived at by adding the values listed in each column.
- Overall project ranking. The ranking identifies the highest-priority projects.

I use a five-point scale to rank five factors for each project. The numeral 1 represents low importance and the

EXAMPLE OF CASCADING GOALS

By John K. Borchardt

This example of cascading goals is taken from my own employment history and illustrated in Figure 1. My employer identified certain detergent chemicals as being potentially useful in removing ink from pulped waste-paper for paper recycling. I was the leader of the team assigned to develop products and technical support for this potential business. As such, I identified two R&D goals cascading from the overall corporate goals: product development and establishing a technical service group to work with the sales and business development team to promote sales. (Establishment of this team and their goals are not shown in Figure 1 but are part of the goals cascading from the overall company goal.) Cascading goals were established based on the R&D goal of developing paper recycling chemicals. Individual chemists, engineers and technicians assigned to the project in turn developed their own goals cascading from the overall R&D and technical service goals shown in Figure 1.

Not shown in Figure 1 due to lack of space are cascading goals supporting the goals shown. These include presenting papers at paper industry trade association conferences and preparing technical literature for products developed in the R&D program.

numeral 5 high importance. The exception is the case of the level of resources, including staffing, required to achieve project goals. In this case, the numeral 1 represents a high level, which is a negative from the management perspective, and the numeral 5, a small amount of resources.

Each of these five factors may not have the same weight. In this case, one can assign a weighting value to each factor. For example, a small laboratory may be much more limited in adding staff to complete a project. Hence the weighting value for the fourth column may be greater than it would be for a large laboratory where a lab manager often has more flexibility in transferring staff members from other projects or hiring new staff.

Project	Impact of Project Results	Uniqueness of the Results	Shelf Life of the Results	Level of Required Resources	Score	Ranking
A	5	4	3	1	13	2
B	3	5	4	4	16	1
C	1	2	1	3	7	4
D	2	2	3	3	10	1

▲ Table 1. Using a Spreadsheet to Prioritize Projects

Table 1 leads to the perhaps counterintuitive conclusion that Project A should not be the highest-priority project. This is because of the high amount of resources needed to achieve the Project A goals.

Table 1, depicting only four projects, may seem unimpressive. However, if you are a department manager whose staff is working on a dozen projects or is in charge of a large laboratory in which 50 projects are in progress, the value of Table 1 in managing a very large number of projects becomes more apparent.

Wrap-up

Doing a good job of establishing project priorities and focusing on the highest-priority projects can enable your laboratory to compete effectively with laboratories having much larger staffs and budgets.

References

1. J. Mowatt, *Becoming a Service Icon in Ten Minutes per Month*, JC Mowatt Seminars Inc. (January 1, 2004).
2. M.S. Dobson, "The Juggler's Guide to Managing Multiple Projects," Project Management Institute (December 1999).

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

ULTRA-PURE, ULTRA-FAST LABORATORY WATER



Presenting the new **GEMINI-MB**

- Up to 4 liters per minute
- Automatically Fill Carboys
- Wall Mounted Design

Aries FilterWorks offers the high flowrate Gemini-MB Ultrapure Water System.

Fill large containers and carboys in half the time with the Wall mounted Gemini-MB.

Programmable dispensing provides easy, repeatable volumetric filling.

The wait is over.

Contact Aries FilterWorks for your water solution!



**WHEN YOU NEED DI WATER ON DEMAND,
DEMAND ARIES.**

856•768•9600

www.ariesfilterworks.com

Made in USA • West Berlin, NJ



GOAL SETTING

TIPS FOR SETTING AND ACHIEVING GOALS FOR YOURSELF AND YOUR LAB

by Karla Brandau



Businesses without concrete goals and objectives will flounder in today's chaotic economic milieu. In a similar fashion, labs lacking clarity of vision will also falter. The one way to maintain sanity and stay on top of the countless activities required of a lab manager is to focus your staff on crystal clear goals.

Lab managers routinely experience the challenges of multitasking in order to meet production requirements, achieve accurate lab results, negotiate employee needs and provide excellent customer service. Clear goals keep all eyes on the vision, values and future success while simultaneously allowing staff to handle the nuts and bolts of the daily grind.

To keep employees focused on the strategies, goals and objectives that will bring future success, you must get them involved in the goal-setting process.

When workers have input into their lab's goals, they become committed to the end results. With an eye on the future, the commitment to mutual goals will drive staff energy and productivity.

Build a tradition of sponsoring an annual off-site retreat to brainstorm goals for the coming year. Write your goals in language that is concrete and choose goals employees can visualize and even see themselves attaining. The best goals stretch employees and their capacities to contribute. Typical issues you could address in your

goal-setting retreat would include ways to do the following:

- Increase productivity
- Reduce errors
- Shrink turnaround time
- Achieve greater regulatory compliance
- Minimize costs

Once your retreat has produced the crystal clear goals and objectives you seek, don't wait for implementation until you get back to the lab. Have the employees determine what they will do as part of their unit to support the umbrella goals. Then ask each employee to make his or her own private goals that support the unit's goals and the lab's goals.

The last step before you leave the retreat is to have the employees fire up their electronic calendars (Microsoft Outlook, Lotus Notes or Google online calendars all work) and record absolute deadlines with intermediate targets and alarms for each objective. With their eye on end results, their productivity and energy will be paced throughout the days, weeks and months, ultimately bringing success at the end of each year. Pay close attention to quarterly checkpoints, because even a goal with recorded deadlines and funky alarms is powerless to drive performance if it is not regularly revisited.

The process of goal setting is labor intensive but pays handsome dividends as you gain employee buy-in.

In summary, the goal-setting process is immensely productive, as it does the following:

- Focuses employees on what really matters to the lab
- Makes every employee more realistic about his or her expenditure of time
- Brings built-in accountability for each employee's stewardship
- Reduces wasted time, as employees are clear on what has to be accomplished in small periods of time
- Helps overcome the procrastination that occurs when employees are overwhelmed and do not know where to start

Don't get pulled into the false thinking that goal setting is so time consuming that your time is better spent checking items off your task list.

Don't think the retreat will be too expensive. In reality, it will save you money as employees will be focused on high priority items—not the 'could be done' or 'nice to do' activities—that will move your lab's performance forward. Your lab will be known for providing excellent customer service and increased profitability.

Karla Brandau is the CEO of Workplace Power Institute, which is dedicated to helping you and your employees be more productive. She is available for keynotes and for the facilitation of retreats. Her programs can help you carve out critical values, visions and objectives and set goal-achieving processes in motion for your lab. You can reach her at 770-923-0883 or visit www.WorkplacePowerInstitute.com.

LABCAST

Join Karla Brandau on Wednesday, September 1, 2010, 1:00–2:00 EST for her Lab Manager Academy Labcast on this same topic. For more details and to register, go to www.labmanager.com/academy.

© 2010 Thermo Fisher Scientific Inc. All rights reserved. All trademarks are the property of their respective owners.



Do it with one glove tied behind your labcoat.

Seal buckets with a simple one-handed snap. It's just one way Thermo Scientific centrifuges make your life easier because they're designed for the way you work. With superior performance, reliability and rotor support built-in — it's the little things that are no small matter when it comes to keeping you happy and productive:

- **Innovative and certified ClickSeal® bucket sealing system:** glove-friendly, one-handed snap-on covers replace screw caps and clips.
- **Easy and secure AutoLock® rotor management:** exchange rotors in less than 3 seconds with the push of a button, switching from high capacity to high performance.
- **Thermo Scientific Fiberlite carbon fiber rotors:** speed, versatility and corrosion-resistant design to maximize performance.

Getting the max out of your centrifuge shouldn't take extra work. To learn more about Thermo Scientific general purpose centrifuges, visit www.thermoscientific.com/centrifuge



Thermo Scientific Sorvall Legend XT centrifuges:

Accelerate your research with increased capacity in the same bench space.

Moving science forward

Thermo
SCIENTIFIC
Part of Thermo Fisher Scientific

INTO THE FIELD

INTEREST IN PORTABLE INSTRUMENTATION INCREASES AS USERS SEEK MORE REAL-TIME, ACTIONABLE ANALYTICS by Angelo DePalma, Ph.D.

Trends in miniaturization, particularly in electronics and microfabrication, have brought about a revolution in instrumentation. Benchtop instruments pack greater functionality into ever-smaller footprints and components. Increasingly, analysts perform routine analysis “where the action is”—locations of environmental interest, manufacturing suites, crime scenes, loading docks, and packaging facilities—through transportable instruments.

Convenience comes at a cost, however, as transportables generally lack the dynamic range, sensitivity, resolution, automation capability, and interoperability of their benchtop counterparts. Nevertheless, interest in portable instrumentation is exploding as users seek more real-time, actionable analytics.

Transportable instruments can be roughly divided into two groupings: briefcase-sized portables weighing up to about forty pounds, and handheld instruments in the one-to-five-pound category. All transportables exploit low-cost connectivity via data cards, RS-232 or USB cables, pen drives and, in some cases, wireless networks. Data processing occurs either on the device, through upload to personal computer software, or both.

Notable exceptions exist, but one can generally think of benchtop, portable, and handheld instruments as analogous to desktop, laptop, and handheld computers, respectively. The analogy holds for both portability and capabilities. Thus the performance gap between portables and either handhelds or benchtop instruments can be significant. While portables often approach the capabilities of benchtop instruments, handhelds tend to be self-contained and limited to a narrow range of analytes or outputs. Handhelds often provide “yes/no” or first-pass outputs sufficient for fieldwork.

The spectrophotometers

Over the last decade markets for infrared and Raman spectroscopy have grown well beyond chemical analysis. This is in no small part attributable to portability advances in interferometry, a key FTIR operation. Conventional interferometers operate in just one geometric orientation, so their use in portable instruments is limited. A2 Technologies (Danbury, CT), which specializes in handheld FTIR, designed an interferom-

eter that operates whether the instrument is pointing up, down, or sideways.

“A benchtop interferometer would not work if you were to stand it on its side,” notes Alan Rein, Ph.D., VP of business development at A2. Dr. Rein claims the instrument performs as capably as benchtop FTIR. “There’s no point in building a Tinkertoy that performs so poorly that it doesn’t tackle a range of applications.”

Where traditional IR requires some sort of sample preparation, handheld FTIR must operate at the point of use with no sample prep. This capability, made possible by bouncing the beam off the sample, is essential for nondestructive evaluation of valuable parts or structures. Limitations for handheld FTIR are the same as for IR spectroscopy in general, Rein explains. “IR is not the most sensitive analysis technique and doesn’t have the sensitivity of UV or MS. It comes down to physics.”

One A2 application, developed with funding from the Federal Aviation Administration, is examining composite airplane wings after a lightning strike. Lightning causes heat damage, whose chemical changes are easily detected in the infrared. “You can see bonds breaking within the composite,” Dr. Rein says. Other critical field FTIR applications include detecting pharmaceutical residues on processing equipment and analyzing engine oil for machine wear. “The cool thing about handhelds is that they open more applications for FTIR than ever before.”

▶ *A handheld FTIR instrument analyzing soil.*



Depending on the user, handheld FTIR may provide as much information as benchtop instrumentation, Rein explains. But most field users are not trained spectroscopists or even chemists. “Some of our users can’t even spell spectroscopy, and they don’t need to.” For them, A2 offers instruments that provide “yes, no, maybe” readouts. “But spectroscopists can get full spectra if they need to.”

Output quality has traditionally been an issue for field instruments based on Raman, infrared, ultraviolet, and visible spectrometry. “All spectrometers collect spectra,” notes Richard Larsen, Ph.D., spectroscopy product manager at Jasco (Easton, MD). “The challenge is obtaining a quality spectrum under non-ideal conditions.” Spectral resolution among portables can vary by as much as sixteen-fold, Larsen notes; for example, 8 cm^{-1} vs. 0.5 cm^{-1} for FTIR, and 16 nm vs. 2 nm in UV/Vis. “The highs and lows represent the difference between research- and QA/QC-grade results.”

Sampling capability is another potential shortcoming, not just for spectrometers but also for all handhelds and portables. Many instruments are limited to one or two sampling modes, whereas general-purpose benchtop spectrometers accept samples in multiple formats.

The “desktop-laptop-handheld” is illustrated in how well field instruments stack up against benchtop systems. For example, Jasco’s portable UV/Vis instruments read 1.5 absorption units (AUs) vs. 6 AU for a bench spec-

▼ *The RMP-320 portable Raman instrument with fiber optic probe and micro-stage with laptop PC control.*



trimeter. Similarly, the company’s field Raman devices are limited to single-laser operation vs. eight lasers and multiple wavelengths for each benchtop version; and their IR instruments lack sample heating/cooling, advanced microscopy capabilities, and access to automation. On the other hand, some portable FTIR spectrometers, including one line sold by Jasco, can serve as fully functional lab instruments, according to Dr. Larsen.

Because of widely differing performance and prices,

▼ *The VIR-9550 portable FT-IR and IRT-1000 FT-IR microscope system, available for field microscopy analysis.*



customers often have difficulty matching analytical needs with instruments, Larsen says. “They don’t always appreciate the distinctions and price differences between purpose-based instruments and full-function portables because they group all field instruments together. It is a product manager’s job to inform them so they get the capabilities they need without over- or underspending.”

INSPECTOR & ABACUS WITH WIPE TEST PLATE



The Inspector and Abacus provide excellent sensitivity for Alpha, Beta, and low energy gamma.



The stainless steel wipe test plate allows the user to perform preliminary wipe surveys. It slides easily on to the meter positioning the wipe at a fixed 1 cm distance from center of the GM tube window.



It can also be used to protect the unit from damage while not in use.

Many customers use the wipe test plates as beta shields as well.

SE INTERNATIONAL, INC

P.O. Box 39, 436 Farm Rd. Summertown, TN 38483
 1-800-293-5759 | Fax: 931-964-3564
 www.seintl.com | radiationinfo@seintl.com



Raman's strength—identifying chemicals without direct contact or sample preparation—makes it a natural application for portables. Thermo Fisher Scientific, through its recent acquisition of Ahura Scientific (Wilmington, MA) produces a line of rugged, handheld Raman spectrometers and a handheld FTIR device for identifying unknowns from a library of more than 10,000 explosives, toxic chemicals, chemical warfare agents, narcotics, and precursor compounds, even within mixtures. Instruments weigh between 0.8 kg and 1.8 kg. The target market is emergency first responders, homeland security, military, law enforcement, and forensics.



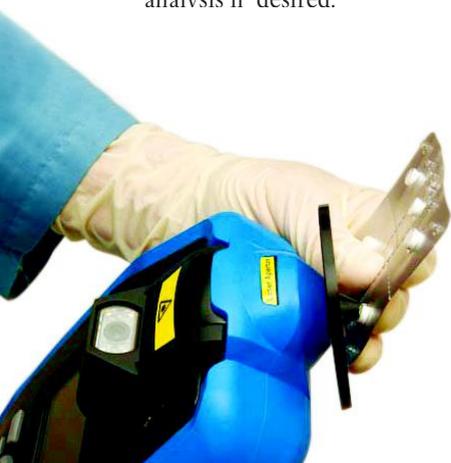
◀ *FirstDefender RMX mounted on QinetiQ's Talon robot to provide users with the ability to execute their response missions with a greater level of safety.*

▶ *A field technician testing water samples with Torion's Guardian-7 field portable GC-TMS.*



One of the Raman models, the FirstDefender RMX, operates in handheld mode or may be attached to a robot for operation in dangerous environments. Another Thermo Raman instrument, the TruScan, identifies raw materials used in pharmaceutical and consumer health industries through packaging, confirming their presence through a pass/fail reading. In April 2010, the Nigerian National Agency for Food and Drug Administration and Control (NAFDAC) deployed TruScan for rapid identification of counterfeit and substandard drugs.

“Traditional laboratory instruments provide the user with just the raw spectra, while our instruments interpret the data and answer the users’ specific questions,” says Duane Sword, VP of marketing. In addition to yes/no outputs, FirstDefender and TruScan instruments can export full spectra for further analysis if desired.



◀ *TruScan handheld Raman spectrometer is ideal for non-contact use on double-bagged actives or excipients, materials in glass vials or bottles, or final product in blister packages.*

From room- to briefcase-sized

Twenty years ago a mass spectrometer filled a room and required trained operators. Thanks to miniaturization in both electronics and the ion trap—a component inside the instrument that captures ionized molecules—the size and price tag of MS instrumentation has fallen steadily, to the point where mass detectors for LC and GC are common, and truly portable mass spectrometers are a reality. “The key,” observes Douglas Later, Ph.D., president of Torion (American Fork, UT), “is maintaining the same trapping capacity and sensitivity when the device is miniaturized.” A conventional ion trap

measures approximately 1 cm across, while traps for portable or miniaturized instruments are about half that size. Torion has shrunk its trap to 2 mm across and combines the resulting hardware with a field-worthy GC into a suitcase-sized GC-MS system.

Torion employs a low thermal mass GC column system from RVM Scientific (since acquired by Agilent) that heats columns by up to 150 degrees per minute with high reproducibility. Rapid heating and cooling results in a run cycle of three to five minutes, according to Dr. Later.

Torion’s “GC-TMS” (its brand) can substitute for a benchtop system in a pinch, particularly for screening or determining dilution factors for full-scale GC-MS analysis. But the instrument does have limitations. It accepts samples through only solid phase extraction or small-volume direct injections of up to 0.2 microliter. Another shortcoming is limited access to spectrum libraries. The GC-TMS connects to a small, pre-configured ion trap library of compounds of interest. It can access much larger standard reference libraries, but these data are typically on quadrupole instruments, whose spectra differ significantly from those of ion trap instruments.

Evolutionary, not revolutionary

GE Power and Water Analytical Instruments’ (Boulder, CO) contribution to portable instrumentation involves total

organic carbon (TOC), a measure of water quality. Utilities, environmental scientists, and users of ultrapure water are the principal markets. At five and twenty pounds in weight, GE's two instruments both fall into the portable-but-not-quite-handheld category.

The smaller, lunchbox-sized unit, CheckPoint, can be moved to different locations or mounted permanently for continuous measurement, but it is not suitable for benchtop use. Stephen Poirier, growth and strategy leader at GE, describes the CheckPoint as a "sensor" rather than an instrument. "Its fundamental technology is not as robust or accurate as what you'd expect to find in a laboratory." The larger instrument, Poirier says, is significantly more compact than a bench analyzer but has equivalent analytic capabilities. Both units connect to data systems through Ethernet, RS232, or USB cables.

Conventional TOC analyzers vaporize away water and combust organics in a high-temperature furnace, followed by infrared measurement of the carbon dioxide generated. In the GE devices, carbon materials are converted to carbon dioxide through low-wavelength ultraviolet light, then quantified by conductivity measurement.

Analysis methodology notwithstanding, Mr. Poirier describes the five-pound CheckPoint as an evolutionary rather than revolutionary design, where compromises were necessary due to the small footprint. "We considered the relevant applications and which technologies would be good enough to deliver a sensor in such a small footprint, rather than introducing a technologic breakthrough."

The versatile approach

Forston Labs (Fort Collins, CO) has an interesting take on portable instrumentation. Its Lab Navigator handheld, modular field analyzer accepts up to five sensor plug-ins—four through proprietary ports and one via USB. Forston sells a variety of such sensors to measure, for example, flow, turbidity, calorimetry, carbon dioxide, dissolved oxygen, pH, conductivity, ammonium, calcium and global positioning. Perhaps the most intriguing "sensor" add-on is a UV/Vis/fluorescence spectrophotometer.

By building versatility into its instruments, Forston occupies an interesting niche in the portable/handheld market-

place. Through its USB port, Lab Navigator accepts a wide range of third-party sensors. For example, there is a UV/Vis/IR module from Ocean Optics (Dunedin, FL). "The Ocean Optics spectrometer scans from 200 to 1,500 nm and provides a wider range and better resolution than our sensor," says Forston president Brian Williams.

The modular approach means that users can select only the capabilities they need. "Many sensor manufacturers produce products with standard zero to one-volt, zero to ten-volt, or four- to twenty-milliamp output," Williams tells *Lab Manager Magazine*. "We have attachments that allow connecting up to four of those. And if we don't have the right attachment, we can easily make one."

Lab Navigator is somewhat unusual for a handheld in its "massive" data storage capabilities, according to Williams, and its ability to execute analysis on-instrument. Users may also upload data to a PC into standard formats through software Forston provides free with each instrument purchase.



◀A technician testing pH while monitoring CO₂ in the ambient air using appropriate sensors with Forston Labs' LabNavigator.

Laboratory instrumentation has come a long way, from room- or benchtop-sized equipment to instruments with approximately the footprint of a vintage cell phone. There are two reasons to expect this trend to continue, both in terms of size reduction and analytic capability. The first is miniaturization and ongoing improvement at the bench scale, which is where innovation occurs first. The second is market demand for field-worthy instruments, which shows no sign of abating. For transportable instruments, this is a winning combination.

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



SPECIALTY GASES

INNOVATIVE CALIBRATION GAS MIXTURES ENABLE NEW ENVIRONMENTAL TESTING AND ANALYSIS

TECHNOLOGIES by Michael Hayes

A burgeoning world population and the industrialization necessary to meet its needs have led to massive technological advances in all facets of human existence—among them, food and textile production, the manufacturing of modern home wares and furnishings, and advancements in medicine, infrastructure and transport. While bringing considerable benefits, these advances have sometimes had a negative impact on the environment.

“There [also] have been quantum leaps in the science of environmental testing and analysis.”

Some chemicals hailed as scientific breakthroughs that would assist in the advancement of society have proved, in time, actually to be environmentally destructive. Chlorofluorocarbons (CFCs) are a prime example. First discovered in the 1920s, CFCs were the “perfect” solution for cooling refrigerators and air conditioners. They were easily turned into liquid at room temperature with application of just a small amount of pressure, and they could just as easily be turned back into gas. At that time considered safe and inexpensive—even eco-friendly—CFCs were also known to be completely inert and nontoxic to humans. They became ideal solvents for industrial solutions and hospital sterilants and could also be used to blow liquid plastic into various kinds of foams.

But in the 1970s scientists studying the decomposition of CFCs in the atmosphere were appalled to discover that catalyzing CFCs had begun to destroy the earth’s ozone layer.

The environmental impact of CFCs and related compounds led to the Montreal Protocol in 1987, signed by many nations that pledged to reduce CFC production. But with the phaseout of CFCs, industry was left with a need for a similar compound. CFCs were subse-

quently replaced by hydrochlorofluorocarbons (HCFCs) and hydrofluorocarbons (HFCs), which were later also found to destroy the ozone layer and/or contribute to an unnatural warming of the planet’s climate.

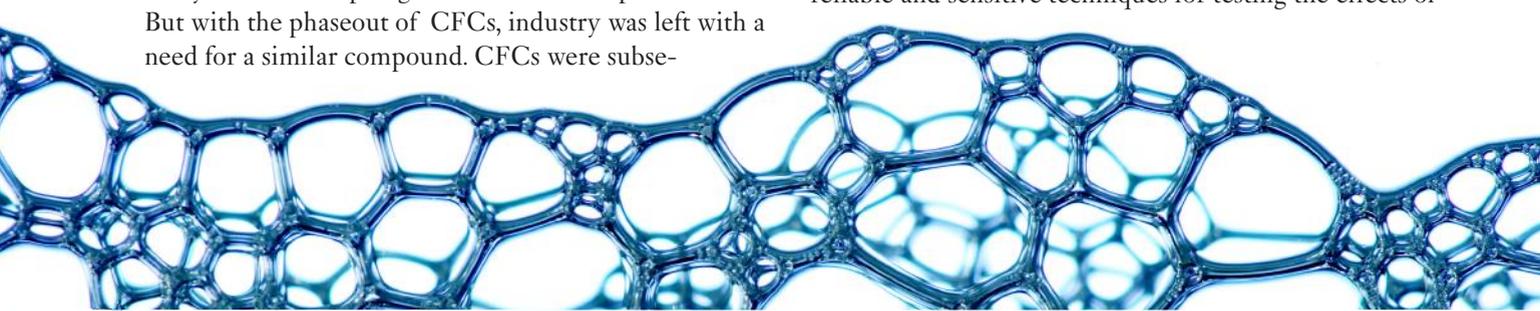
There are many other examples of chemicals, such as some pesticides, dyes and detergents, being developed with the best of intentions and later found to be environmentally harmful.

Damaging at low levels

Once a chemical is found to be potentially hazardous, it is critical to determine at what level it is harmful, so it can be controlled or eliminated. Many contemporary chemicals are damaging at very low levels—down to subparts per billion—and accurate, reliable methods and equipment are required to measure them once they have been released into the environment. Consequently, there also have been quantum leaps in the science of environmental testing and analysis.

The requirements for reducing environmental pollutants have been evolving rapidly, and today industries emitting pollutants must comply with rigid limits. They are also required—at regional, national and international levels—to provide regular and current data on air emissions and soil and water contaminants to a variety of agencies in order to comply with legislative or regulatory formats and reporting systems. For industry, this means that using more pollutants requires monitoring of a greater number of emission sources, bringing with it the requirement to measure pollutants at progressively lower levels with greater accuracy.

These developments have made reliability in measurement calibration absolutely critical. The demand for stable, accurate measurement is the cornerstone of emissions analysis, and there is an increasing need for reliable and sensitive techniques for testing the effects of



the growing number of pollutants being released into the atmosphere.

Environmental toxicology highlights the potential effects upon organisms of compounds released into the natural environment. Using the latest technology in analytical instrumentation, scientists can analyze air, water and soil samples for the characterization and assessment of an extensive range of harmful contaminants, including volatile organic compounds (VOCs), metals, petroleum-based compounds, pesticide and herbicide residues, and detergents, among others.

Sound analytical protocols are at the heart of work taking place at laboratories every day, and in environmental analysis and testing, a range of sophisticated instruments and next-generation gas chromatography and mass spectrometry techniques play a vital role in the identification and qualification of environmental pollutants. Both techniques and equipment require high-quality specialty gases for instrument operation and/or calibration, in addition to dedicated high-purity gas distribution systems. As the reliability of analysis is only as good as the quality of the gas being used, distribution systems and equipment for high-purity and specialty gas mixtures must be able to meet increasing demands for high standards of performance and new analytical methods. Impurities occurring in as low concentrations as parts per trillion (ppt) can have serious consequences.

Pollutants can be extracted from soil and ground water or collected as free-floating samples on top of ground water. Advanced techniques go beyond merely identifying pollutants and are even able to age contaminants in soil and identify their source.

For soil, gas and water, environmental analysis, monitoring and testing are done in the ambient environment where human development exists—where we plant our crops, source and drink water, and breathe the air. This has resulted in testing stations being set up near roads and highways, on the top of tower blocks, and in fields and oceans. This testing is often sponsored by governments and national agencies and conducted by them or on their behalf by universities or commercial contract laboratories.

For gas and water, environmental analysis and testing are also carried out at the point of emission—by the industrial concern at the emission source or factory perimeter—to control and monitor what is being discharged into the environment. There is an increasing



▲ *Sample collection in field.*

trend to undertake measurement and analysis and to locate instruments where the potential contamination sample might be created.

Analysis can be facilitated via either a distributed or a “remote” lab near the point of emission, or can even be

Products for Automation & Sub-Micron Motion Control

Ultra-Precise Closed-Loop DC Servo
XYZ Stage Systems
for all major microscopes
and stand-alone applications

Piezo-Top Stages
for ultra-fast and precise
Z-axis positioning

**Low Vibration
Filterwheels**

**Video Autofocus &
Laser Focus Holding**

**Custom OEM Systems
and Components**
and *much more...*

ASI
APPLIED SCIENTIFIC
INSTRUMENTATION

www.ASIimaging.com

541-461-8181

800-706-2284



PLANETARY BALL MILLS

For rapid grinding down to the nano range

- Reproducible results due to energy and speed control
- Suitable for long-term trials and continuous use
- Programmable starting time ("night shift" feature)
- 10 SOPs can be defined and stored for routine applications
- Comfort grinding jars made of various materials, volumes from 12 ml to 500 ml, completely airtight
- Suitable for dry and wet grinding
- Safe and stable operation
- Available with 1, 2 or 4 grinding stations

www.retsch-us.com/pm



www.retsch.com/superheroes

Retsch®

Solutions in Milling & Sieving

74 Walker Lane · Newtown, PA 18940
1-866-4-RETSCH · info@retsch-us.com

a VERDER company

www.retsch-us.com

situated directly in the process causing the emission, essentially "taking the lab to the product" rather than analyzing the product in the lab. Analysts are beginning to favor this "closer is quicker" approach, because it allows less opportunity for the integrity of the sample to be compromised or degraded. To this end, more industrial concerns are undertaking their sampling in situ, analyzing the sample in real time and feeding the results to an online central database.

"There is an increasing trend to... locate instruments where the potential contamination sample might be created."

Gases and their role in metrology and environmental protection

The gas industry plays a vital role in the metrological chain, producing several patterns that are used in the calibration and verification of instruments and equipment.

With increasing regulatory requirements, more rigorous demands in measurement and even new contaminants to monitor, laboratories performing environmental analysis to detect and monitor our air quality are being constantly confronted with change and are under continuous pressure to expand their scope and expertise. Innovative, next-generation calibration gas mixtures are essential to enable new air-quality analysis technologies and to meet the needs of laboratory researchers.

Both high-purity gases for conducting daily measurements in soil, water and atmospheric phases and calibration gas mixtures that ensure optimal functionality of measurement instrumentation have become increasingly sophisticated in order to identify

and quantify ever-more-minute levels of potentially harmful contaminants in the environment.

"In producing calibration gas mixtures, the most reliable reference materials from international entities like NIST (National Institute of Standards and Technology, U.S.), the VSL (Van Swinden Laboratorium, formerly NMI, Netherlands) and the NPL (National Physical Laboratory, U.K.) should be used to ensure [that] users can conduct their environmental measurement in line with international standards," says Stephen Mandel, head of Environmental and Calibration Products, Linde Gas North America. "Calibration should

take place using high-quality, traceable standards and the same phase as the measurement," continues Mandel. "So if you're measuring the ambient environment, you should be calibrating the instrument with a specialty gas standard."

Specialty gases innovation to support environmental analysis

To keep pace with technological advances and increasingly stringent legislative requirements, some modern calibration gas mixtures use state-of-the-art packaging technology with proprietary cylinder treatment processes that exceed the increasingly demanding requirements for consistency and stability in a wide variety of calibration standards—down to parts-per-billion levels. Offering long-term stability for binary calibration gas mixtures that require low-level carbon monoxide, carbonyl sulfide, methyl mercaptan, hydrogen sulfide, nitric oxide, nitrogen dioxide or sulfur dioxide can provide greater confidence to laboratories, as

www.labmanager.com

these components are among the most frequently analyzed and controlled substances in the atmosphere around us.

A further development in emissions monitoring and detection has been the miniaturization of emissions monitoring devices, which are often dispersed across remote locations. These instruments demand smaller, highly portable gas calibration solutions. A limited range of compact, lightweight, refillable gas cylinders not only meet the challenge of calibrating distributed devices, but are significantly more environmentally friendly than disposable cylinders traditionally used for this specific application.



▲ Gas cylinder in lab.

In many applications, continuous emission monitoring is required to collect and analyze at least one sample every fifteen minutes from industrial processes. High-purity gases for such analysis of air emissions are vital for this purpose, as are custom standards for head space analysis of water and soil samples.

Traceability for measurement certainty

“Traceability has become a key environmental issue,” says Stephen Harrison, global head of Specialty Gases and Specialty Equipment, Linde Gas. “With environmental emission monitoring or

emission trading, authorities demand traceability to help ensure that public safety requirements are met.

“Traceability is the relationship between a measured value and an established element of a national [or] international measurement system. For traceability to exist there must be an unbroken chain of comparisons between the sample and an accredited measurement system. The measurement system by which values are transferred must be clearly understood and under control.

“Accreditation—an independent assessment of the competence of a laboratory to produce and/or certify samples or products—is an important aspect in the production of specialty gases. Manufacturers all over the world want to be assured that suppliers can deliver their products to the required quality [standard]. Specialty gases facilities should have received certification as a producer under ISO 9001, and [under] independently accredited

programs such as ISO 17025:2005 as a testing and/or calibrating laboratory, and [under] ISO Guide 34 as a standards producer, which provides the highest level of quality assurance and allows the gas producer to confidently state that the methods used to certify [its] accredited calibration gas mixtures are accurate, consistent, documented and validated,” Harrison adds.

Michael Hayes is general manager Environmental and Calibration Products, Linde Electronics and Specialty Gases, A Division of Linde North America LLC. Michael can be reached through Susan Brownlow, PR & Internal Communications Manager BA Merchant & Packaged Gases, susan.brownlow@linde.com.



MIXER MILLS/ CRYOMILL

For quick, efficient pulverization and homogenization of small-volume samples

- Suitable for – cryogenic grinding
– dry grinding
– wet grinding
– cell disruption
- Outstanding efficiency with high frequency impact ball milling at 25 Hz/30 Hz
- High sample throughput due to short grinding times
- Reproducible results due to digital setting of grinding time and vibrational frequency, programmable
- No-loss screw-top grinding jars up to 50 ml
- Extensive range of accessories

www.retsch-us.com/mm



www.retsch.com/superheroes

Retsch®

Solutions in Milling & Sieving

74 Walker Lane · Newtown, PA 18940
1-866-4-RETSCH · info@retsch-us.com

« EXPERT: Dr. Rebecca Williams

ASK THE EXPERT

HOW TO OVERCOME CHALLENGES WITH MICROSCOPY

by Tanuja Koppal, Ph.D.

Dr. Rebecca Williams, Director of the Microscopy and Imaging Facility at Cornell University, talks to Tanuja Koppal, Ph.D., contributing editor to Lab Manager Magazine about her role in overseeing the imaging laboratory while pursuing independent research in the field. She talks about how the facility functions, its users and the trends in microscopy that she has spotted in recent years.

Q: How is the Microscopy and Imaging facility at Cornell run?

A: The microscopy and imaging facility at Cornell is a user-based facility. Instruments are available for use for an hourly fee. We started out as a confocal microscopy facility and hence, fluorescence microscopy has always been our area of expertise. We have now procured a couple of other instruments such as a bioluminescence-based whole mouse imaging system and a fluorescence-based instrument that can image anything from whole animals to single cells. We also have a high-resolution ultrasound machine. We don't have an infrared (IR)-based imaging system yet, but a number of researchers are moving towards IR-based applications. Our routine users don't work in the IR region but a few of our biomedical engineers are developing probes for IR imaging.

Q: Who are your users? What types of applications drive them to use your facility?

A: We have a very diverse user base but most of them are cell biologists. Some are plant researchers studying the biology of a plant cell, while others are cell biologists looking at fixed preparations or live animal cells. We also have material scientists using our facility to image all kinds of different materials and structures. The instruments remain the same but we try to accommodate each individual user as much as we can.

“The instruments remain the same but we try to accommodate each individual user as much as we can.”

Q: Do you provide any kind of training to your users?

A: The Microscopy and Imaging Facility is a part of the Cornell Life Sciences Core Laboratory Center. We have two facilities. One is located in the veterinary school and is more animal (mouse)-based and the other is on the central campus, which is more cell and tissue-

based. Users can use either facility depending on their needs. We are probably the only facility where the users work by themselves. Each facility has a manager who trains people on the basic use of the instrument, but imaging tends to be so specialized that you have to mostly do it yourself. Our managers are there to troubleshoot and their expertise is critical to the users as they help carry out some of the more challenging experiments. We have also had success getting people to communicate with each other. We used to have a monthly seminar series where people would come and talk about their work. They would also share tips and give advice on how to do certain things correctly.

Q: What is your role as the director of the facility?

A: My role is to accommodate the research needs of the Cornell campus. I have to make sure that things are operating smoothly and safely. I am also responsible for the overall finances of the facility. We have to keep up with new equipment that is available for new applications. When we need a new instrument, we assess the need on campus and then put in for a shared instrumentation grant to the government. We just put in a grant proposal for a spinning disk confocal microscope, which allows very rapid optical sections to be obtained in a very short time

GLACIER™

experience

[environmentally engineered equipment]

Environmentally Safe

Every Glacier™ -86°C ultra low temperature freezer is manufactured to RoHS compliance standards. Glacier™ uses 100% CFC-free refrigerants and insulation to create and maintain ultra low temperatures.

Long Term Reliability

Cool operating compressors are designed to last. Cascade refrigeration system creates greater temperature uniformity. Audible and visual alarms notify when storage conditions are compromised. Redundant back up systems support storage conditions. Continuous self diagnostics sense abnormalities in the system.

Ergonomics and Safety

Low noise operation to 47 dba. Easy-to-use eye level controls. Heavy duty door latch allows one-hand operation with low force door opening. A halo bypass coil frame heater minimizes frost accumulation. Internal chamber release gasket disperses pressure buildup.

Value

NuAire's Glacier™ line of -86°C ultra low temperature freezers are designed to meet CE and ETL criteria for safety and performance. Backed by "best in industry" service and support, Glacier™ provides real value.

Ultra Low Temperature Freezers



Controlled Environments for Optimum Storage Conditions



Dr. Rebecca Williams is the director of the Microscopy and Imaging Facility, which is a part of the Cornell Life Sciences Core Laboratory Center. As the director, her role is to ensure that the facility is meeting the imaging needs of Cornell's research community. She is also the associate director of DRBIO, a NIH/NIBIB optical imaging resource. She holds faculty positions at Cornell as a research scientist in the Biomedical Engineering department and as an adjunct assistant professor in the Biomedical Sciences department. She received her Ph.D. in physics from Cornell University in 1997.

period. The instruments often don't run at cost recovery and the University has been generous in supporting these facilities to make sure we have adequate space and that the instruments are well-maintained.

“We are probably the only facility where the users work by themselves.”

Q: What trends in microscopy have you seen since you took over as director in 2007?

A: Users are now more interested in doing live cell and tissue work and they are interested in developing probes that are “smart” and indicative of biological function. The optics of confocal microscopy hasn't changed much but the instruments have more features added on. As people are starting to use more live cells and tissues, these instruments are getting easier to buy and use. No more perfusion pumps all over the place. People are also using different imaging strategies by combining various technologies, for instance, luminescence coupled with X-rays. There are also more

high-resolution optical imaging techniques being developed like stochastic optical reconstruction microscopy (STORM) and photo-activated localization microscopy (PALM).

Q: Do you have any advice for people looking to buy or upgrade their microscopy instruments?

A: My advice is to look for specific instrument characteristics that you need for your applications. For instance, in live tissue imaging, efficiency is important. We need our instrument software to be intuitive and user-friendly because the imaging here is done by the researchers themselves. Five years ago the software programs varied a lot, but now with most instruments the software is relatively straightforward and quite comparable. A relationship with the vendor is also important and technical service is a very critical feature, especially for us, since we are so remotely located. We have nearly ten imaging instruments in our facility, out of which four are confocal microscopes. We try and troubleshoot as much as we can ourselves. We also have service contracts on our two primary confocal instruments, the ones that are used all the time. For the secondary instruments we can afford a little bit of down time while they get fixed.

Q: Besides directing the imaging facility you are also pursuing your own research. Can you give us some details on that?

A: My research is funded by DRBIO, which stands for Developmental Resource for Biophysical Imaging and Optoelectronics, a NIH-funded developmental resource for optical research and instrumentation. My current research projects involve using adaptive optics to more effectively image through scattering tissue and developing probes for *in vivo* imaging of oxygen tension. I have been involved in developing instrumentation and applications for multi-photon microscopy since 1991. Multi-photon imaging was developed at Cornell in 1990, but is now becoming more widely used for cellular imaging and clinical applications. We have different multi-photon instruments that are in various stages of development at the DRBIO facility. This technique is suited for *in vivo* imaging and helps image deeper. Although the optics is simpler, it is more expensive than confocal microscopy.



- Stores up to 57,200 samples



- -86°C for long-term storage



- 3.6 ft³ under-the-counter ULT



- Durable, energy saving design



NEW!



New Brunswick
an eppendorf company

Something really cool from Eppendorf

Eppendorf is now offering New Brunswick Ultra-Low Temperature (ULT) -86°C Freezers. Choose from 10 models to satisfy your space requirements.

New Brunswick equipment is legendary for design innovation, quality construction and long-term durability. 304 L stainless steel interior, insulated and gasketed inner doors, and voltage stabilizer are only a few of the many standard features found on the New Brunswick freezer line-up.

- **Innova® Freezers**—utilizes vacuum insulation technology providing 30% more storage capacity
- **Premium Freezers**—a cost saving alternative to the Innova line
- **Energy-efficient**—consumes less power per Kilowatt-Hour than comparable ULT freezers
- **CFC and HCFC Free**—environmentally friendly and non-ozone depleting
- **5 year limited warranty** and 12 years on vacuum insulation

For more information visit
www.eppendorfna.com/freezers

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

DESIGN CRIME LAB

ADVANCES IN TECHNOLOGY, INCREASED SCRUTINY, AND DEVELOPING TECHNIQUES DEMAND A SPECIFIC DESIGN RESPONSE
 by Michael Mount, AIA, LEED AP, and Adam Denmark, AIA, LEED AP

Design requirements for forensic laboratories are unique and unlike those for other laboratory types. While forensic labs share certain features with academic, research, and other laboratories, the composition of these elements and the addition of other characteristics make these facilities an uncommon challenge. Seven general criteria underscore how different forensic facilities are from other laboratories:

- Lab section organizational structure
- Interaction/collaboration requirements
- Five-in-one laboratory structure
- Unique laboratory sections
- Unique mission
- Chain of custody requirements
- Accreditation

Lab section organizational structure

A forensic laboratory consists of a number of separate and distinct laboratories, each with its own specific function, spaces, and equipment. For accreditation purposes, each laboratory section must be designed as a separate and secure entity. Although different crime labs will likely not have identical organizational structures, some typical forensic laboratory sections include:

- **Biology section** - for the examination of biological evidence and the development of DNA profiles. This section must be designed as a biological sciences laboratory and is also responsible for assisting in the maintenance of an international DNA database.
- **Chemistry section** - usually for the examination of narcotics, narcotics paraphernalia, and other forensic examinations involving wet chemistry procedures. This section also relies on substantial numbers of instru-

mentation units, such as GC/MSs, FTIRs, ICP/MSs, and other computer-driven, diagnostic instrumentation.

- **Toxicology section** - for the examination of blood and urine for the presence of drugs, alcohol, or other foreign substances. This section frequently provides laboratory support for medical examiners by examining tissue samples from decedents in order to determine cause of death, and it must be designed to include features of wet chemistry and biological sciences laboratories. Like the chemistry section, the toxicology section uses various types of gas-consuming, heat-generating, noise-producing instrumentation requiring isolation and special design considerations.
- **Latent fingerprint section** - for the examination of evidence for the presence of fingerprints, using various chemical and nonchemical procedures. Responsibilities also include fingerprint input and searches in an international fingerprint database.
- **Firearms section** - for the examination of any evidence pertaining to firearms, including weapons, bullets, bullet projectiles, and bullet casings. This is primarily a physical properties analysis laboratory, but does include some elements of a wet chemistry lab. This section also includes instruments designed to access an international database of bullet components.
- **Trace evidence section** - for the identification of any substances that cannot be identified in the chemistry section. Typical substances include microscopic particles known as trace evidence and can include, but are not limited to, paints, glass, food products, and building products. This section relies heavily on instrumentation and microscopy, including scanning electron microscopes, FTIR microscopes, and comparison microscopes.

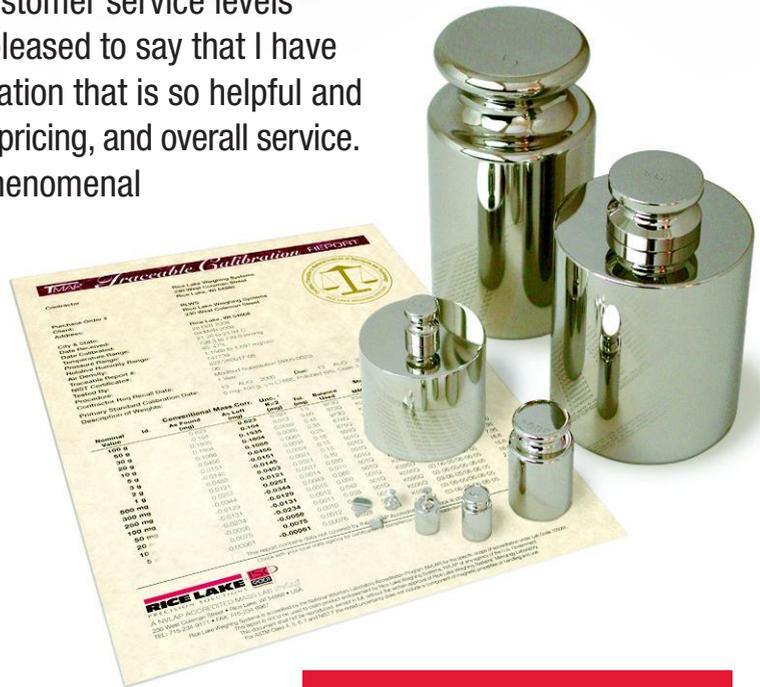
These are just a few examples of the laboratory section organizational structure of a crime lab. Other spaces



“Thank you Rice Lake!”

“Maybe you could rate your customer service levels at a 10 rather than a 5. I am pleased to say that I have never worked with an organization that is so helpful and knowledgeable about product, pricing, and overall service. A four-day turn-over rate is phenomenal and your team of customer service and calibration techs are great to work with.”

*Mary Anderson,
DiaSorin, Inc*



RICE LAKE[®]
WEIGHING SYSTEMS
To be the best by every measure[®]

USA 800-472-6703 • www.ricelake.com/weights

© 2010 Rice Lake Weighing Systems



◀ *The drug and fingerprint laboratories at the U.S. CBP Southwest Regional Science Center accommodate a range of analysis options for scientists.*

PHOTOGRAPH COURTESY OF SMITHGROUP

within a crime lab might include an arson examination lab, a forensic garage for the processing of impounded vehicles, and a questioned documents lab for the examination of any evidence that includes paper, inks, and forged documents.

Interaction/collaboration requirements

Most laboratories encourage interaction and collaboration among their scientists, analysts, and technicians; however, in a forensic laboratory, it is essential that the forensic staff have dedicated spaces for interactive activities. It is not uncommon that an item of evidence must be examined in two or more laboratory sections. A pistol submitted as evidence, for example, might contain blood stains, which immediately necessitates the examination of this pistol in three laboratory sections: firearms, biology, and latent fingerprints. Inviting and comfortable interaction spaces should be provided to encourage forensic scientists to engage in informal conversations to discuss cases and explore strategies.

Five-in-one laboratory structure

There are five basic laboratory types in terms of their architectural and engineering design requirements: wet chemistry, biological sciences, instrumentation, microscopy, and physical properties analysis. Most laboratories contain two to four of these laboratory types; however, forensic laboratories are unique in that they consistently employ all five of these laboratory types within the same facility.

Wet-chemistry laboratories are spaces designed for the handling of hazardous chemicals. To mitigate these hazards, these laboratories utilize fume hoods and other specialty containment devices. While most

sections within a forensic laboratory have some degree of wet chemistry, the toxicology, drug chemistry, and biology sections are typically the most chemical-intensive. Biological science laboratories are those that examine biological specimens or evidence, which may be infectious or highly prone to cross-contamination. In forensic laboratories, procedures for DNA profiling are undertaken in this type of laboratory. Many other laboratory sections in the forensic lab, including the blood alcohol and latent prints sections, deal with biological evidence.

Instrumentation laboratories are those designed to house a concentrated number of pieces of computer-driven analytical equipment. It is not uncommon for many nonforensic laboratories to have a GC/MS or two at the end of a laboratory bench; however, forensic laboratories typically contain large numbers of these heat-generating, noise-producing, and gas-consuming instruments. In the Center for Forensic Science labora-



▲ *The toxicology section of the Toronto, Ontario, Forensic Services and Coroner's Complex Centre for Forensic Science provides a three-to-one ratio of instruments per scientist.*

RENDERING: COURTESY OF WZMH ARCHITECTS.

tory, currently being designed in Toronto, the toxicology section alone will have space for 80 of these instruments. Each laboratory instrument comes with a unique set of requirements for utilities, vibration, countertop or floor area, environmental conditions and exhaust. The drug chemistry, trace evidence and toxicology sections utilize the majority of instrumentation in a forensic laboratory.

“It is not uncommon that an item of evidence must be examined in two or more laboratory sections.”

Benchtop microscopy at laboratory workstations is not uncommon for most laboratories. In addition to more common microscopy, the forensic laboratory will contain specific rooms designed for substantial numbers of sensitive microscopes. Equipment types will include stereo and polarizing microscopes, FTIR microscopes and comparison

microscopes. The trace evidence section of the crime lab will typically require a specially designed room with light control for varied microscopy, in addition to a scanning electron microscope room with its detailed requirements.

Physical properties analysis laboratories are those that disassemble and physically analyze the parts and components of particular items of evidence. These types of laboratory sections have specific requirements for layout space and specialized casework, as well as for storage of reference materials and comparison exemplars. Special consideration must be given to the type of items being analyzed as well as to their physical and utility requirements in order to provide an optimal environment for the analytical process. Examples of these types of laboratory spaces in the crime lab include the firearms, forensic garage and digital forensics sections.

Unique laboratory sections

While forensic laboratories have several sections in common with laboratories in general, what really set

Discover 70 years of innovation at www.mybuchichem.com

BUCHI



Spray Drying



NIR Spectroscopy



Automated Kjeldahl



Accelerated Extraction



Preparative Chromatography



Rotary Evaporation

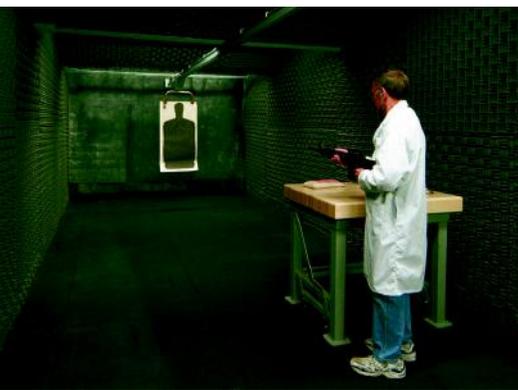
With the same innovative spirit that made us the market leader in evaporation, Buchi has also contributed to the advancement of many scientific processes, developing state-of-the-art instrumentation used in R&D and QC Labs across the Academic, Pharmaceutical, Environmental, and Food & Feed industries.

Visit us at: **ACS Fall** - Aug 22-26 - Boston, MA - **Booth 835**

BUCHI Corporation
New Castle, Delaware

1-877-MYBUCHI
Quality in your hands

these facilities apart are their unique sections. Examples include sections for firearms examinations, which include a firing range and bullet recovery tank; questioned documents, with specialized equipment designed for document examination, such as electrostatic detection apparatus and visual spectral comparators; latent prints, which includes unique procedures and equipment using cyanoacrylate (superglue), powder dusting, alternate light sources, and volatile chemical processing; and vehicle examination, or a forensic garage, for the processing of impounded vehicles for fingerprints and trace evidence.



◀ *A firearms examiner discharges a weapon in the Minnesota Bureau of Criminal Apprehension's laboratory firing range.*

PHOTOGRAPH COURTESY OF SMITHGROUP.

Unique mission

At its essence, the forensic laboratory is dedicated to diagnostic analysis. No other laboratory type is consigned to discovering the who, what, when, where, why, and how of forensic evidence. From humble beginnings and limited resources, the field of forensic science has ascended to become an indispensable tool internationally in the fight against crime. The unique steps that com-

“No other laboratory type is consigned to discovering the who, what, when, where, why, and how of forensic evidence.”

prise the forensic mission include crime scene processing, collecting of forensic evidence, providing scientific examination of forensic evidence, and providing testimony in a court of law regarding the findings.

Spurred by the National Academy of Sciences report on the state of forensic science in the United States, U.S. District Court Judge Nancy Gartner recently

urged defense attorneys to challenge the basis of analysis for evidence submitted and prosecutors to defend its validity.¹ These types of increasing pressures will drive the field to continual refinement of accepted processes, protocols, and procedures, which, in turn will have significant implications for the manner in which forensic laboratories are designed.

Chain of custody requirements

An important component of ensuring the validity of test results is the proper handling of forensic evidence throughout the investigation process. From the time that evidence is collected at the crime scene until it is presented in a court of law, it is crucial that the sometimes rigorous, court-mandated requirements for chain of custody of evidence are met. For the forensic laboratory this means that evidence must be accurately accounted for as to its location, who has handled the evidence, and which individual has custody of the evidence through each step in its journey. The facility must be able to not only accommodate a means of continuous document tracking, but also must provide an accepted secure means of housing evidence at proper environmental conditions at all times. If a defense attorney can prove that a continuous chain of custody of evidence has been broken, that evidence will be inadmissible in court.

Accreditation

Forensic laboratories undergo an accreditation process that is unique to their laboratory type. The idea of forensic laboratory accreditation was originally conceived by the American Society of Crime Laboratory Directors (ASCLD) in the early 1980s. It was during this time that the original ASCLD/LAB guidelines were drafted with the intent of improving quality, strengthening operations, providing overview, and identifying laboratories that meet established industry standards. In the mid-2000's ASCLD/LAB initiated the ASCLD/LAB-International Accreditation Program, which incorporated ISO/IEC 17025:2005, the main International Organization for Standardization standard utilized by testing and calibration laboratories.² Although there is no current federal mandate, with increasing awareness and

scrutiny of forensic laboratories, facility accreditation could become a requirement in the near future.

“... it is crucial that the sometimes rigorous, court-mandated requirements for chain of custody of evidence are met.”

Conclusion

While the forensic laboratory shares many characteristics with its laboratory brethren, its many unique characteristics demand a specific set of facility design responses. Advances in technology, increased scrutiny, developing techniques, and refinement of procedures are certain to continue to change the parameters required to effectively undertake forensic investigations. Documents such as the National Academy of Sciences report have irrevocably diverted the future of forensic science. With so many influences, forensic laboratory design will continue to evolve to meet the investigative necessities of tomorrow.

References

1. Jonathan Saltzman, “U.S. Judge Urges Skepticism on Forensic Evidence,” *The Boston Globe* (March 29, 2010).
2. ASCLD-LAB, “History of the American Society of Crime Laboratory Directors Laboratory Accreditation Board (ASCLD/LAB),” http://www.asclcd-lab.org/about_us/history.html.

Michael Mount, AIA, LEED AP, is an internationally recognized expert in the planning and design of forensic facilities and is a principal and senior lab planner at the Phoenix office of SmithGroup (www.smithgroup.com),

one of the nation's leading architecture and engineering firms, with 11 U.S. offices. He can be reached at michael.mount@smithgroup.com.

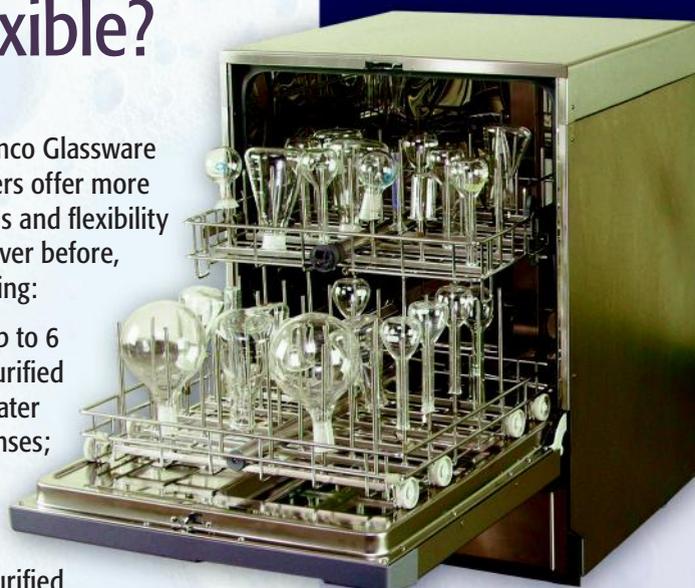
Adam Denmark, AIA, LEED AP, serves as a forensic planning and design architect, specializing in facilities for forensic science, medical examiners, and Biosafety Level 3 units. He can be reached at adam.denmark@smithgroup.com.

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.



Kansas City, MO | 800.732.0031
www.labconco.com

LEARNING TOWARD LEAN?

APPLIED PROPERLY, LEAN PRACTICES CAN DELIVER PRODUCTIVITY IMPROVEMENTS OF BETWEEN 25 PERCENT AND 50 PERCENT
by Tom Reynolds

Lean originated in the automotive industry, and it's easy to see how the tools and concepts are a good fit for that type of manufacturing. What's much less obvious, however, is how Lean can and should be applied in labs. Recently lean lab projects have become quite common, but . . . *Is Lean really an appropriate strategy in the lab environment, or are labs just blindly following trends?*

The origins of Lean

The term "Lean Manufacturing" was first coined in 1990 by MIT researchers studying the global automotive industry. They used the term (now commonly abbreviated to "Lean") to describe what they saw in Japanese car plants (especially Toyota's).

Toyota called its approach the Toyota Production System (or TPS). It was and still is based on "flow and pull" and was more or less the antithesis of the "batch and queue" approach then common in U.S. and European plants.

The Toyota system was mainly developed by Taiichi Ohno and Shigeo Shingo. Interestingly, Ohno attributed much of the credit for the Toyota approach to Henry Ford. Ford's system certainly had flow, but it was built around a single, never-changing product, and it did not cope well with multiple or new products.

Shingo (at Ohno's suggestion) had worked on reducing Toyota's setup and changeover times. Rapid setup allowed for small batches and an almost continuous flow (like the original Ford concept), but it allowed a flexibility that Henry Ford thought he did not need. Ohno and Shingo both wrote books that were translated into English in the late eighties when the productivity and quality gains of the Toyota production system became evident to the outside world.

The West began to adopt the principles of the Toyota system under a variety of manufacturing systems such as Just in Time, World Class Manufacturing, Continu-

ous Flow Manufacturing and others. However, it was not until the Lean Manufacturing label came along that it really took off. Abbreviating the label from Lean Manufacturing to simply Lean allowed the philosophy's transfer to the processing and service industries.

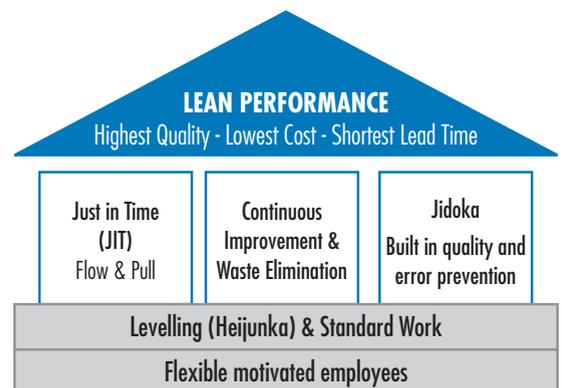
What is Lean anyway?

If you ask people this question, most will answer "waste elimination." But this is only a partial answer. Toyota identified three primary wasteful practices, one of which is waste (or *muda* in Japanese). Ohno identified seven separate kinds of *muda*, and many weaker Lean projects are based solely on reducing or eliminating these. However, the intent of the Toyota Production System and of Lean is to maximize value by minimizing all wasteful practices.

These include the seven *muda* but also *mura* (unevenness—volatility) and *muri* (overburden—overloading of people or equipment).

The significance of *mura* and *muri* is often misunderstood and underestimated. Flow, pull and standard work are also key concepts in the Toyota system, but once again these are often poorly understood and inadequately addressed in many Lean projects. There is a simple reason for this. Waste is easily seen and understood, and tools such as value stream mapping help identify lots of waste to work on, whereas levelling and flow are much more difficult to understand and address, particularly in labs. Unfortunately, Lean is a space littered with well-qualified personnel who are poor practitioners.

► *The principles of Lean are sometimes shown in graphical form as "The House of Lean." The roof represents the goals of Lean, the pillars are the critical lean practices and the foundation blocks are the key enablers. Therefore, for example, levelling and standard work are essential enablers for moving to flow and becoming truly lean.*



Eliminating waste from a levelled, flowed lab process instead of at isolated points creates processes that need less human effort, less space and less time to test samples at less cost and with fewer errors and test failures than traditional labs have. Lean labs are also able to respond to changing customer priorities with fast throughput times.

Labs are different

Labs are not the same as manufacturing environments. Listed below are a few of the differentiating factors in labs:

- Workload and mix can be volatile; i.e., the mix and volume of samples often varies significantly, day to day and week to week.
- A complex mix of routine and non-routine testing, other tasks and project work all share the same resources.
- There is often a significant additional GMP/GLP compliance burden.
- For many tests the effort required to set up a test is significant compared to the sample run time—this makes “one piece flow” unfeasible and some grouping of samples essential.
- Typically, analyst travel time (to gather materials, etc.) is a much smaller proportion of the overall task time than it is in manufacturing. This means that the “movement” waste is less significant, and lean tools such as “spaghetti diagrams” and 5S are less important.
- Individual analyst workloads often vary from day to day and week to week.
- Individual daily roles usually have a higher degree of variety and complexity.
- Many standard lean tools such as line balance charts, value stream mapping, takt time, etc., work differently in the lab (if at all).

The core principles of Lean still apply, but a generic approach using a standard tool kit will struggle in the lab.

Applying Lean in the lab

Although the basic concepts and techniques of Lean are straightforward, adapting them to a particular lab situation and integrating them into a defined process that uses resources well (and is simple to manage) is quite a challenge.

Levelling and flow

In labs (and elsewhere) there is a link between levelling and flow. You cannot flow samples through a lab unless

the short interval workload is level, and you generally can't level volatile workloads unless you flow the samples.

In most labs, short-term volatility in overall workload

“... Lean is a space littered with well-qualified personnel who are poor practitioners.”

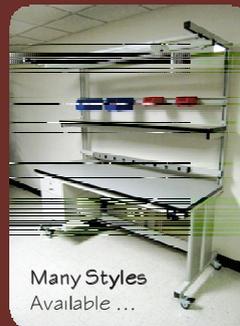
is imported directly into the testing process. This causes low productivity during troughs and poor lead time performance during peaks. Very often the capacity of the lab is not well understood, and no mechanism exists to level the workload.

Levelling a volatile workload or mix is perhaps the single most valuable thing that can be done when leaning a lab—it enables flow that changes how a lab operates and performs and it significantly reduces “fire fighting.”



RDM INDUSTRIAL PRODUCTS, INC.

Manufacturer-Direct & Distributor for Peripheral Products...
Custom Built Industrial Furniture & More !!



Many Styles Available ...

- Industrial-Duty
- Custom & Standard Designs
- Laboratory Tables
- Exhaust Fume Hoods
- Laminar Flow Workstations
- Cleanroom Furniture
- Static Control Furniture
- Cleanroom Furnishings
- Mobile Carts
- Laboratory Casework



Manufacturer-Direct Prices !!!!

Wood or Steel...



Stainless Steel / Custom



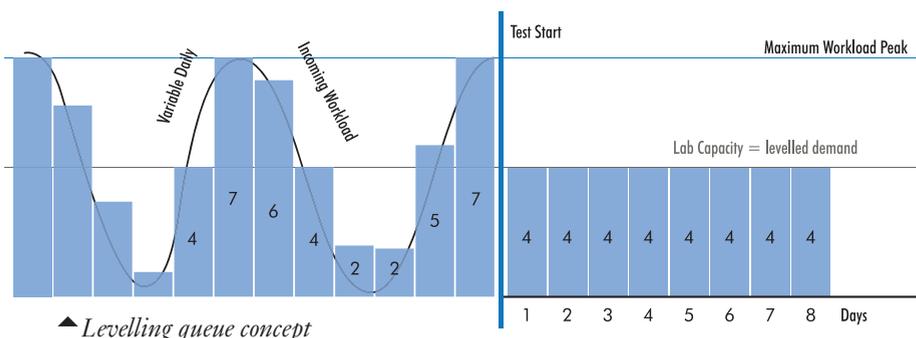
QUALITY • SERVICE • TIMING

We also offer Seating, Carts, Shelving, Cabinets and Much More...

The simplest levelling strategy is to create the ability to process samples at the “levelled demand rate” quickly by developing repeating sequences of testing that move the samples through all the required tests and reviews quickly. These sequences must be designed to meet the overall laboratory workload and to achieve the lead times required by the business. Once the process is started, samples do not queue between tests, and this significantly reduces the throughput time. The difference between the new, reduced throughput time and the lead time required by the business is used to allow samples to be held in an incoming levelling queue until released into the lab as part of a levelled daily or weekly workload.

While in the levelling queue, samples can be prioritized or reprioritized according to customer requirement using a system of “must-start dates.” But when released into the lab as part of a level daily workload, they are processed in FIFO order. To make this approach simple to manage and to control, Heijunka devices such as “rhythm wheels” or “test trains” can be developed.

However, there are many other levelling strategies. Every lab is a unique combination of workload, volatility, lead time, equipment, people and tests, and the exact nature and detail of levelling and flow solutions can and will vary from lab to lab.



▲ *Levelling queue concept*

Note: In real lab situations it's usually necessary to level the mix of sample types as well as the overall workload, and the repeating of test sequences and levelling queues are designed based on work content rather than on sample numbers.

Successfully levelling a volatile workload will deliver significantly greater benefits than waste elimination alone. However, because the relationship between levelling and flow is not intuitive and often not well understood, flow is simply ignored in many lean lab projects.

Standard work

Some analysts are naturally good “time and task” managers and will organize and sequence their work in

EM Sampling Day E Role 1	
Compd.	Morning (1) Prep Compd. Cart & Transfer Materials (2) Travel & Gown in to Compd. (3) Each Room: Airs & Surfaces
12 x Twice Weekly	Sampling Sequences: 1. Paperwork & Label plates 2. Start at SAS 3. Start Climate 4. Weib & Equ surfaces 5. Rec. sample info/Climate results 6. Sample floors
Break Target	
Compd. Sampling Complete	<input checked="" type="checkbox"/> Compounding Role 1 Room Sequence: 369, 365, 367 (Temp), 334, 316, 319, 318
Sterile Fill	After Break (1) Travel & Gown in to Sterile Fill (2) Collect SF Cart, Re-stock prod & zero climates (3) Each Room: Airs Surfaces
10 x Daily 2 x Weekly	2nd Break Target
SF Sampling Complete	<input checked="" type="checkbox"/> SF Role 1 Room Sequence: 311, 312, 313, 327, 304, 306 (W)
IQA	Afternoon (1) Travel & Gown in to IQA (2) Collect IQA Cart, Re-stock prod & zero climates (3) Each Room: Airs & Surfaces
3 x Weekly 1 x Twice Weekly	End of Shift Target
IQA Sampling Complete	<input checked="" type="checkbox"/> IQA Role 1 Room Sequence: 615, 616 (TW), 617, 618

▲ *An example of a standard work “role card”*

a logical and productive manner. However, many are not. A standard work approach can be used to develop repeatable analyst roles. This will improve the operation of a rhythm wheel or train and reduce errors and failures. Also, because standard work combines tasks and uses people’s time well, it delivers a significant productivity gain in itself.

In order for a standard work approach to be effective:

- Design standard roles that make good use of resources
 - Identify manned and unmanned tasks, and define a sequence and combination of tasks that utilizes available time effectively.
- Leverage your good time and task managers
 - Define the combination and sequencing of tasks based on people who are productive because they organize their work well, rather than because they move fast.
- Do a design on paper with a team, then try, refine and deploy
 - Involve analysts in an iterative process to design productive roles that meet the requirements of your train or rhythm wheel.

Sigma-Aldrich® Supply Rewards® Program

Performance management/short interval control

Structured performance management processes, including definition of suitable metrics and daily review huddles, are essential for sustainability of lean processes. In most laboratories, only lead time and the investigations rate are measured. Lab productivity is often ignored because it is perceived as difficult to understand and measure. Overall lab performance and performance trends are often not communicated well to the individual analysts.

Operational performance (versus a predefined sequence of testing) should be reviewed at least daily as part of a short team huddle held in front of a performance white board.

Resources

If a lean lab project is to be successful and delivered within a reasonable time frame, it is necessary to resource it properly. This should include significant senior management support and/or the use of external consultants with a relevant track record and excellent project management skills. Obviously this costs money, and a clear ROI (return on investment) goal and measurable project objectives should be established prior to embarking on a full project.

Benefits

When Lean is applied properly in labs, productivity improvements of between 25 percent and 50 percent and/or lead-time reductions of 80 percent are not unusual. Other benefits include:

- Consistent predictable performance
- Reduced levels of WIP and inventory
- Greater empowerment of laboratory personnel
- A culture of proactive performance management and continuous improvement
- Improved customer service levels

Conclusion

Laboratories are not the same as manufacturing environments. But Lean can and should be applied to labs. A generic approach will not work, but careful application of the techniques based on a thorough understanding of lab processes will deliver significant benefits in terms of cost or speed or both. While most of the key principles of Lean apply, many unique challenges are involved in effectively implementing them in laboratories.

Tom Reynolds, BSM operations practice director, can be reached at tom.reynolds@bsm-usa.com.

BSM is a leading life science "Lean and Operational Excellence" consulting company with offices in the United States, Ireland and the United Kingdom. Visit www.bsm-usa.com to learn more.

Reward your lab, your team or yourself just for buying select products.

Enroll by October 31, 2010 and earn 250 bonus points!

Enter promo code **6R8N-NTWT-193C** when enrolling.

Start earning points today. Go to, sigma-aldrich.com/supplyrewards or www.supplyrewards.com



Supply Rewards Program available in the U.S. only
Supply Rewards is a registered trademark of BL.



STAFFING COMPANIES: PERCEPTION VERSUS REALITY

Scientific professionals perceive workplace issues differently. Some scientists believe that certain organizations have more employee loyalty, greater customer satisfaction, and higher quality products and services that are more valuable to consumers than those of other organizations. However, the exact opposite may be true.

Perception is not always associated with reality. For example, each year, global staffing companies provide high-quality and rewarding positions to thousands of scientific professionals around the world. Nevertheless, some scientists have preconceived notions about staffing companies that may not be true, such as the costs associated with staffing services and the qualifications and skill sets of employees.

As workforce solutions companies strive to educate the public on the positive aspects of contract employment, it is useful to examine four common perceptions that scientific professionals have of staffing companies and to present the realities of what staffing companies can provide.

Perception: Candidates must pay in order to work with staffing companies.

In response to the ever-changing conditions of the global economy, many scientific professionals seek help obtaining positions within the scientific community. However, they are unsure of the ways a workforce solutions company can help them cost-effectively find work. Believing there is a cost associated with staffing

service companies, many science professionals have avoided them entirely and continue to pursue career opportunities on their own.

Reality: Many staffing companies provide services free of charge.

Many staffing companies place scientific professionals with highly reputable organizations completely free of charge. Staffing recruiters will work with candidates to identify a scientific position that matches their background, skill sets, and interests. With help from staffing companies, both scientific professionals and organizations are able to benefit from each other, thus creating a true win-win situation.

Through the no-cost staffing services of workforce solutions companies, such as Kelly Scientific Resources (KSR), organizations have access to high-caliber scientific professionals around the world. With its network of worldwide offices, KSR is able to place employees within organizations throughout the United States, as well as across the globe. In the meantime, organizations obtain top scientific talent while contract employees typically develop their skill sets, network within their preferred industries, and improve their future career prospects, even in the midst of an economic downturn.

Perception: Workforce solutions companies only staff temporary employees.

In addition to scientists' misperceptions of

the cost of workforce solutions services, some professionals also believe that staffing companies only provide opportunities for temporary employees. This idea is far from the truth.

Reality: Workforce solutions companies staff full-time and temporary employees.

Throughout the world, staffing companies assist individuals as they pursue the following three types of positions:

Temporary (contract)

In contract positions, candidates are able to obtain relevant work experience while working for an organization on a short-term basis.

Temporary-to-permanent or temporary-to-hire

As temp-to-hire employees, candidates can work for an organization for a brief amount of time in order to determine whether or not a position or organization is a good fit for them, especially with regard to skill sets and career goals. If the organization is a "match," that candidate may be hired full time.

Direct hire

With direct-hire positions, candidates can establish full-time, long-term careers with clients of staffing companies. Workforce solutions companies will frequently recruit professionals for direct-hire positions.

If staffing companies are unable to provide professionals with full-time, direct-hire opportunities, they will likely find temporary positions that may lead to full-time employment in the future.

Therefore, scientists should not view temporary offers as positions that will end in three or four months. Rather, through consistent networking, high performance, and persistence, temporary scientific employees may receive full-time offers and

long-term tenure within an organization after the economy improves.

Perception: A majority of the workforce is comprised of full-time employees.

Nationwide, many professionals have attempted to obtain full-time salaried positions within the science industry and consider contract employment a less desirable choice. Many scientists believe that the majority of scientific professionals are full-time employees. However, as the workforce changes, companies will also change the way they manage their talent pools.

Reality: Many employees are pursuing contingent work.

According to an MIT and Littler Mendelson P.C. study, 50 percent of the workforce that will be added in 2010 will consist of contingent workers. Thus, 25 to 35 percent of the workforce will include temporary, contract, or project-based employees. Additionally, 73 percent of large companies are expecting to increase "their contingent workforce by a median of 25 percent between late 2008 and late 2010."¹ Growth will likely continue well into 2010, as one-third of all large companies surveyed are predicting contingent workforce growth of 50 percent or more.

As the economy recovers, some organizations will be more cautious about hiring full-time employees. When economic conditions begin to improve and the recovery truly strengthens, companies will likely continue to hire contingent scientific professionals. While the workforce continuously evolves, companies will look for the best available options in order to efficiently manage their talent needs. Scientists will be able to rely on the temporary and direct-hire staffing experience of workforce solutions companies during the coming years.

Perception: Workforce solutions companies only staff individuals with certain skill sets.

Some individuals think that workforce solutions companies only have employment opportunities for scientific professionals with advanced degrees and extensive experience. Many scientists are reluctant to contact a staffing company because they do not have the experience that some of their fellow colleagues have, or they lack a doctorate or master's degree.

So, what is the truth exactly? Do scientific professionals need 20 years of past work experience before they should consider contacting a workforce solutions company? Actually, whether they have a doctorate in molecular biology and years of research experience or are just beginning their careers, all scientific professionals seeking employment opportunities can contact staffing companies.

Reality: Workforce solutions companies staff employees of all skill sets and backgrounds.

Staffing companies are focused on finding both temporary and full-time positions for scientific professionals of all levels of education and work experience. As equal-opportunity employers, workforce solutions companies staff all types of scientific professionals on a daily basis. Candidates should never be deterred from achieving their personal ca-

reer goals as a result of having less work experience or academic credentials than their fellow scientists. Rather, workforce solutions companies will continue to help individuals meet their employment objectives on a contract, full-time, or project basis well into the future.

1. *The Emerging New Workforce: 2009 Employment and Labor Law Solutions for Contract Workers, Temporaries, and Flex Workers*, The Littler Report, April 2009, www.littler.com.

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

Premiere Ergonomic Seating for Productive Laboratory Environments

Bevco's polyurethane seating is specifically designed for outstanding comfort, 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
 - ◆ Easily adjustable pneumatic seat height
 - ◆ Exceeds ANSI/BIFMA standards for safety and durability.
 - ◆ Exclusive **12 year warranty**

Call for a **FREE** brochure



EVOLUTION OF WATER PURIFICATION SYSTEMS

BY JOHN BUIE

Although water is the most commonly used laboratory solvent, the importance of water quality is often overlooked. Achieving water of sufficient quality requires the careful use of purification technologies and a method for accurately measuring and monitoring contaminants. Once pure water has been produced, it must be validated and then carefully stored and maintained to ensure that its quality does not deteriorate.

There are several commonly used methods for purifying water. The principal methods used for laboratory purposes include:

- reverse osmosis • electrodeionization • ion exchange • ultraviolet (UV) • ultrafiltration • distillation

In **1748**, the French cleric Jean-Antoine Nollet made the important discovery that water naturally diffuses from a dilute to a concentrated solution. This phenomenon later became known as "osmosis." During the following century, the study of osmosis became of particular interest to practitioners of the biological and medical sciences.

In **1878**, Robert Barnstead, a master plumber, developed the first all-metal laboratory distillation unit for Massachusetts General Hospital.

In **1916**, the use of ultraviolet (UV) light treatment was first attempted in the United States as a method to purify drinking water.

In **1951**, the original patent on mixed-bed ion exchange resins was issued to Francis McGarvey and Robert Kunin. McGarvey and Kunin discovered that a mixed bed of quaternary ammonium anion-exchange resins and existing hydrogen-cation-exchange materials was able to effectively and efficiently remove salts from water, and could be regenerated after use. The ion exchange process, in which water percolates through a bead-like resin, is now a common method for water purification. This process is used for both water softening (in which sodium ions are used to replace calcium or magnesium ions in the water) and deionization.

In **1957**, the first patent for EDI was granted to a Dutch company. A U.S. patent for the purification of acetone using EDI was also granted in this year to Paul Kollsman for his "Method and Apparatus for Treating Ionic Fluids by Dialysis."

1910

In **1907**, Bechold published a paper on the process known today as "ultrafiltration." Bechold described driving solutions at high pressures through a membrane prepared by impregnating filter paper with acetic acid. He used the term "ultrafilter" to describe a collodion membrane of graded pore size. Ultrafiltration is now commonly understood to mean a process that allows colloidal particles, emulsions and microorganisms to be removed from a solution.

1930

In **1927**, the Sartorius Company in Germany began selling ultrafiltration and microfiltration membranes, manufactured using the Zsigmondy process developed in 1918. This marked the beginning of the membrane market. At this stage, membranes were targeted for laboratory rather than industrial use.

Between **1926** and **1931**, key research was performed on the phenomenon of reverse osmosis by various researchers including Michaels, Manegold and McBain.

1950

In **1955**, electrodeionization (EDI) was first described in a publication by scientists at Argonne Labs as a method for the removal of trace radioactive materials from water. In the process of EDI, ionizable species are removed from liquids using an electrical potential across an electrically-active medium to affect ion transport. Unlike other water purification techniques, EDI does not require the use of caustic or acidic chemicals.

In the late **1950's**, the first pilot EDI device incorporating mixed resins was developed in the United Kingdom by the Permutit Company on behalf of the Harwell Atomic Energy Authority.

In **1970**, Cadotte and Lonsdale developed composite membranes for reverse osmosis. Cadotte later discovered how to make more effective, multilayered-polyamide reverse-osmosis membranes, now called thin-film composite (TFC) membranes, which have since largely replaced cellulose acetate membranes.

Also in **1970**, Forbes introduced the first industrial application of ultra-filtration in electrophoretic painting.

In **1973**, Millipore introduced the Milli-Q water purification system, the world's first lab-scale ultra-pure water system. "Milli-Q water" refers to water that has been purified and deionized to a high degree by this system.



In **2008**, Millipore introduced the Milli-Q Integral water system. This was the first system to purify tap water to type 2 and type 1 levels in a single, space-saving system.



In **2006**, Millipore introduced the Milli-Q Advantage system that could be equipped with up to three Q-POD remote dispensers to deliver water wherever it was needed in the lab and remove critical contaminants at the point of water delivery without recontamination.

In **2005**, Thermo Fisher Scientific, then know as Barnstead International, introduced the AccuDispense, the first remote dispenser for ultrapure water systems that displays water quality at the dispensing gun, allowing users to place water systems out of site for increased workspace in the laboratory.

In **1999**, Thermo Fisher Scientific, then know as Barnstead-ThermoLyne, introduced the NANOpure Diamond, the first ultrapure water system to integrate volumetric dispensing into the unit, allowing users to automatically dispense set amounts of water from the unit to eliminate spill and contamination risks.

1970

In **1967**, Millipore introduced the Super-Q water purification system, designed to produce ultrapure water by providing the "final polish" to water pre-treated by reverse osmosis, distillation or deionization.

In **1963**, Loeb and Sourirajan, working in a research laboratory at the University of California, Los Angeles, succeeded in developing an anisotropic membrane that was sufficiently selective and water permeable to be able to allow desalination. The Loeb-Sourirajan film consisted of a cellulose acetate gel (~50% water), which relied on a dense layer, approximately 0.1 micron thick, for its separation capacity. It is at this exceptionally thin "skin" where the actual water transport and desalination takes place. This film was recognized as an important breakthrough and marked the start of the mass manufacture of asymmetric membranes for reverse osmosis.

1990

In **1987**, EDI devices and systems were first fully commercialized by a division of Millipore.

In **1996**, Millipore introduced systems with ATO monitors for Total Organic Carbon (TOC) measurement of purified water. It is known that even relatively low TOC levels in purified water affect the outcome of many laboratory experiments. Previously, water systems had measured ionic contamination by resistivity alone.

In **1998**, Millipore introduced ready-to-use water system validation packages for the pharmaceutical industry.

2010



In **2009**, ELGA LabWater launched the PURELAB flex water purification system integrating in-hand monitoring and accurate, pure-water dispensing in one product.

THE FUTURE OF LABORATORY WATER PURIFICATION SYSTEMS

Water purification has come a long way in a short time since the first filtration and membrane systems of the twentieth century. New advances continue to drive the industry forward, such as Millipore's Millitrack remote monitoring software that enables electronic archiving of water quality records. There seems little doubt that this pace of change will continue into the immediate future. Many experts predict that nanotechnology will become the standard of laboratory, industrial and domestic water treatment in the years ahead, potentially offering less expensive and more effective water purification methods.

▼ DNA sequencing team.

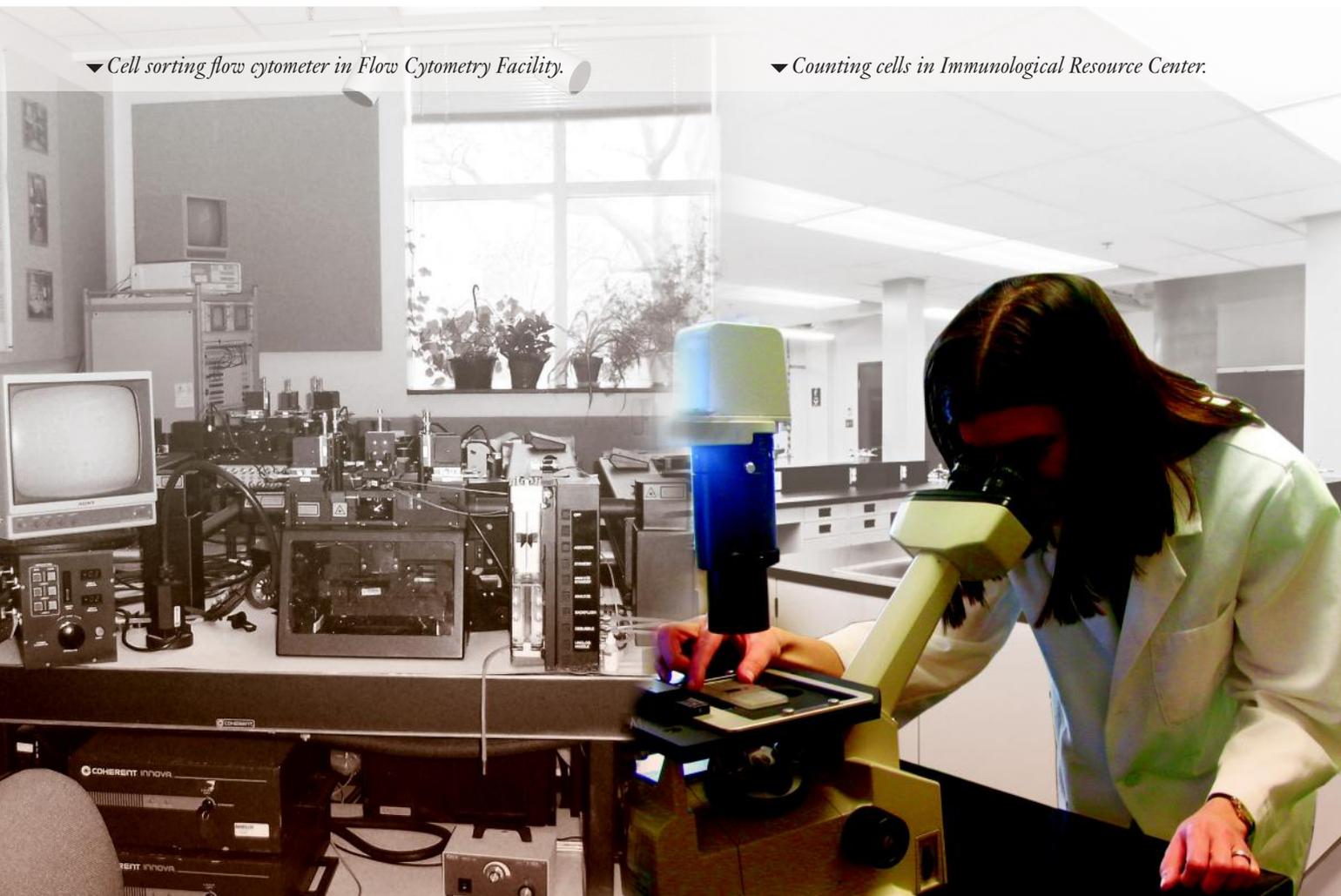


BIOTECH CENTER DIRECTOR AND PI, JONATHAN SWEEDLER, MANAGES IT ALL

by Sara Goudarzi

▼ Cell sorting flow cytometer in Flow Cytometry Facility.

▼ Counting cells in Immunological Resource Center.



Jonathan V. Sweedler is a busy man: he runs a large research group in the Department of Chemistry at the University of Illinois at Urbana-Champaign and is the principal investigator for the UIUC Center for Neuroproteomics on Cell-Cell Signaling and the director of the Roy J. Carver Biotechnology Center (CBC)—a service facility that provides state-of-the-art research infrastructure to investigators on and off campus to enable life sciences research.

Specifically, CBC provides services in the areas of genomics, proteomics, bioinformatics and DNA sequencing, among others.

“We try to enable researchers to do their best research, so we might measure expression profiles, sequence microbial genomes completely [or] we might be

identifying proteins that change during a treatment,” says Sweedler. “So what we do depends a lot on the individual we’re working with.”

The center supports more than 220 on-campus researchers scattered throughout 38 entities—from the

School of Molecular and Cellular Biology to the College of Veterinary Medicine—as well as off-campus researchers and companies.

“About 600 individuals bring in samples every year, so we are, if you want to think of it, a business within the University of Illinois whose major job is to analyze

samples, give data to researchers and in some cases to produce products such as antibodies or specific transgenic mice,” explains Sweedler.

“We work with individuals with diverse technical backgrounds—from real experts driving technology

development to faculty who are not used to working in an area. We really accommodate everyone,” he adds.

Facility structure

Distributed across five buildings, CBC occupies about 10,000 square

“The interesting thing about DNA sequencing is it’s almost like the inkjet printer model ...”

feet of space on the university's Urbana campus and comprises five different units. The W.M. Keck Center and the Proteomics Center are the largest of the group, followed by the Carver Metabolomics Center, the Transgenic Mouse Facility and the Career Services Office.

The Proteomics Center, composed of three units—Flow Cytometry Facility, Immunological Resource Center and Protein Sciences Facility—is involved in protein and cell characterization.

“The center provides the expertise and the facilities to sequence and quantify DNA and RNA.”

“The proteomics facility has the ability to identify and quantify proteins, so somebody could have a piece of animal tissue or plant material and we can separate out and analyze its protein content,” Sweedler explains.

The focus of the W.M. Keck Center is genomics, with researchers involved in comparative genetic organization, evolution and function of plant, animal and microbial genomes. The Keck Center is divided into high-throughput sequencing and genotyping, functional genomics and bioinformatics.

“If you think of the molecules of life, most people would list DNA, RNA and proteins,” Sweedler says. “The center provides the expertise and the facilities to sequence and quantify DNA and RNA.”

The Metabolomics Center identifies and quantifies metabolites of plants, animals and humans, and the Transgenic Mouse Facility supplies genetically engineered mice to

researchers—a task that Sweedler explains is labor intensive.

Lastly, the CBC has a Career Services Office, a unique interface for recruiters that exists mainly because biotechnology reaches across various fields.

“I don't know of other university biotechnology centers that do that,” Sweedler explains. “The Career Services Office basically [exists] because recruiters come to this campus and want to hire somebody who, for example, understands molecular

of a pyramid structure.”

Inventory and maintenance

The individual facilities within CBC each have vastly different maintenance and inventory needs. For example, the Keck Center inventory may be more instrument based, whereas the Transgenic Mouse Facility may need to conduct an inventory of the animals. Therefore, with the assistance of their staff, each director and lab manager takes care of the day-to-day inventory and maintenance. And unless the purchase or maintenance is above a certain dollar amount, Sweedler doesn't get involved.

But when it comes to negotiations or equipment whose operating costs may run more than the initial purchase price, he works his hardest to get the best deal for the university. An example of this is the work on DNA sequencing.

“The interesting thing about DNA sequencing is it's almost like the inkjet printer model where you could buy an inkjet printer cheaply for, I'll make up an amount, \$100, but then you end up spending \$40 every time you buy an ink cartridge. So over the lifetime of a printer the ink costs many times more than the printer,” he explains.

“You may spend \$400,000 on a sequencing platform, but the ‘inks,’ the reagents for it, end up costing many times more than that. So we do get involved in negotiations for the reagents because those add up to hundreds of thousands of dollars to millions, in some cases. So you could call that an inventory, and we do help the individual managers because such large purchases also have to follow a large number of federal and state rules.”

biology, and they might have to interview people in multiple departments—animal sciences, molecular and cellular biology, veterinary medicine—and they don't like to do that so they come to us and ask for a recommendation.

“Long ago, we became the campus contact for recruiters in the areas of biotechnology and then we'd reach out to all the units on campus so that the companies didn't have to,” he adds. “In this way, our Career Services Office was created.”

Although Sweedler is the director of CBC, he insists that the management of the center, its 36 full-time staff—with backgrounds in bioinformatics, engineering, plant biology and genomics, among others—plus the students who work part time in the various facilities, is a shared task.

“I don't go through all the different units every day,” he says. “Mark Mikel, the associate director, goes to the labs more often. And the individual facility managers really are the points of contact, so I guess it's somewhat

ELGA

The future of pure water



PURELAB flex

Make your life easier with a water purification system that delivers consistently high water quality and is effortless to operate and maintain. Featuring an adaptable configuration, PURELAB flex combines the latest innovation, design and technology with more than 50 years of water knowledge to set the standard of flexible water purification.

Contact us:

Phone: 1-877-315-ELGA (3542)

Fax: 1-630-910-4798

Email: elga.usa@veoliawater.com

 **VEOLIA**
WATER

Solutions & Technologies

Automated Sample Prep in Minutes

- Processes samples directly from original sample bottle
- Automatically delivers required solvents, rinses bottle, extracts analytes from the SPE disk
- Preprogrammed EPA Methods
- Reduces solvent use
- Lowers operating costs
- Increases productivity and efficiency
- Improves quality/consistency

Automated Sample Preparation for GC/MS & HPLC

**Extraction
Drying
Concentration**

Challenges

CBC, being part of the state of Illinois and part of a state university, is affected by budget fluctuations at the government level. Their funding is about 50 percent service revenue, 30 percent university supported and 20 percent from outside grants and other off-campus sources. This, Sweedler explains, is perhaps one of the biggest challenges of his job.

“A recent example is the furloughs state workers must take,” he says. “Many members of the biotechnology center are state employees; they’re paid by the

is that the people who work at the biotechnology center are incredibly well trained, and many can get jobs at other places, and so how do you keep them here?”

Sweedler believes that giving his staff ample freedom is one way to ensure that they stick around and stay happy at work.

“If they’re convinced that a different set of services would help people, let them try it,” he explains. “If they want to, for example, expand in an area, you explain what it would take in terms of outside support or finding people to make this a reality,

“Long ago, we became the campus contact for recruiters in the areas of biotechnology ...”

university and so they have to take the furloughs. But a few employees are completely on research grants and they don’t take furloughs, and those types of issues cause morale issues [and] challenges.”

So how does he keep the morale up in a unit that’s doing very well and keep things moving forward? The secret, according to Sweedler, is effective communication and the right attitude.

“A lot of it, I think, is how you project positive,” he says, and adds that he often compliments the staff on how well they are doing and tries to explain the constraints they are under. For example, the university created a policy of no raises, and so Sweedler ensures that everyone realizes the lack of a raise is not about them but for reasons beyond his control.

“The bigger issue we have, I think,

and help them write the grants if that’s what they want.

“Give them the freedom to try new things as much as possible to prove that ideas would work or not work. So I think the biggest thing is empowering employees to feel ownership as much as possible.”

Although the employees may not always be monetarily rewarded, working at a university and for the state gives them job security that may not always come with a bigger paycheck.

“It’s not likely if there was a slowdown lasting six months that we’d get rid of people,” Sweedler says.

Balancing act

While Sweedler is the director and CBC staff report to him, he himself reports to the vice chancellor for

research and has to adhere to rules set by the university.

"I have an advisory committee that can instruct me and tell me what I'm doing right or wrong, and so I have to deal with many inputs at that level," Sweedler says. "It may, to many faculty, seem like I get to set prices, but we have a university office that can actually overrule anything that we come up with.

"There are, in essence, rules in what we charge, what direct cost rates are and every other aspect, so what I tend to do is be the interface from the center to the outside world,

jobs in industry, and this training is at least as important as the research results."

"I have to balance these two distinct jobs, but both involve very different management styles and goals."

For his research group, Sweedler holds weekly meetings in the labs and also meets with every individual in his research group to ensure that all is running smoothly and all the information from above is correctly passed on to his teams. Time permitting, he also walks through as many labs as possible each week.

"The biggest thing is empowering employees to feel ownership as much as possible."

which is the rest of the university.

"That's the other side of it; there's a lot of interfacing and management that goes through the other direction and so it's a balancing act."

Additionally, he manages a research group with his professor hat on that consists of 18 graduate students, four staff and four postdoctoral associates. As part of this responsibility, he is the principal investigator for the Center for Neuroproteomics on Cell-Cell Signaling, a National Institute on Drug Abuse center that investigates neuropeptides and hormones.

"I guess to state it simply, the goal of a research group is different than [that of] many companies. We have two outputs—one is research results in the form of scientific publications and the other is people," Sweedler says. "My group trains scientists for

So how does he do it all?

"Dealing with the students and keeping the research group going is probably the one thing, long term, that's most exciting to me," Sweedler says. "Keeping the biotechnology center state-of-the-art and moving forward, keeping it responsive to everyone on campus and keeping the staff happy is another area of excitement.

"They're very different jobs but it's kind of fun to have so many different aspects to my daily routine, which says that my routine is not very routine."

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

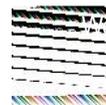
SPE Disks Process Larger and Dirtier Samples

- Pesticides and Herbicides
- Pharmaceutical By-Products
- Personal Care Products
- Hormones/Endocrine Disruptors
- Bisphenol A/Nonyl Phenol
- Oil & Grease/1664A
- Semi Volatile Organics
- TPHs, PAHs, PCBs
- Emerging Contaminants
- EPA Methods 525.2, 8270, 1694 ... many more

Extraction Solutions for GC/MS & HPLC/MS

Aqueous and Environmental Applications

Telephone: 1 603 893 3663



ENABLING TECHNOLOGY FOR HIGH-THROUGHPUT ASSAYS

by Angelo DePalma, Ph.D.

Microplate readers (MPRs) are used extensively in the pharmaceutical industry for high-throughput drug screening and in biology labs for enzyme assays, immunoassays, binding assays, protein and cell assays, ELISAs, and biomolecule concentration measurements.

Flexibility (available detection modes), performance (sensitivity, throughput), and cost are prime considerations in MPR selection, although the order of preference may differ for each market. "Pharmaceutical screeners typically value throughput as their top criterion," says Xavier Amouretti, product manager at BioTek (Winooski, VT), "while academic researchers may be more satisfied with a lower throughput but high flexibility, particularly if it means a lower overall cost."

MPR 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.

According to a 2009 market study by HTStec (Cambridge, UK), about 60 percent of microplate readers employ optical filters only. Filters are selective for excitation and emission light, so two are required. Thirty percent of readers use monochromators, which tune in excitation and emission wavelengths through diffraction gratings controlled by the instrument software. Approximately 10 percent of readers are hybrid systems incorporating both monochromators and filters. Filters provide the highest sensitivity and read speed, while monochromators afford flexibility, wavelength scanning, and lower operating costs; hybrid systems constitute the best of both worlds.

In 2007 HTStec estimated market growth of MPRs at about 6 percent per year, with an average high-throughput system costing between \$65,000 and \$110,000. (Note: simple absorbance readers for individual plates cost significantly less). Large pharmaceutical and biotech companies purchased 23 percent of systems, academic labs 25 percent, and small pharma/biotech 52 percent.

The more recent HTStec survey listed on-site demonstration as the single most important factor in MPR purchase decisions. According to Amouretti, users

also value flexibility, add-on functionality, and upgrade capability. 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.

"Many researchers are investigating multiplexed assays, where more than one assay is performed in the same well," Amouretti notes. "For example, we have monitored the small molecule induction of cytochrome P450 isozymes in hepatocytes using luminescence readout while simultaneously monitoring cell viability by fluorescence. Multiplexing saves time, provides better data quality, and ensures that all assays are conducted under identical conditions. But this requires the reader to have good performance across a number of detection modes."

Absorbance: the sweetspot

Bio-Rad Laboratories (Hercules, CA), offers only absorbance-based

Microplate Readers: Are you using a microplate reader in your lab? Are you considering purchasing a microplate reader soon? *Lab Manager Magazine's* online surveys help improve the purchasing process and provide you with greater confidence in your final purchasing decision. To take the survey, please visit www.labmanager.com/surveys/microplate-readers.

readers to serve the large and growing market for ELISA assays. Marina Pekelis, senior product manager, describes absorbance, which is suitable for both single-point and kinetic assays, as the “workhorse” detection mode for MPRs.

“Absorbance readers are popular due to their ease of use and intuitiveness,” Pekelis tells *Lab Manager Magazine*, “and are by far the most economical way to perform ELISA assays. Users don’t want to spend a lot of time figuring out an instrument when all they want to do is protein detection.” Price is another positive: simple desktop absorbance MPRs cost less than \$10,000.

Absorbance techniques have the inherent limitation of detecting only one wavelength per well. To provide multi-parameter assays, Bio-Rad licensed

the Luminex xMAP bead-based assay technology and turned it into a proprietary product, Bio-Plex. Experiments are run in 96-well plates, but instead of being a result of optical reading, detection occurs through flow cytometry.

Like MPRs with multiple detection modes, absorbance readers can analyze one well at a time, which is slow but more reliable, or use a detector array that reads an entire row on the plate at once. In this mode reader, system software will automatically calculate an average well reading and generate statistics.

In addition to using system software that has limited functionality, users typically control MPRs and setup methods through dedicated personal computer applications. Add-on software provides advanced statistical calculations, concentrations, ratios,

threshold or qualitative readings, report generation, method development and storage, export to popular spreadsheet programs, and other capabilities through a familiar Windows interface. BioRad’s Microplate Manager PC software, like packages sold by other vendors, is proprietary, but Ms. Pekelis says that workarounds exist that permit software and systems from different vendors to coexist.

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

MICROPLATE READERS

Applied Biosystems	Carlsbad, CA	800-327-3002	www.appliedbiosystems.com
Beckman Coulter	Fullerton, CA	800-233-4685	www.beckman.com
Berthold Technologies	Oak Ridge, TN	865-483-1488	www.berthold.com
Biochrom	Cambridge, UK	858-779-9141	www.biochrom-us.com
Bio-Rad	Hercules, CA	800-424-6723	www.bio-rad.com
 BioTek®	Winooski, VT	888-451-5171	www.biotek.com
BMG Labtech	Offenburg, Germany	011 49 781 969 6822	www.bmglabtech.com
Douglas Scientific	Alexandria, MN	320-762-6888	www.douglasscientific.com
Molecular Devices	Sunnyvale, CA	800-635-5577	www.moleculardevices.com
PerkinElmer	Waltham, MA	617-225-0400	www.perkinelmer.com
Tecan	Durham, NC	800-338-3226	www.tecan-us.com
Thermo Fisher Scientific	Waltham, MA	781-622-1000	www.thermo.com
Turner Biosystems	Sunnyvale, CA	888-636-2401	www.turnerbiosystems.com

GET A BETTER REACTION

**LAB MANAGER MAGAZINE'S
INDEPENDENT
GUIDE TO
PURCHASING
A MICROPLATE
READER**

www.labmanager.com



BioTek offers an extensive range of microplate readers that fit most price and performance profiles, from the patent-pending Synergy™ H4 Hybrid Microplate Reader to the basic ELISA reader, the ELx800™, used in thousands of laboratories around the globe. Included in the BioTek reader product range are multi-mode readers, fluorometers, luminometers and a variety of both monochromator-based spectrophotometers and filter-based absorbance readers.

For important assays like nucleic acid and protein quantification, where very small sample size is critical, BioTek's Take3™ Multi-Volume Plate offers the ability to measure multiple samples as small as 2 µL in the monochromator-based multi-mode and absorbance readers.

www.biotek.com



Molecular Devices offers a full range of microplate analysis products—from single-mode absorbance, fluorescence, or luminescence readers to multi-detection systems with up to five detection modes to validation & compliance tools. SpectraMax® Multi-Mode Microplate Readers offer flexible configurations across all commonly-used detection methods to accommodate most life science applications, including ELISAs, protein quantification, and cell-based screens. Fully compatible with out-of-the-box automation solutions from long-standing business partners as well as the StakMax® Microplate Handling System, these multi-mode readers are ideal choices for researchers who need walk-away automation for microplate-based analyses.



Introducing the Optimiser™. Imagine completing a sandwich immunoassay in just 30 minutes! The Optimiser employs the Power of Microfluidics to provide this advantage and more. With the Optimiser you have the choice of saving precious samples or boosting assay sensitivity. You will also save reagents, eliminate traditional wash steps and improve laboratory workflow. The Optimiser even conforms to the architecture of traditional 96 well plates, so it is compatible with all existing instrumentation and readers.

The Optimiser by Siloam Biosciences, Inc. Learn more at www.siloambio.com.



PerkinElmer is the company to think of first for all your multilabel detection needs. With thousands of installed instruments worldwide, PerkinElmer delivers the knowledge and expertise you require in multilabel detection. From stand-alone plate readers to fully integrated, automated systems, you can be confident that your detection solution has been precisely validated for specific assay technologies.

Our application-focused discovery support team means you can be confident our advice will be on target with your needs. And with plate readers that fit every application and budget, choose the company that's known as the global multilabel detection expert — PerkinElmer!

INTRODUCTION:

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.

SINGLE-MODE DETECTION

The purchaser should consider the type of assay that the microplate reader will be expected to perform, and whether luminescence, absorbance or fluorescence

A ABSORBANCE DETECTION

Absorbance is the oldest type of detection used in microplate readers. In an absorbance microplate reader, the percentage of light of a certain wavelength transmitted through the sample is recorded. Absorbance detection is commonly used for assays such as ELISA, protein and nucleic acid quantification or enzyme activity assays.

INTEGRATED PC AND SOFTWARE

Microplate readers with integrated computer and software capability allow the user to record and analyze data *in situ*. However, the range of applications and analyses available may be a little more limited than the options available on an external PC.

 Awareness Technology Stat Fax 4200	 Awareness Technology Stat Fax 3200	 PerkinElmer EnSpire	 BioTek ELx800
 Bio-Rad iMark Microplate Absorbance Reader	 Bio-Rad xMark Microplate Absorbance Spectrophotometer	 Thermo Fisher Scientific Thermo Scientific Multiskan FC	 BioTek ELx800
 Thermo Fisher Scientific Thermo Scientific Multiskan FC	 Promega GloMax®-Multi+	 Promega GloMax®-Multi	 Tecan Sunrise Touchscreen

CONNECTION TO EXTERNAL PC REQUIRED

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.

 Awareness Technology ChroMate	 BMG LABTECH SPECTROstar	 BMG LABTECH FLUOstar OPTIMA ABS	 Tecan Sunrise Remote Control
 PerkinElmer EnVision	 PerkinElmer VICTOR X	 Thermo Fisher Scientific Thermo Scientific Multiskan Spectrum	 Tecan Infinite 200 PRO NanoQuant
 Promega GloMax®-Multi+	 Promega GloMax®-Multi	 MDS Analytical Technologies Emax ELISA Microplate Reader	 Tecan Infinite F50
 Molecular Devices VMax ELISA Microplate Reader	 Molecular Devices VersaMax ELISA Microplate Reader	 Molecular Devices SpectraMax 190 Absorbance Microplate Reader	 Molecular Devices SpectraMax 340PC 384 Absorbance Microplate Reader
 Molecular Devices SpectraMax Plus 384 Absorbance Microplate Reader	 BioTek Epoch	 BioTek PowerWave	

B FLUORESCENCE INTENSITY DETECTION

In a fluorescence microplate reader, using a specific wavelength, causing the sample to emit light, which is collected by a photomultiplier tube. Fluorescence detection is used in a wide range of applications than absorbance detection and generally the instrumentation is generally more expensive.

INTEGRATED PC AND SOFTWARE

Microplate readers with integrated computer and software capability allow the user to record and analyze data *in situ*. However, the range of applications and analyses available may be a little more limited than the options available on an external PC.

 PerkinElmer EnSpire	 Promega GloMax
 Molecular Devices FLIPR Tetra System	 BioTek ELx800

CONNECTION TO EXTERNAL PC REQUIRED

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.

 BMG LABTECH FLUOstar OMEGA	 BMG LABTECH FLUOstar
 Luminex® FLEXMAP 3D™	 BERTHO Fluorometer LB 970
 PerkinElmer EnVision	 PerkinElmer VICTOR X
 Promega GloMax®-Multi+	 Promega GloMax
 Molecular Devices SpectraMax Gemini XPS Fluorescence Microplate Reader	 BioTek Synergy
 Tecan Infinite F500	 Tecan Infinite

START
HERE

etection is most appropriate.

excitation system illuminates the sample to cause it to fluoresce. An emission system filters the excitation light, and measures the signal intensity. Luminescence detection has a broader range of applications and generally has a greater sensitivity. However, fluorescence detection is most appropriate.

computer and software capability allow the user to record and analyze data *in situ*. However, the range of applications and analyses available may be a little more limited than the options available on an external PC.

Promega GloMax[®]-Multi +



integrated computer and software capabilities 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.

BMG LABTECH LUMIstar OPTIMA F



BERTHOLD TECHNOLOGIES Luminometer Twinkle



PerkinElmer Thermo Scientific Fluoroskan Ascent



Promega SpectraMax Gemini EM Fluorescence Microplate Reader



Tecan Infinite 200 PRO



BioTek Synergy 2 SL



Tecan Infinite M1000



LUMINESCENCE DETECTION

Luminescence microplate readers detect light emitted by samples as a result of a chemical or biochemical reaction. The optical system consists of a light reading chamber and photomultiplier detector that measures the light emitted by the samples during the reaction. Luminescence detection is commonly used for luciferase-based gene expression assays, as well as cell viability and cytotoxicity assays based on the luminescent detection of ATP.

INTEGRATED PC AND SOFTWARE

Microplate readers with integrated computer and software capability allow the user to record and analyze data *in situ*. However, the range of applications and analyses available may be a little more limited than the options available on an external PC.

BERTHOLD TECHNOLOGIES Clinical Luminometer CentroLIA LB 961



PerkinElmer EnSpire



Promega GloMax[®]-Multi +



Promega GloMax[®]-Multi



BioTek FLx800



CONNECTION TO EXTERNAL PC REQUIRED

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.

Awareness Technology LuMate



BMG LABTECH LUMIstar OMEGA



BMG LABTECH LUMIstar OPTIMA



BERTHOLD TECHNOLOGIES Luminometer Centro LB 960



BERTHOLD TECHNOLOGIES Luminometer CentroPRO LB 962



BERTHOLD TECHNOLOGIES Clinical Luminometer CentroLIApc



PerkinElmer EnVision



PerkinElmer VICTOR X



Thermo Fisher Scientific Thermo Scientific Fluoroskan Ascent



Berthold Detection Systems Orion L



Berthold Detection Systems Orion II



Promega GloMax[®]-Multi +



Promega GloMax[®]-Multi



Promega GloMax[®] 96



Molecular Devices SpectraMax L Luminescence Microplate Reader



BioTek Synergy 2 SL



Tecan Infinite 200 PRO



Tecan Infinite F500



Tecan Infinite M1000



MULTI

The purchas

A MID-LE

Mid-le
fluorescence

1 STANDA

A standa
conducted in

NO SHAKING

For simp
microplate re

PerkinElmer EnSpire



PerkinElmer VICTOR X



Molecular Devices SpectraMax L Luminescence Microplate Reader



BioTek FLx800



SHAKING

Some mic
users to mix t
temperature c
within the rea
requirements,

BMG LABTECH LUMIstar OPTIMA



BMG LABTECH LUMIstar OPTIMA



PerkinElmer EnSpire



PerkinElmer VICTOR X



Promega GloMax[®]-Multi +



Promega GloMax[®]-Multi



BUYER MAGAZINE'S INDEPENDENT PURCHASING A MICROPLATE READER

MULTIPLE-MODE DETECTION

The purchaser should consider whether the microplate reader is required for a small number of predefined assays, or a comprehensive system is required that will be able to do

A MID-LEVEL MICROPLATE READERS

Mid-level microplate readers generally combine two or three of the most common detection modes in one unit (luminescence and/or fluorescence and/or absorbance detection).

1 STANDARD THROUGHPUT

A standard 96-well microplate (8 by 12 matrix) is generally sufficient for most assays conducted in academic research laboratories or clinical diagnostics laboratories.

NO SHAKING CAPABILITY AND/OR TEMPERATURE CONTROL

For simplicity of operation and for cost containment, basic multiple-mode microplate readers tend not to incorporate a shaking capability or temperature control.

	PerkinElmer EnSpire		PerkinElmer EnVision		Tecan Infinite 200 PRO
	PerkinElmer VICTOR X		Promega GloMax®-Multi		Tecan Infinite M1000
	Molecular Devices SpectraMax M2 Multi- Mode Microplate Reader		Molecular Devices SpectraMax M2e Multi- Mode Microplate Reader		Tecan Infinite F500
	BioTek FLx800				

SHAKING CAPABILITY AND/OR TEMPERATURE CONTROL

Some microplate readers are equipped with shaking and incubation functions, allowing users to mix the well content and easily measure samples at elevated temperatures. The temperature control also allows temperature-sensitive reactions to be carried out entirely within the reader. The shaking function can usually be programmed according to exact requirements, ensuring high uniformity throughout the sample.

	BMG LABTECH FLUOstar OMEGA FL		BMG LABTECH FLUOstar OPTIMA FL		Tecan Infinite F500
	BMG LABTECH FLUOstar OMEGA FA		Beckman Coulter DTX 800		Tecan Infinite 200 PRO
	PerkinElmer EnSpire		PerkinElmer EnVision		Tecan Infinite M1000
	PerkinElmer VICTOR X		Thermo Fisher Scientific Thermo Scientific Fluoroskan Ascent FL		BioTek FLx800
	Promega GloMax®-Multi +		Molecular Devices FLIPR Tetra System		

2 HIGH THROUGHPUT

Higher density microplates (384- or 1,536-well microplates) are typically used for screening applications, when throughput and assay cost per sample are critical.

NO SHAKING CAPABILITY AND/OR TEMPERATURE CONTROL

For simplicity of operation and for cost containment, basic multiple-mode microplate readers tend not to incorporate a shaking capability or temperature control.

	PerkinElmer EnSpire		PerkinElmer EnVision
	PerkinElmer VICTOR X		Molecular Devices SpectraMax M2 Multi- Mode Microplate Reader
	Molecular Devices SpectraMax M2e Multi- Mode Microplate Reader		Tecan Infinite F500
	Tecan Infinite 200 PRO		Tecan Infinite M1000

SHAKING CAPABILITY AND/OR TEMPERATURE CONTROL

Some microplate readers are equipped with shaking and incubation functions, allowing users to mix the well content and easily measure samples at elevated temperatures. The temperature control also allows temperature-sensitive reactions to be carried out entirely within the reader. The shaking function can usually be programmed according to exact requirements, ensuring high uniformity throughout the sample.

	BMG LABTECH POLARstar OMEGA		BMG LABTECH FLUOstar OMEGA
	BERTHOLD TECHNOLOGIES Multimode Reader TriStar LB 941		PerkinElmer EnSpire
	PerkinElmer EnVision		PerkinElmer VICTOR X
	Thermo Fisher Scientific Thermo Scientific Fluoroskan Ascent FL		Promega GloMax®-Multi +
	BioTek Synergy HT		Tecan Infinite 200 PRO
	Tecan Infinite F500		Tecan Infinite M1000

B MULTI-LABEL MICROPLATE READERS

Top-of-the-range microplate readers typically offer fluorescence polarization

1 STANDARD THROUGHPUT

A standard 96-well microplate (8 by 12 matrix) is generally sufficient for most assays conducted in academic research laboratories or clinical diagnostics laboratories.

NO SHAKING CAPABILITY AND/OR TEMPERATURE CONTROL

For simplicity of operation and for cost containment, basic multiple-mode microplate readers tend not to incorporate a shaking capability or temperature control.

	PerkinElmer EnSpire
	PerkinElmer MicroBeta2
	Molecular Devices SpectraMax M5 Multi- Mode Microplate Reader
	Molecular Devices FLIPR Tetra System
	Tecan Infinite M1000

SHAKING CAPABILITY AND/OR TEMPERATURE CONTROL

Some microplate readers are equipped with shaking and incubation functions, allowing users to mix the well content and easily measure samples at elevated temperatures. The temperature control also allows temperature-sensitive reactions to be carried out entirely within the reader. The shaking function can usually be programmed according to exact requirements, ensuring high uniformity throughout the sample.

	BMG LABTECH FLUOstar OMEGA
	BMG LABTECH POLARstar OPTIMA
	PerkinElmer EnSpire
	PerkinElmer MicroBeta2
	BioTek Synergy HT
	Tecan Infinite M1000

conduct most, or all, of the commonly used assays.

MICROPLATE READERS

Microplate readers combine multiple modes, including liquid scintillation counting, luminescence, fluorescence intensity, time-resolved fluorescence, and absorbance. These microplate readers allow the user to perform almost any standard assay.

HIGH THROUGHPUT

A 96-well microplate (8 by 12 matrix) is generally sufficient for most assays in research laboratories or clinical diagnostics laboratories.

SHAKING CAPABILITY AND/OR TEMPERATURE CONTROL

For simplicity of operation and for cost containment, basic multiple-mode microplate readers tend not to incorporate a shaking capability or temperature control.

2 HIGH THROUGHPUT

Higher density microplates (384- or 1,536-well microplates) are typically used for screening applications, when throughput and assay cost per sample are critical.

NO SHAKING CAPABILITY AND/OR TEMPERATURE CONTROL

For simplicity of operation and for cost containment, basic multiple-mode microplate readers tend not to incorporate a shaking capability or temperature control.

	PerkinElmer EnVision		PerkinElmer VICTOR X
	Molecular Devices SpectraMax M3 Multi-Mode Microplate Reader		Molecular Devices SpectraMax M4 Multi-Mode Microplate Reader
	Molecular Devices SpectraMax M5e Multi-Mode Microplate Reader		Molecular Devices SpectraMax FlexStation 3 System
	Tecan Infinite 200 PRO		Tecan Infinite F500

	PerkinElmer EnSpire		PerkinElmer EnVision		PerkinElmer VICTOR X
	PerkinElmer MicroBeta2		Molecular Devices SpectraMax M3 Multi-Mode Microplate Reader		Molecular Devices SpectraMax M4 Multi-Mode Microplate Reader
	Molecular Devices SpectraMax M5 Multi-Mode Microplate Reader		Molecular Devices SpectraMax M5e Multi-Mode Microplate Reader		Molecular Devices SpectraMax FlexStation 3 System
	Tecan Infinite F500		Tecan Infinite 200 PRO		Tecan Infinite M1000

SHAKING CAPABILITY AND/OR TEMPERATURE CONTROL

Some microplate readers are equipped with shaking and incubation functions, allowing users to mix the well content and easily measure samples at elevated temperatures. The temperature control also allows temperature-sensitive reactions to be carried out entirely within the reader. The shaking function can usually be programmed according to exact requirements, ensuring high uniformity throughout the sample.

SHAKING CAPABILITY AND/OR TEMPERATURE CONTROL

Some microplate readers are equipped with shaking and incubation functions, allowing users to mix the well content and easily measure samples at elevated temperatures. The temperature control also allows temperature-sensitive reactions to be carried out entirely within the reader. The shaking function can usually be programmed according to exact requirements, ensuring high uniformity throughout the sample.

	BMG LABTECH FLUOstar OPTIMA		BMG LABTECH POLARstar OMEGA
	BMG LABTECH NOVOstar		Beckman Coulter DTX880
	PerkinElmer EnVision		PerkinElmer VICTOR X
	Thermo Fisher Scientific Thermo Scientific Varioskan Flash		Thermo Fisher Scientific Thermo Scientific Appliskan
	BioTek Synergy MX		Tecan Infinite 200 PRO
	Tecan Infinite F500		

	BMG LABTECH PHERAstar FS		BMG LABTECH PHERAstar Plus		BMG LABTECH RUBYstar
	Beckman Coulter PARADIGM Detection Platform		BERTHOLD TECHNOLOGIES Multimode Reader Mithras LB 940		PerkinElmer EnSpire
	PerkinElmer EnVision		PerkinElmer VICTOR X		PerkinElmer MicroBeta2
	Thermo Fisher Scientific Thermo Scientific Varioskan Flash		Thermo Fisher Scientific Thermo Scientific Appliskan		BioTek Synergy H4
	BioTek Synergy 2		Tecan Infinite 200 PRO		Tecan Infinite M1000
	Tecan Infinite F500				

EXTENDING VISUALIZATION INTO THREE DIMENSIONS

by Angelo DePalma, Ph.D.

Invented in the late 16th century, the microscope is arguably the oldest laboratory instrument. Yet despite its maturity, microscopy continues to evolve toward greater capabilities.

Because microscopy is limited by the physics of light collection and manipulation through lenses, it will never experience the miniaturization and integration we have observed in electronics-based instrumentation. Still, vendors are constantly extending the capabilities of lenses while integrating optics with advanced automation, image acquisition and storage. Microscopy has moved well beyond conventional visual light into fluorescence, infrared and Raman, which provide “spectrum-in-pixel” capabilities that transform 2-D and 3-D micrographs into multidimensional visualization tools.

Trends

“Rarely do we find a customer who only needs to purchase a microscope,” observes Kristen Orłowski, product marketing manager for light microscopy at Zeiss (Thornwood, NY). “This is a significant change from years past.” Users, Orłowski explains, are looking for “complete solutions” to their microscopy needs. A typical

system will consist of the microscope, a selection of optics, a camera, and software. Choices of system and components are related to price point and, ultimately, system capability. The two factors contributing most are the quality of the optics and the integration of system components with easy-to-use software.

Orłowski believes that product support is a critical factor in purchase decisions. Support could be in the form of online FAQs, how-to videos, a support telephone hotline, and knowledgeable and responsive sales consultants and specialists. “Without support, you might just find yourself with a very expensive paperweight.”

Live-cell microscopy

One of the fastest-growing applications of microscopy is live-cell microscopy, or live-cell imaging. Most major microscope manufacturers supply systems suitable for analyzing live cells as they carry out reproduction, cell cycle, ingestion, metabolism, apoptosis (cell death), secretion, signal transduction, and other essential functions. Applications span biological disciplines from drug discovery and metabolism to medical diagnosis, immunology, cell

biology, neuroscience and pharmacology. With live cells, investigators can visualize not just gross cell features, but can probe deep inside the cell.

Microscopes can be set up to capture video continuously or take snapshots at varying intervals for one cell or a predesignated collection of cells. Live-cell methods most often employ fluorescence techniques using externally added reagents based on green fluorescent protein (GFP), red fluorescent protein, and others, either alone or in combination. The use of multiple fluorescent labels enables analysis of multiple phenomena simultaneously. Visible light may also be used on live cells, but the information it provides is limited to regions where the light penetrates.

Live cell analysis requires important modifications to a microscope’s sample holder, principally the ability to regulate within strict limits culture conditions outside the cells’ natural environment. Controlled conditions include culture media and nutrients, temperature, pH, osmolarity, and dissolved gases, and these conditions need to be maintained for the duration of the experiment—up to several days. “The cells have to ‘think’ they’re still inside the mouse’s body,” comments Stan

Schwartz, marketing VP at Nikon Instruments (Melville, NY).

Because live cell microscopy involves trade-offs between image acquisition and cell viability, instrument speed and sensitivity are critical. Instruments need to resolve images in both time and space and do so rapidly and accurately over experiments that last several days.

Systems

The heart of a live-cell imaging system is a confocal, inverted microscope. Confocal instruments provide high-resolution 3-D images by eliminating out-of-focus light. Inverted microscopes view the sample from below instead of from above. "Cells are denser than water and tend to sink in an aqueous sample," says Anthony Santerelli, advanced fluorescence product manager at Leica Microsystems (Bannockburn, IL). Inverting the

microscope therefore shortens the distance between the objective lens and the cell(s) under examination.

"Users are looking for 'complete solutions' to their microscopy needs."

Other key components include a light source; a fast, high-resolution, low-noise camera; an imaging system; and automation. Camera speed is critical for capturing transient or short-lived events deep within cells. Automation enables investigators to move rapidly from one object to another and back, to keep track of multiple cells or events, and to maintain focus. With the high-speed camera, automation permits time-lapse imaging of events occurring at multiple locations within the field. Tying everything together is software that

controls movement of the stage, acquires data, and performs calculations.

Most users interested in live-cell microscopy purchase complete systems rather than a collection of components. This will continue as biology, rather than microscopy, becomes the dominant competency among individuals performing live-cell analysis. "You still have some tinkerers who purchase microscopes and build systems for their unique needs," Santerelli notes. Many high-end microscopes suitable for cell imaging are, in fact, interoperable with third-party components and software. However, the trend toward complete "solutions" is unmistakable in microscopes, as it is in other instrument markets.

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

MICROSCOPES

Carl Zeiss	Thornwood, NY	800-233-2343	www.zeiss.com
CRAIC Technologies	San Dimas, CA	310-573-8180	www.microspectra.com
Edmund Optics	Barrington, NJ	856-547-3488	www.edmundoptics.com
Hamamatsu	Bridgewater, NJ	908-231-0960	www.sales.hamamatsu.com
Hirox-USA	River Edge, NJ	201-342-2600	www.hirox-usa.com
JEOL	Peabody, MA	978-535-5900	www.jeol.com
Keyence	Woodcliff Lake, NJ	201-930-0100	www.keyence.com
Leica Microsystems	Bannockburn, IL	800-248-0123	www.leica.com
Meiji Techno America	Santa Clara, CA	800-832-0060	www.meijitechno.com
MilesCo Scientific	Princeton, MN	800-365-0838	www.professionalmicroscopes.com
Motic Instruments	Richmond, British Columbia	877-977-4717	www.motic.com
Nikon Instruments	Melville, NY	908-333-4153	www.nikoninstruments.com
Olympus	Center Valley, PA	800-446-5967	www.olympusamerica.com
Prior Scientific	Rockland, MA	781-878-8442	www.prior.com
Unitron	Bohemia, NY	631-589-6666	www.unitronusa.com

HOW LOW CAN YOU GO?

by Angelo DePalma, Ph.D.

Low-temperature laboratory freezers are cooling boxes that achieve temperatures of about -40°C or lower. Kitchen freezers, by contrast, operate to about -20°C .

The temperature “sweet spot” for lab freezers is about -85°C . “Mechanical” (compressor-based) freezers reach the -40° to -50°C range with a single compressor. A second compressor is required to cool below that point. To achieve energy efficiency and extend the life of the compressors, the low-stage compressor turns off automatically when the set-point temperature is reached, while the high-stage compressor remains on continuously.

“Some systems using exotic refrigerants can get much lower than -85°C ,” explains Buckner Richerson, VP of international sales at NuAire (Plymouth, MN). For example, ultra-low-temperature freezers reach temperatures of -150°C , which is useful for storing bone marrow for medical procedures. “But these are quite expensive, and not too many are sold,” Richerson tells *Lab Manager Magazine*.

Blood storage is a growing application for low-temperature freezers. Whole blood and blood products must be stored at -33°C or cooler. One spe-

cial type of device, a blast freezer, chills blood quickly and maintains it at -40°C or lower. Other applications include storing viruses, bacteria, and human or animal tissue.

Features and choices

NuAire provides these high-level differentiators for low-temperature laboratory freezers:

- Sensitivity and accuracy of temperature controls
- Precision of electronic microprocessor controls
- Long-term reliability and protection of automated backup systems
- Noise level
- Available options and accessories

“Higher-end freezers can also provide, through a USB data hookup, a history of temperature and usage.”

Specific design attributes include communications and data storage, alarms, quality/configuration of the inner and outer door closures, vacuum release that permits reopening a freezer immediately after door closure, temperature uniformity, and

temperature recovery after opening.

Where floor space is at a premium, users can opt for vacuum-insulated panels, which take up less room than polyurethane insulation. Vacuum insulation used to be a rather expensive option, but it has come down in price, Richerson says. Another cold-conserving feature is double outer doors or double inner doors to minimize the loss of cold air.

Alarms are critical for regulated industries like pharmaceuticals and where stored materials are used in legal cases. In both instances, users must demonstrate the ability to validate cooling and convince “higher authorities” that samples have been properly stored. Higher-end freezers can also provide, through a USB data hookup, a history of temperature and usage. Entry codes and keys have become more popular for freezers that store biohazards like germ warfare agents.

Users pay more for advanced data and recording features, but not all will be in a position to use them. Chris Wilkes, director of product management for cold storage at Thermo Fisher Scientific (Asheville, NC), notes that regulated industries have validated standard operating procedures around chart recorders and are therefore unlikely to change.

Low-temperature Lab Freezers: Are you using a low-temperature freezer in your lab? Are you considering purchasing a low-temperature freezer soon? *Lab Manager Magazine's* online surveys help improve the purchasing process and provide you with greater confidence in your final purchasing decision. To take the survey, please visit www.labmanager.com/surveys/freezers.

High-end freezers should maintain uniform temperature throughout the unit and recover quickly from openings. Opening the door of an ultra-low-temperature freezer introduces warm, moist air that causes the device to work harder to retain its set-point temperature and causes condensation and freezing of water vapor inside the unit and on samples. The speed at which a freezer recov-

erations. Temperature uniformity is critical as ambient temperature rises, for example, in laboratories or medical centers located in the tropics.

Environmental factors

Environmental issues are driving changes that include greater energy efficiency and the move away from halogenated hydrocarbon refriger-

are alternative cooling mechanisms such as liquid nitrogen, which boils at -196° C. Cryogenic nitrogen is readily available and relatively inexpensive and remains liquid for extended periods, provided its container is insulated. A liquid nitrogen freezer does not use a compressor, and electrical consumption is less than for conventional freezers. But while the acquisition costs are comparable, ongoing costs for liquid nitrogen are higher than for the electricity it takes to run a mechanical freezer.

Purchasers of low-temperature laboratory freezers can select from numerous options and temperature ranges, but as Thermo's Wilkes notes, "Once you get below -135° C, there is not a huge benefit to getting colder."

Richerson of NuAire concurs: "Ninety percent of our customers just want a reliable, inexpensive freezer that will last."

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

"Concerns with carbon footprint are spurring innovations in low-temperature refrigeration."

ers from temperature excursions is a function of BTU reserve capacity, which, according to Thermo Fisher Scientific, is defined as "a measure of a freezer's ability to maintain a cold temperature across the entire cabinet in the presence of a heat load." Higher BTU reserve is better.

Low-temperature freezers should maintain their coldest temperature even under balmy ambient condi-

ants. Manufacturers are investigating novel alternative refrigerants, as well as older alternatives such as low-boiling hydrocarbons. But newer refrigerants are expensive and may pose health or environmental hazards of their own, while hydrocarbons present a serious risk of fire or explosion.

Concerns with carbon footprint are spurring innovations in low-temperature refrigeration. Among the trends

ULTRA-LOW TEMP FREEZERS

Cincinnati Sub-Zero	Cincinnati, OH	513-772-8810	www.cszindustrial.com
New Brunswick Scientific	Edison, NJ	800-631-5417	www.nbsc.com
	Plymouth, MN	800-328-3352	www.nuaire.com
Sanyo Biomedical	Wood Dale, IL	800-858-8442	www.us.sanyo.com
So-Low	Cincinnati, OH	513-772-9410	www.so-low.com
The Baker Company	Sanford, ME	800-992-2537	www.bakerco.com
Thermo Fisher Scientific	Waltham, MA	781-622-1000	www.thermo.com

HOLDING UP TO WORKLOADS IN CLASSIFIED SPACE

by Angelo DePalma, Ph.D

Choice of clean room casework, or furniture, is one of the most important decisions made when setting up classified space. Cabinets and associated doors, hinges, handles, panels, bench-tops, shelving, and vertical/horizontal surfaces must be compatible with the application and the clean room's classification by Federal Standard 209E for airborne particulate cleanliness. Surfaces must be as easily cleaned as walls and floors, emit no particulate contaminants, and above all resist exposure to liquids and solids processed inside the room. Since the purpose of a clean room is to protect the environment from hazardous materials or sensitive materials from the environment and humans, or both, clean room casework must fulfill those missions and be environmentally "invisible."

Facilities—walls, ceilings, lighting fixtures, and furniture—are a significant source of clean room contamination arising from the materials of construction or, secondarily, from surfaces that harbor contaminants from other sources. For example, crevices that collect dust and are difficult to clean may be suitable for casework installed in non classified rooms, but not for even a Class 10,000 clean room where cabinets and drawers should be at least as inert and cleanable as the clean room walls and floors.

Material choices

Most clean room casework today is made from coated steel, stainless steel, and polypropylene. Polypropylene used in casework fabrication comes in four grades: standard and three flame-retardant grades that Terry Thompson, polypropylene sales manager at NuAire (Plymouth, MN) likens to "a Chevy, a Cadillac, and a Ferrari." The lowest grade will minimize fire damage while the highest grade, FM-4910, will self-extinguish if it catches fire.

Polypropylene casework has been around for years, remaining a niche product due to its high cost, but Thompson says polypropylene is the material of choice for clean rooms that use corrosive acids or chemicals or that experience high humidity.

Polypropylene is about 2.5 times as expensive as steel or wood casework and just slightly more expensive than stainless steel. As Thompson explains, "Polypropylene is made from a petroleum product, so we're at the mercy of the oil markets. But more important, a polypropylene cabinet needs a lot of handling during manufacture—much more than stainless steel, which

is simply put onto a machine and bent, formed, punched, and welded. Polypropylene edges are sharp and must be smoothed and de-burred, then welded together."

Approximately 80 percent of NuAire's poly casework installations are for the semiconductor industry, with modest representation by pharmaceuticals and biology. And these are all-plastic: doors, panels, horizontal surfaces, drawers, even hinges, latches, screws, and fasteners. "You don't want something rusting in a clean room and contaminating your specimens or processes," Thompson says.

"... clean room casework must be environmentally "invisible."

One would expect the pharmaceutical industry, with its penchant for cleanliness and disregard for high-priced equipment, to embrace polypropylene casework. Thompson believes the reason they have not is because drug makers are used to stainless casework and work surfaces. Another possible reason, notes David Campbell, VP of sales at Hemco (Independence, MO), is that most pharmaceutical clean rooms are used for aseptic processes

such as formulation and vial- or syringe-filling rather than for handling corrosive materials used in processing or manufacturing. The perception, he says, is that cleaning validation for stainless steel is more straightforward than for other materials. "In pharmaceuticals the sun rises and sets with stainless steel."

Companies considering all-polypropylene casework might save considerable expense by rethinking how and where the clean room workflow will occur. Campbell notes that applications requiring corrosive materials will often take place within a fume hood, which makes the acid-sensitivity claim for polypropylene moot outside that work area. "There is no reason why owners cannot specify a polypropylene or poly-resin material for fume hoods only, and less expensive casework materials for the rest of the room."

Specifications

Clean room casework is normally specified by whoever plans the room, which is either an architect or a company engineer. Owners increasingly

ask for modular casework, Thompson explains, because it provides versatility and changeover capability when a clean room's mission changes.

"... polypropylene is the material of choice for clean rooms that use corrosive acids or chemicals or that experience high humidity."

Outside design firms sometimes over-specify for casework, Thompson says, to cover all contingencies. In one instance where polypropylene casework was designated, Thompson called the owner to confirm that the application called for it. "They didn't realize how expensive it was and wound up ordering a less costly alternative that suited their needs just as capably. If you can get by with metal casework, that's obviously the way to go."

Hemco specializes in Class 1000 and Class 10,000 clean room furnishings and installations, a niche that Campbell describes as "clean labs" to distinguish them from higher-class semiconduc-

tor processing suites. Hemco has done Class 100 installations, but usually as sub-areas of Class 1000 rooms. Within that marketplace the company sells

casework fashioned from welded steel coated with an epoxy powder coat finish. These structures are fabricated as easily as stainless steel but have much higher resistance to acids and moisture. They are also available for about one-third the cost of polypropylene and stainless.

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

CLEAN ROOM FURNISHINGS

American Cleanroom Systems	Rancho Santa Margarita, CA	949-589-5656	www.americancleanrooms.com
BEVCO	Waukesha, WI	800-864-2991	www.bevco.com
CleanAir Solutions	Fairfield, CA	707-864-9499	www.cleanroomspecialists.com
Clean Rooms West	Tustin, CA	714-258-7700	www.cleanroomswest.com
Gerbig Engineering Company	Burnsville, MN	888-628-0056	www.gerbig.com
HEMCO	Independence, MO	800-779-4362	www.hemcocorp.com
Liberty Industries	East Berlin, CT	800-828-5656	www.liberty-ind.com
PortaFab	Chesterfield, MO	800-325-3781	www.portafab.com
Sovella	Kennesaw, GA	770-424-0004	www.sovella.us
Terra Universal	Fullerton, CA	714-578-6000	www.terrauniversal.com
United Lab Equipment	Depew, NY	800-548-7426	www.unitedlabequip.com



SURVEY SAYS: WHAT GOES INTO BUYING A TITRATOR

Titration has become a mainstay in analytical laboratories serving practically every industry, including chemicals, materials, environmental, and foods, to support quality control, process monitoring, or regulatory requirements. Common titration analyses include measurement of salt in potato chips, moisture in pharmaceuticals, heavy metal content of water/wastewater, iodine levels in solution, biological activity of enzymes or substrates, peroxide solution strength, wine acidity, pH of biological buffers, and many others. Titrators are the specialized instruments that perform titrations with minimal operator intervention.

As part of our new online Lab Products Survey series, we present here results from our recent survey on purchasing a titrator.

→ If you would like to participate in our laboratory product purchasing surveys, please visit www.labmanager.com/surveys

How many Titrators are currently in place in your lab?

4 or more	10%
3	20%
2	23%
1	32%
None	15%

Most widely used Titrator brands currently in the lab.

Denver Instrument Company
Hach Company
Hanna Instruments
JM Science
Lab Synergy (Schott)
Man-Tech
Metrohm
Mettler Toledo
Sigma-Aldrich
Thermo Fisher Scientific

Please choose the primary purpose for the Titrator(s) in your lab.

Clinical	5%
Quality Control	70%
Research	25%

Which type(s) of Titrator are currently being used in your lab? (All that apply)

Karl Fischer Volumetric	21%
Karl Fischer Coulometric	21%
Potentiometric	53%
Other: (Please specify)	5%

Which of the following Titrator components are you also using? (All that apply)

Homogenizer	27%
Autosampler	40%
Karl Fischer oven	18%
Evaporator	12%
Other: (Please specify)	3%

If you are planning to purchase a Titrator, what is your expected time frame for the purchase?

12+ months	27%
4 - 12 months	21%
0 - 3 months	13%
No current plans to purchasing a Titrator	18%
Don't know	21%

What is your budget range for this Titrator purchase?

\$30,000+	11%
\$15,000 - \$30,000	7%
\$5,000 - \$15,000	54%
\$1,000 - \$5,000	25%
Less than \$1,000	3%

Are you planning to purchase a new or pre-owned Titrator?

New	67%
Pre-owned	9%
Considering both	24%

Please rate the Titrator features/benefits based on importance in your decision-making process.

	Not important	Important
Price	0%	100%
Operating cost	25%	75%
Ease of use	15%	85%
Low maintenance	20%	80%
Reliability	10%	90%
Warranty	45%	55%
Accuracy	10%	90%
Speed	20%	80%
Service and support	10%	90%
Small footprint/size	60%	40%
Ease of installation	25%	75%

Top 5 reasons for selecting a Titrator brand as your first choice.

Past experience with product and vendor	28%
Reputation of vendor	21%
Currently using product in the lab	35%
Price	10%
Recommendation from colleagues	6%

Let's make things simple.



One Click Titration™

Titration Excellence from METTLER TOLEDO combines unsurpassed application power with simple and efficient operation, and it's as easy as One Click. The innovative Homescreen features an intelligent user interface where tasks can be assigned to Hot Keys, so daily routines are intuitive to the first time user. Adding LabX Software creates a system that allows LIMS export capability and generation of customized reports, and also facilitates compliance with FDA guidelines.

With the addition of volumetric Karl Fischer and the automation possibilities of the new Liquid Handler, Titration Excellence offers more innovative features than any other titrator on the market. Find out how METTLER TOLEDO can improve your efficiency!

► www.mt.com/one-click-titration

METTLER TOLEDO

BUILDING FOR PEOPLE

INDOOR ENVIRONMENTAL QUALITY CONSIDERATIONS FOR LABORATORY CONSTRUCTION by Vince Mcleod

A couple of months ago we wrote about parameters to consider during the design of new facilities. We discussed:

- ventilation requirements and local exhaust ventilation;
- duct systems, including proper duct material, return air plenums and terminal diffusers;
- mechanical equipment such as air handlers and heating and air-conditioning control systems;
- filtering media and air-cleaning devices; and
- outside air intakes.¹

In this issue we shift our focus to the construction phase and the related issues on which we should fix our attention. Construction activities invariably contaminate the building. Depending on the materials affected and the type of contamination, any residuals could potentially affect building indoor air quality over the structure's lifetime. If we keep our eyes on a few simple rules, it will pay big dividends in terms of worker health and productivity as well as facility maintenance costs down the line. Recent research suggests that improving indoor air quality can increase worker productivity between 1 and 8 percent, with an average improvement of about 3 percent. And, if we stop to consider that the average cost of employee salaries in a typical Class A building is around \$150 per square foot, better indoor environmental quality can save an employer around \$4.50 per square foot due to improved worker productivity.²

By nature, construction is a messy business. It does not matter whether we are constructing a new facility or renovating an old space, the

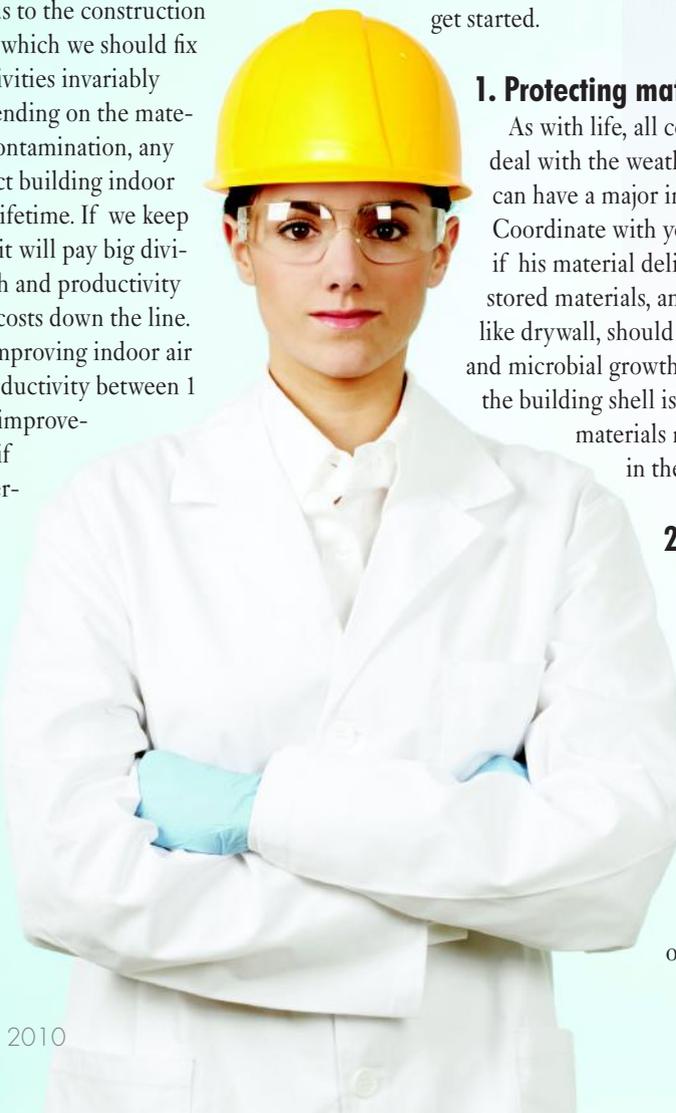
issues are for the most part the same. However, by developing and following a good construction management plan we can control the mess and greatly reduce the impact on indoor environmental quality during and after the construction process. Two good resources for putting together your construction management plan are the Environmental Protection Agency's *Indoor Air Quality Tools for Schools*³ and the Sheet Metal and Air Conditioning Contractors' National Association's *IAQ Guidelines for Occupied Buildings under Construction*.⁴ These publications discuss five or six controls to implement during your construction project. We have added one or two of our own to round out a comprehensive construction management plan. So let's get started.

1. Protecting materials

As with life, all construction projects have to deal with the weather. This is unavoidable and can have a major impact on indoor air quality. Coordinate with your building contractor and see if his material delivery schedule makes sense. All stored materials, and especially porous material like drywall, should be protected from moisture and microbial growth. This is much easier once the building shell is dried in. Any water-damaged materials must be discarded and not used in the construction.

2. Controlling sources

Controlling sources involves preventing or eliminating pollutants from entering the building. For example, do not allow vehicles, machinery or equipment to operate or idle near entries, loading docks or air intakes. These practices allow exhaust fumes, which are loaded with carbon monoxide, to flow into the building.



Also, ensure that trash and dumpsters are positioned and stored well away from these areas. One other aspect of source control is to locate or move pollution-causing activities (painting, concrete, block or brick cutting, etc.) away from building openings. This control method is also tied to housekeeping and worker education (discussed below).

3. Pathway interruption (ventilation and exhaust)

Pathway interruption takes source control to the next level. When pollution-causing activities must occur inside the building we need to implement steps to isolate these dirty work areas from clean or occupied spaces. We use ventilation and exhaust systems to control and remove pollutants produced by these activities. If the heating, ventilating and air-conditioning (HVAC) system is already installed we can use pressure differentials to keep pollutants generated in dirty areas from getting to clean areas. This strategy often requires building temporary barriers. We can then pump more supply air to the clean area and, if needed, increase exhaust from the dirty work area, preventing pollutants from escaping to the clean sections. Depending on your climate and the local weather, we may also use 100 percent outside air for the HVAC system, thus diluting and venting contaminants, provided we protect the HVAC system (more on this later). One final tactic of this control method involves using local indoor exhaust equipment. Place high-volume evacuation blowers with ducting in the dirty area and near the contaminant source activity to capture and vent the pollutants directly outside.

4. HVAC protection

During construction activities, it is imperative to protect all installed air-handling equipment from dust, insects, moisture and microbial contamination. If the HVAC system is operated during construction, it should not be done without filters. Temporary filter media with a minimum dust spot efficiency of 35 percent (MERV* 8 or 9) is recommended. New filter media must be installed when construction is completed and before occupancy.

All leaks in the ducts or air handlers must be repaired promptly. Clean or replace any contaminated HVAC equipment or ductwork prior to system start-up.

*Minimum Efficiency Reporting Value

If the HVAC system is designed with ducted return air (i.e., ductwork under negative pressure), then the return side should be damped off, sealed with plastic or isolated during heavy construction, demolition or pollutant-generating activities.

“... do not allow vehicles, machinery or equipment to operate or idle near entries, loading docks or air intakes.”

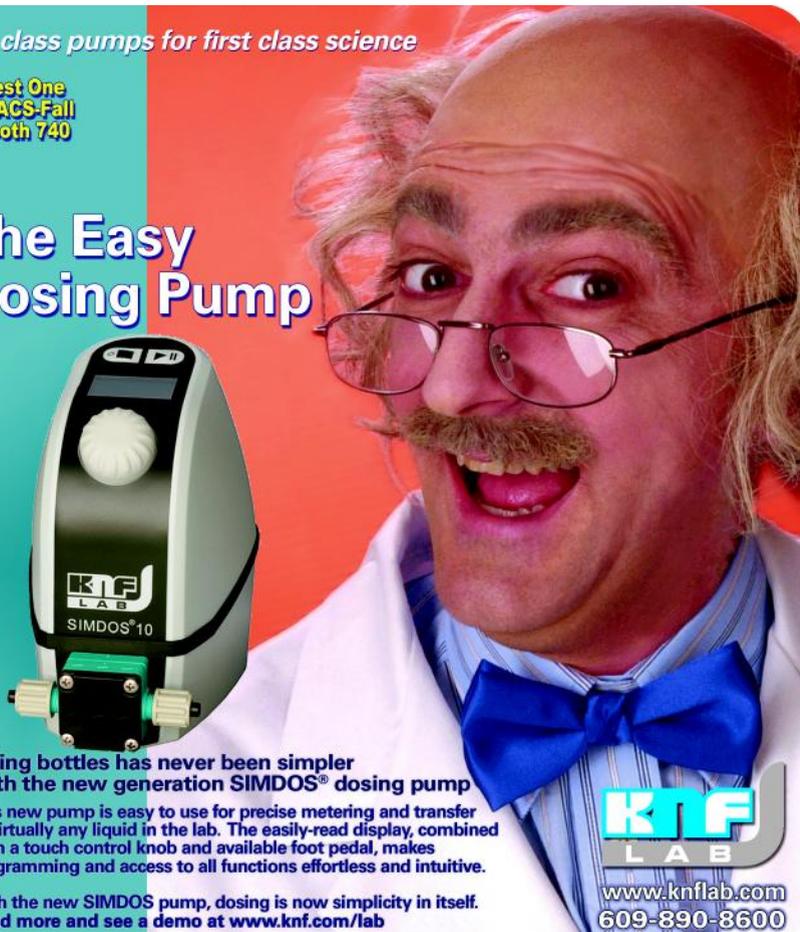
5. Interior finishes

New construction and renovated spaces are plagued with emissions from adhesives, paints, floor coverings, carpets and furnishings. It is best to control indoor pollutants from these sources using the HVAC system. It is recommended that before applying finishes, the interior spaces should be properly weatherized; that is, drywall and plaster should be cured and show a proper moisture content. One alternative is to run the system

first class pumps for first class science

Test One
at ACS-Fall
Booth 740

The Easy Dosing Pump



Filling bottles has never been simpler with the new generation SIMDOS® dosing pump

This new pump is easy to use for precise metering and transfer of virtually any liquid in the lab. The easily-read display, combined with a touch control knob and available foot pedal, makes programming and access to all functions effortless and intuitive.

With the new SIMDOS pump, dosing is now simplicity in itself. Read more and see a demo at www.knflab.com

KTF LAB
www.knflab.com
609-890-8600

24 hours per day for a minimum of three days at a stable temperature and a relative humidity of 60 percent or less. In addition, operate the system 24 hours per day during the installation of all interior finishes.

We strongly recommend not permitting vinyl wallpaper or other water-impermeable coverings on the interior side of exterior walls. These materials tend to trap moisture and lead to mold growth and other problems.

Finally, give strong preference to the use of carpets, glues, paints and other furnishings with low volatile organic compound (VOC) emissions. This will reduce the volume of contaminants you have to deal with as they cure and off-gas.

6. Scheduling

We mentioned the importance of scheduling to protect building materials at the beginning. Construction sequencing is also important in minimizing absorption of VOCs by porous materials. This involves ensuring that application of wet and odorous materials such as coatings, paints and sealants is completed before installing absorbent “sink” materials like carpets, ceiling tiles and upholstered furnishings.

In addition, proper timing is essential if your construction or renovation project is in close proximity to occupied adjacent buildings or spaces. Dust, noise and odors common to construction can easily find their way into these areas and negatively affect occupants. Refer back to source control and be sure to keep odor-producing and dusty operations well away from all the outside air intakes and building entrances. Schedule indoor air quality issues, referred to as “time of use” problems, on weekends or after normal hours, when the potentially affected facilities are closed. These include activities such as cleaning (see housekeeping below), roofing projects or floor refinishing. If your project is a renovation, we recommend you re-read the pathway interruption control section and recall the value of isolating work areas from non-work areas.

7. Housekeeping

Perform regular (at least daily) housekeeping to prevent tracking dust and debris from construction areas to clean, non-work areas. Prior to installation, store building materials in a clean area protected from weather. Before allowing occupants to move in, perform a thorough cleaning to remove contaminants from the building. Keep in mind that some conventional cleaners can be sources of contaminants. Concentrate cleaning activities on spaces to be occupied and the HVAC system. For the HVAC, ensure that all coils and fans are cleaned and filters are replaced with new ones in advance of performing the final test and balance, and especially before conducting baseline air-quality testing (which we also strongly recommend).

8. Worker education

The previous section discussed how poor housekeeping and conventional cleaning chemicals could adversely affect indoor air quality. By providing all workers with information and training on how to prevent, control and remove indoor air-quality pollutants we can minimize these influences. Just as for finishes, choose cleaning chemicals that are low VOC emitting. Make sure the material safety data sheets (MSDS) are reviewed and kept nearby. Implement a consistent hazard communication program for all employees.

Wrapping up

Putting a good construction management plan into effect preceding building projects can go a long way in protecting workers' health and preventing poor indoor environmental quality. A poor or lacking construction IEQ plan can negatively affect indoor air quality throughout the life of the building. By employing the eight control methods identified above you have done everything possible to protect the health of the construction workers and the building occupants for years to come.

References

1. Vince McLeod, CIH, “The ABCs of IEQ,” *Lab Manager Magazine* (May 2010), www.labmanager.com/stips.asp?ID=114.
2. *Experience Exchange Report*, Building Owners and Managers Association International. Washington, D.C. 2009. <http://www.boma.org/Resources/benchmarking/Pages/default.aspx>.
3. *Indoor Air Quality Tools for Schools*, Environmental Protection Agency. Washington, D.C. May 2010. <http://www.epa.gov/iaq/schools/>.
4. *IAQ Guidelines for Occupied Buildings under Construction*, Sheet Metal and Air Conditioning Contractors' National Association. Chantilly, Va. 2007. http://www.smacna.org/bookstore/index.cfm?fuseaction=search_results&cfd=15451692&cftoken=55647325.

Vince McLeod is an American Board of Industrial Hygiene-certified industrial hygienist and the senior industrial hygienist with 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.

SAFETY TIP

DEVELOP A SAFETY ORIENTATION PROGRAM

All new employees should receive a specially designed indoctrination to your safety program. This orientation should cover the philosophy, policies, and procedures. It should explain how to deal with emergencies and how to handle emergency equipment. The new person should receive a set of rules or operating manual for the academic institution or company and be expected to sign a statement (rules agreement) indicating that they have read, understand, agree to follow, and re-

alize that failure to do so can result in termination.

If you are involved in hiring new employees, consider asking the candidates the following question: "What is there in your background that suggests that you are both concerned and knowledgeable about issues of laboratory safety?"

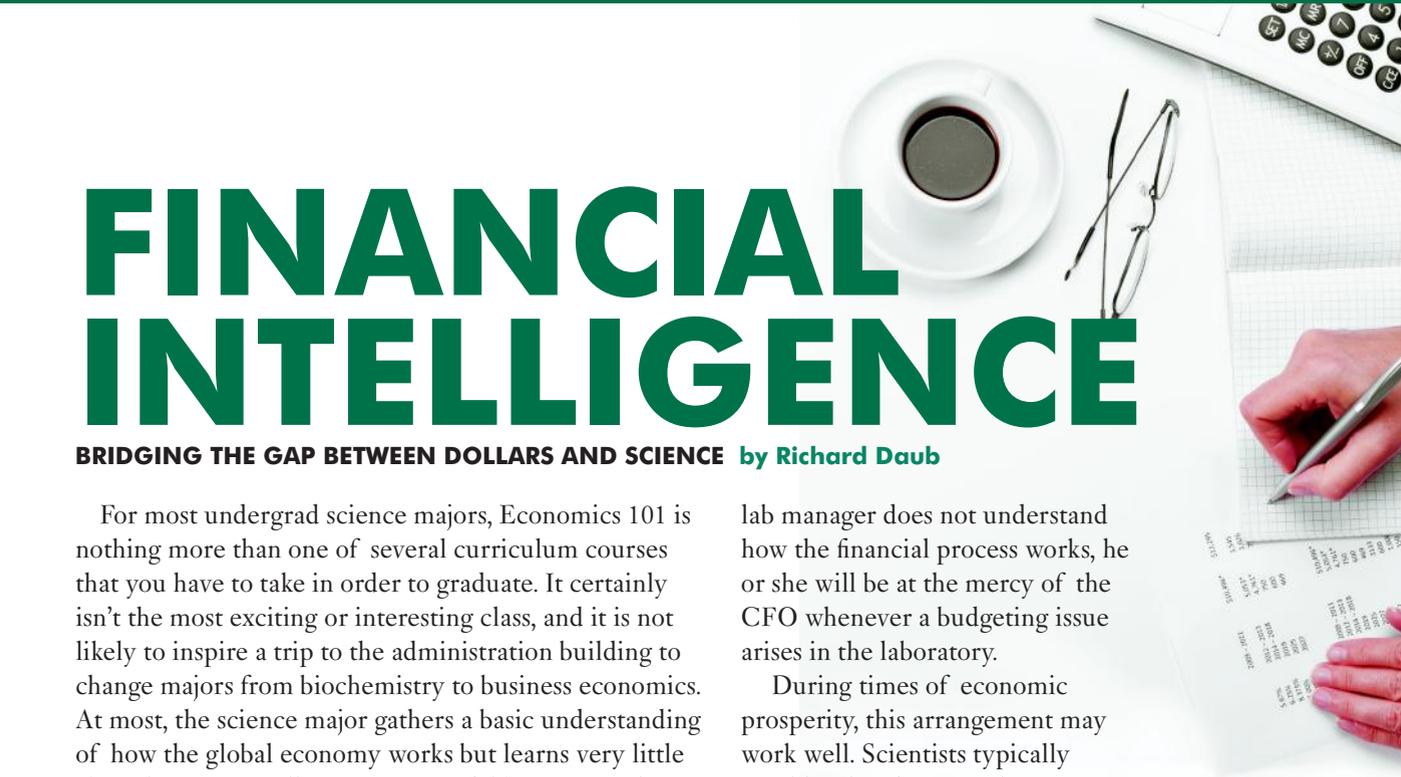
You'll never have the special opportunity again that you have on day one to make a lasting impression

about how much you care about health and safety.

Want to start your "new employee safety orientation" sooner? Add the two words, "Safety Conscious" to your display ad looking for new lab employees.

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





FINANCIAL INTELLIGENCE

BRIDGING THE GAP BETWEEN DOLLARS AND SCIENCE by Richard Daub

For most undergrad science majors, Economics 101 is nothing more than one of several curriculum courses that you have to take in order to graduate. It certainly isn't the most exciting or interesting class, and it is not likely to inspire a trip to the administration building to change majors from biochemistry to business economics. At most, the science major gathers a basic understanding of how the global economy works but learns very little about how to actually run a successful business within it.

lab manager does not understand how the financial process works, he or she will be at the mercy of the CFO whenever a budgeting issue arises in the laboratory.

During times of economic prosperity, this arrangement may work well. Scientists typically would rather focus on the science

“If the lab manager does not understand how the financial process works, he or she will be at the mercy of the CFO whenever a budgeting issue arises ...”

than deal with the company's finances, and the CFO typically doesn't mind remaining blissfully unaware of how the company makes its money as long as it continues to do so. During a severe recession, however, if the

lab manager and the CFO don't understand each other's roles, this relationship can be contentious and can eventually lead to the failure of the company.

For the rare science major with the foresight to realize that out in the real world science is an industry and that learning the business side of it may actually come in handy someday, there is nowhere to turn unless you want to commit to the expensive and time-consuming option of enrolling in a Professional Science Masters program, the value of which is debatable. There's always the option to minor in business, but that would take away from minoring in a secondary scientific area.

In smaller laboratories, the lab manager is often responsible for the science *and* the finances. It is highly unlikely that he or she is an economist turned lab manager, so the financial side of the job has to be learned on the fly. In this scenario, Economics 101 seems like even more of a waste of time now than it did when the manager was an undergrad, and little consolation is taken from the thought that most MBAs will likely tell you that a true financial education does not come from the classroom.

Several years and degrees later, the lucky scientists find themselves in the cozy confines of a corporate laboratory, concerned only with hypotheses and test results. Meanwhile, others find themselves contending with someone who wears not a lab coat but a business suit and who sits in an office that might not even be in the same building (or the same state, for that matter). This individual, the chief financial officer, who quite possibly has never stepped foot in the laboratory, is responsible for drawing up the lab budget and has the power to approve or deny requests for expenses such as equipment, supplies, and personnel. In a situation such as this, if the

Experience is the greatest teacher, and mistakes are the most important lessons. Very few, if any, scientists have the ability to step right in and steer the ship smoothly across the choppy waters of the economy. And while it should be understood that mistakes will be made, is it wise for the lab manager who is trying his or her hand at CFO for the first time to tread cautiously or charge full steam ahead?

“I think restraint is a common mistake that novice CFOs make,” says Phillip Clinton, lab director at Logan

Community Hospital in Guthrie, Oklahoma. "They can't be so conservative that they aren't progressive. I think it's important to add new products and services to make yourself valuable."

On the flip side, some novice CFOs try to do too much and wind up digging a deep hole for the company. Miguel Suderman, president and chief science officer of Cell Systems 3-D in Texas, says that a common mistake that novice CFOs make is succumbing to the temptation of trying to build a state-of-the-art laboratory right out of the gate.

"You have these salespeople who are basically offering you the world," he says. "They'll give you a credit line, and it's very easy to succumb to this temptation, but then the next thing you know, you owe this particular company \$5,000 a month and you may not be bringing that much in. So you instantly find yourself between a rock and a hard place. At one time you may have previously worked in a private practice that has all the bells and jangles and state-of-the-art equipment, but you have to remember that this guy has probably been in practice for

ten to twenty years and that he probably acquired that equipment one piece at a time."

"If the lab manager and the CFO don't understand each other's roles, this relationship can be contentious and can eventually lead to the failure of the company."

Kenneth Jensen, a laboratory consultant based in Colorado, says that another costly mistake is to purchase the newest and most modern instrumentation without measuring its effectiveness.

"They run out and buy bells and whistles without evaluating what the bells and whistles are going to do," he says. "You now have an instrument that's going to ding

Biomolecular Screening: Advanced Applications Across Academia, Government & Industry

SBS Symposium
October 18 - 19, 2010
Durham, North Carolina
USA

Uniting scientists from various aspects of the drug discovery community

This SBS symposium is intended to enhance cross-fertilization among academic, government and industry scientists as well as between the small molecule and RNAi screening disciplines. Scientific sessions will address the topics of advanced technologies in small molecule and RNAi high-throughput screening with presentations from academic, government, and industry screening experts.

Concurrent tracks allow you to select the talks which interest you the most

Track I Sessions

1. ADME & toxicology screening
2. Ion channels & 7TM screening
3. Signal transduction & intracellular target screening

Track II Sessions

1. RNAi screening, Part I
2. RNAi screening, Part II
3. Strategies for management & funding of academic screening facilities



"This symposium will provide a forum for learning about diverse uses of biomolecular screening in support of a host of goals, including target validation, lead discovery, safety assessment, chemical genomics and RNAi research."

— Co-chair Keith Houck, of the US Environmental Protection Agency

Symposium Keynote Speakers

Keynote Speaker: Christopher P. Austin, M.D., NIH Chemical Genomics Center
Keynote Speaker: Robert J. Lefkowitz, M.D., Duke University Medical Center

Secure your place today

Access meeting details and register online by visiting the SBS web site, www.sbsonline.org/advancedapps/.

at you and call your attention to it every time you get a specific reading, but these results are things that your technologist on an advanced level should see instantaneously. You shouldn't need a bell or whistle to tell you if [a measurement] is too low or too high. Modern technology is based on computerization, so the perception is that the more computerized it is, the less likely that you have human intervention, and with less human intervention, the cheaper the cost because computers don't take coffee breaks."

Dr. Suderman says that he resists the temptation to go on a shopping spree by assigning priority numbers to bargains he finds on used equipment.

"I have a checklist of items that I think we can budget for, so every Sunday evening I get the new listing from LabX, and I'll spend an hour or so looking through it," he says. "If I see any pieces of equipment we could use, I'll assign a priority number to them, and I try to put the decision off to the side for five to ten days and then come back and look at them again. If I feel the same way after ten days, then it's time to sit down and think about it."

The primary purpose for purchasing new equipment is not to make the lab technician's job easier but to improve efficiency of the overall workflow to the point where productivity is increased. A machine that performs a task of a lab technician but does not increase productivity is probably not worth the investment. This is an area where the lab manager must demonstrate to the CFO how the purchase of new equipment will improve productivity and translate into an increase in profitability. In other words, the lab manager must learn to speak the CFO's language, which can be broken down to three words: dollars and cents.

"The more tests you turn out and the faster you turn them out, the more money you make," says Roberta Hickman, laboratory supervisor at The Medical Center in Hutchinson, Kansas. "My emphasis is on efficiency and keeping up with the technology without going overboard. I have tried to modernize the lab so that we have more

efficient output and we're not spending additional man-hours backtracking on errors and reperforming tests."

Even more important but less predictable than the machines is maximizing the efficiency of the people.

"The most important resource you have is your staff," Ms. Hickman says. "You need to make sure that you're investing as much time and revenue in your staff as you are in your equipment, because that's really where you're going to get your biggest payoff."

According to George Lucier, Site Analytical Manager for the Battelle Memorial Institute in Utah, teaching a new employee how to do the actual job is not as challenging as the process of adjusting to the culture of the laboratory.

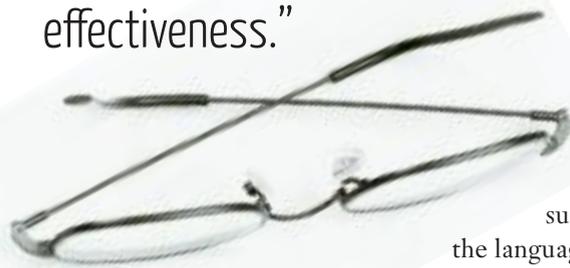
"The mistakes I've seen here are not planning up front how long it takes to get a new employee to be productive

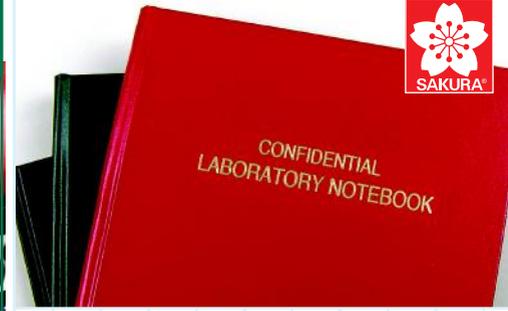
in a laboratory," he says. "In our operation, we have to plan for about six months before they are productive. The bigger part is the culture. You can get that only from learning on the job because you need to learn the work culture and all the details of how things are done in this laboratory. And I just don't know that it can be accelerated. It just takes time."

In addition to learning to speak the language of the CFO, the lab manager must also make sure that the CFO learns to speak the language of the laboratory.

"There has to be some real tenacity on the part of the lab manager to get the CFO to understand how we do business, and that's a tough thing to do," says Gail Woosley, manager of lab services at Wooster Community Hospital in Ohio. "So many folks think lab technicians just push buttons and turn out results and that's it. The biggest detrimental factor is that they don't know how we work. If you can get the CFO or anybody from the administration, from the CEO to the nursing director to the outpatient services director, to spend just three or four hours out of one day in his or her career in the laboratory to understand how we do things and what we have coming at us, I think your CFO is going to be a lot more willing to ask questions and understand a little bit better how we do business. I want them to come spend

"[A] costly mistake is to purchase the newest and most modern instrumentation without measuring its effectiveness."





four hours with me, and I want them to follow a specimen from the time it's drawn from an outpatient all the way through the process of reporting the results so they can understand how we do business."

As for those firms where the lab manager is also responsible for running the finances, Dr. Suderman suggests enlisting the help of a good accountant.

"We don't have the funding for me to go out and hire an MBA or somebody with CFO credentials, so I really have to depend on my accountant to tell me when we're getting overextended and when we should pull back a little," he says. "And I don't even attempt to keep up with some of the government regulations

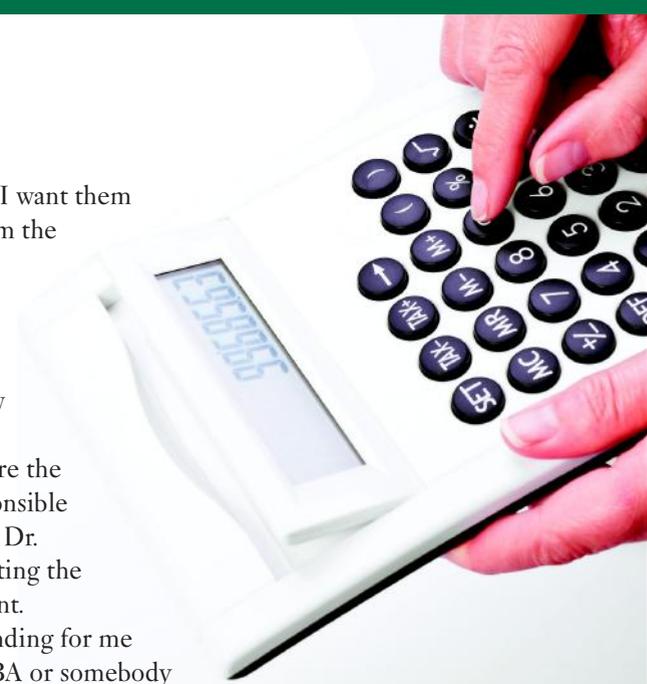
"A machine that performs a task of a lab technician but does not increase productivity is probably not worth the investment."

and changes in the IRS because that's not my expertise. My CPA has probably kept me out of hot water and out of jail on a couple of occasions."

For a laboratory to be able to survive in a difficult economic environment, it is crucial for the scientific and financial sides of the business to be in sync.

"The CFO really has to have a good understanding of the mission of the laboratory," Dr. Suderman says. "If the CFO doesn't have a good understanding of what the laboratory or the company is trying to do, then he or she is going to be operating in one world and the company is going to be operating in another. And that's why most biotechs fail. I think biotechs have a higher mortality rate than restaurants."

Richard Daub is a freelance journalist based in New York City who writes for trade publications in a variety of different industries. He can be reached by phone at 917-657-6532 and by e-mail at rdaub82@gmail.com.



The Pen! for Documentation

The choice for critical record keeping, Micron® pens feature permanent, archival-quality Pigma® pigmented ink.



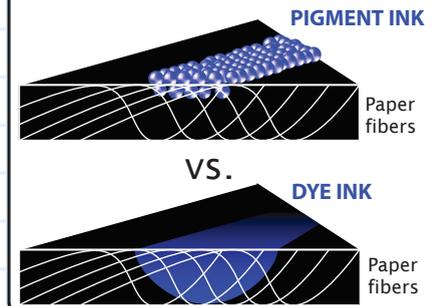
Pigma® ink:

- ✓ waterproof
- ✓ chemical & fade resistant
- ✓ prevents bleed through
- ✓ non-toxic
- ✓ reinforced tip
- ✓ 6 tip sizes

Also for
labeling &
signing



Pigment stays on paper with dense color.
Dye penetrates into paper.





VALUING SPECIALIZATION

MID-SIZED BIOTECH FIRMS NEED TO TRADE IN-HOUSE BUSINESS SOLUTIONS FOR SELECTIVELY OUTSOURCED ONES by Christopher Lotito

A clinical research facility performing Phase II drug studies has a number of requirements in order to complete its tasks successfully. Not least among those are well-designed and equipped laboratories to process and record the clinical test results. Yet you would not expect the highly skilled researchers who will occupy those labs to create the blueprints for these spaces. Though they may offer input, in the end it is an architect who will deliver the building plans. Likewise, a dedicated project manager will oversee the construction process and an experienced contractor will complete the building phase.

“The biotech industry is nothing if not specialized.”

Similarly, it is not the contractor who designs the tools needed for commercial construction. Even though end users rely on a particular technology, they rarely have the knowledge or experience to produce that technology. And if they did, chances are the finished product would be unusable and not adhere to quality standards.

Why should business practices be any different? The biotech industry is nothing if not specialized. Researchers require many years of advanced education to become experts in subjects so mind-bogglingly specific that they are met with polite stares and nods when discussed at dinner parties. It is unsurprising, then, that these scientists require specialized tools, specialized software, and even specialized business functions to complete their work. What *is* surprising is that in addition to designing the specifications for these things, they too often attempt to craft the tools, software, or functions themselves.

Perhaps it is a shortcoming of the industry, but how often have you seen a filing system so specialized that it is completely unheard of outside the facility where it was developed? How often have you seen software for specific tasks rigged together by a long list of independent developers, ex-employees, and “Jerry in Marketing who’s not bad with computers”? In biotech, standardization certainly stands in stark contrast to specialization, a fact that can lead to positions that are impossible to recruit for and render outsourcing of technical support unmanageable.

The best example of this is that of the veteran employee who claims, “It’s not a mess; I know where everything is!” How convenient that no one else does and thus his employment is ensured. The myth here is that the system is not broken but rather works well. The truth is that the system is quite broken and our so-called file-folder savant is working despite this, slowed by the dead weight of a false solution dragging behind him.

Software solutions in mid-sized companies tend to be the same: mid-sized companies begin as small companies with small needs—a filing cabinet or two, a desktop shredder, Microsoft Office 97, and a couple of old Dells running Windows XP. Then the modifications begin. First the company uses physical files to manage potential, current, and past clients. Next is the document scanner, with a whole host of Windows shared folders on an older desktop PC. Recognizing a legitimate need for increased document handling, a decision is made to implement the most inexpensive solution. When price becomes the sole deciding factor in system design, considerations such as available technical support, ability to recruit employees proficient in the use of that system, and the system’s adaptability to future growth often fall by the wayside.



True Blue.

HELMER



800.743.5637 · www.helmerinc.com

Rather than being considered an investment in the company's future, the solution is perceived as a necessary evil resulting from a dire and persistent need, so it is unsurprising that this is exactly what such piecemeal solutions become: necessary evils.

“Results must not only be sufficient for our needs, but they must be consistent and repeatable.”



An efficient and well-designed business solution will take repetitive and standardized tasks out of the hands of employees, freeing them up to handle the client relations and communications tasks that become more important as the company expands. An inefficient business solution will actually retard growth.

Perhaps worse than simply slowing the growth of your business or stunting it altogether, nonstandard in-house solutions can also expose your business, no matter what field you are in, to significant yet difficult-to-quantify risk. We all have to answer to someone, whether it's the director of regulatory affairs, the CEO, the FDA or, regardless of the chain of command, the client who ultimately pays the bills. The last answer you want to give to any of those entities is, “I don't know.” Yet this is exactly what we set ourselves up for when we choose business solutions that cannot query an external third party for support, are under documented, frequently do not adhere to industry standards, and rely on sometimes daily maintenance and stop-gap repairs from the in-house gurus who designed them. Truly, the marvel is not that these solutions work at all, but that we expect we will not end up losing clients, going out of business, or going to court due to their failures.

Despite the temptation to design and implement our own solutions, we must strive to adhere to industry standards where they apply and to forge new standards across the industry where they are needed. This means allowing skilled specialists to do what they do best. This also means paying more initially for better data systems designed by experts, but less in the long run to free our data from said systems' clutches for government audits, unanticipated client use, market research, and, eventually, the next big thing in industry software.

I saw an excellent example of this “standardize more, risk less” philosophy during an e-mail system transition project for which I was a team member while working for a large health care company. The project began by researching scope and feature sets and underwent a thorough risk assessment before product testing even began. The benefit of all this was that—even though we did not go with the most affordable option and we completely moved away from the antiquated e-mail administration system our company had expanded with—the chosen solution not only met our needs but was sufficiently standardized to require minimum staff training, less downtime and provide greater confidence in its extensibility for future growth than any of the other options. To say that this was a case where spending more up front, both in planning and purchase, paid off is akin to saying cake is better cooked with an oven than a light bulb: it is self-evident.

Whether in the lab or the office, results must not only be sufficient for our needs, but they must be consistent and repeatable. In biological terms, this requires a division of labor among various cell types. In staffing terms, this means tapping various resources that do a few things very well, then getting out of the way and letting them do their jobs. Jacks-of-all-trades need not apply, and if the masters charge more, they're able to do that for a reason: they're worth more. This holds true in any laboratory operation as well; the results must be replicable. Even the FDA's 21 CFR Part 11 reinforces that a result unrecorded did not occur, and for results to be recorded they must be replicable.

What's needed is a standardization of specialization. Smaller biotech firms that specialize in drug development need to rely heavily on both physical and virtual resourcing. For instance, firms may utilize independent auditors for auditing processes, GxP auditing firms for oversight of the auditing process, computer hardware and software vendors for IT support, and document

“An inefficient business solution will actually retard growth.”

management and control systems supported through external firms. Each part of the system of the biotech company needs to focus on completing whichever process it fulfills best; otherwise, worthy products and

projects can too easily be lost to the shortsightedness of ad hoc solutions, perhaps well-conceived but poorly executed in most business settings.

“Selective outsourcing to quality industry experts is the core skill to be cultivated.”

Selective outsourcing to quality industry experts is the core skill to be cultivated here, as biotech organizations are likely to find themselves left behind by technological advances that are harder to keep up with, a genetic science curve that is wildly at odds with traditional drug development processes, and increasingly government regulations that are swiftly being standardized across the international marketplace. In the face of all this, it is not firms that can conquer that will survive and thrive, but it is those that can adapt.

Those who hire more project managers and fewer programmers, those who invest in strategic sourcing personnel and adopt risk-based approaches to vendor selection—they will be the ones poised to adapt to the ever-changing biotech landscape. They will be the companies that spend the 21st century making money instead of reinventing the wheel.

Christopher Lotito is an experienced project manager and business development consultant with a diverse background in biotech, healthcare, and information technology. His latest venture can be found at <http://biotechdashboard.blogspot.com>. Lotito can be reached at clotito@alumni.drew.edu or by phone at 716-402-1459.

REGISTER NOW!
www.labmanager.com/experts

Lab Manager[®] MAGAZINE

« EXPERT: Dr. Gregory Shipley



ASK THE EXPERT

WebcastSeries

**UTILIZING WHOLE CELL LYSATES
DIRECTLY FOR REAL-TIME qPCR**

TUESDAY, JULY 27, 2010; 1:30 – 2:30 EST

**AS AN ATTENDEE
YOU WILL –**

- Learn what kinds of challenges some lab researchers run into when working with real-time qPCR instruments and reagents and how to overcome them.
- Learn how to continuously keep up with new reagents and instrumentation being introduced into the market.
- Learn how to apply new products and methodologies for new applications.

Why do more than 5,000 customers in 80 countries around the world choose Rudolph?

Quality, Reliability, Accuracy



Automatic Polarimeters ■ Automatic Refractometers ■ Automatic Density Meters



Here's what some of our customers have to say:

"We have the Autopol V from Rudolph Research Analytical. I have used numerous polarimeters and this is by far the best. It is one piece of equipment that you never worry about."

– **A.D., Rockwell Medical Technologies**

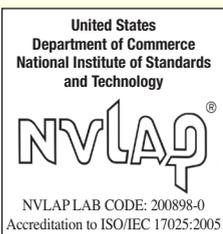
"The instrument has given us faultless service. I have been more than impressed with its accuracy, precision and reliability." – **M.A., Merck**

"The instrument has been trouble free, exceptionally stable and accurate as well as easy to use. I highly recommend the instrument." – **J.C., Schering Labs**

"Our school of pharmacy has fully converted to Rudolph, based on specifications, price and support. We have been very pleased with our purchases." – **J.R., University of Mississippi**

"The instrument is so stable in fact, that I can honestly say after using the instrument for over a year, we have never had a different reading from the original measurement, no matter how many times we repeatedly press the "Measure" button." – **R.R., The Western Sugar Cooperative**

Integrity, Quality, and Innovation for over fifty years



www.rudolphresearch.com
Phone: 973-584-1558 ■ Fax: 973-584-5440

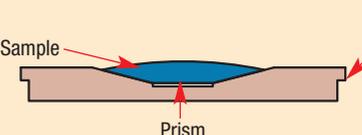
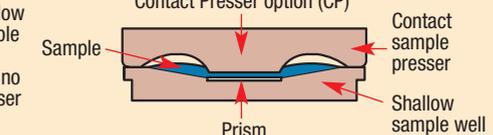
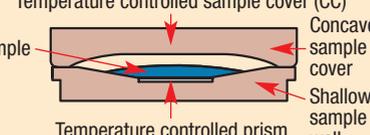


The Rudolph Advantage

Below are a few of the reasons customers replaced their old refractometer with a J-Series from Rudolph

Problem	Solution
 <p>You are tired of arguments over shadowline interpretation on your Abbe Refractometer. One person says the material is on specification, one person says it's not. In addition, scratches on the glass prism make visual interpretation even more difficult.</p>	<p>J-Series Internal Reflection Refractometers use scratch proof artificial sapphire prisms that measure the reflected light not the transmitted light, like the Abbe, so dark samples measure as easily as clear samples. Just put a drop of sample on the prism, press measure and walk away. No shadow line, no manual balancing or interpretation.</p>
 <p>Waterbath maintenance is costly and time consuming. Theoretically it should be easy – just top it off with water every week, clean it out and add new algacide once a month. So why does the bath always seem to be low on water and covered with green slime?</p>	<p>The J-Series has an electronic peltier temperature control solution that is right for you. Select your temperature through the touch screen and watch the instrument quickly come to temperature and make a measurement all in one easy step.</p>
 <p>Your old refractometer was great when you bought it but now it is being repaired more and more often while measurement instability wastes time and money.</p>	<p>Our customers say it best:</p> <p><i>“This instrument has greatly reduced our sample time and improved our accuracy. Calibration of the instrument is easy and rarely required. We have had no problems or issues with the two instruments that we currently have in service... I would highly recommend the Rudolph J57HA Refractometer over any other brand of refractometer that I have used or tested throughout my many years working in the sugar industry.”</i></p>

Why switch to a Rudolph Research Refractometer? Superior temperature control and easy to clean prism

For samples close to ambient select a model without a presser	For semi-solid and highly evaporative samples more than 10° from ambient select a model with a contact presser (CP option)	For most samples 10° from ambient select J Series standard temperature controlled sample cover (CC option)
 <p>Sample</p> <p>Shallow sample well with no presser</p> <p>Prism</p>	 <p>Contact Presser option (CP)</p> <p>Sample</p> <p>Contact sample presser</p> <p>Shallow sample well</p> <p>Prism</p>	 <p>Temperature controlled sample cover (CC)</p> <p>Sample</p> <p>Concave sample cover</p> <p>Shallow sample well</p> <p>Temperature controlled prism</p>

Rudolph's dual temperature control system

Rudolph Research Analytical is the only refractometer manufacturer to offer **electronic temperature control from both prism and presser surfaces**. The requirements of an electronically temperature controlled refractometer operating close to ambient air temperature are very different from the temperature control requirements of a refractometer operating more than 10°C from ambient air temperature. Only the Rudolph J Series is designed to be the perfect refractometer for both applications.

Measuring RI or Brix close to ambient air temperature

The J57's shallow sample well and presserless design makes **cleaning easier than deep well prism designs while still maintaining accuracy**. The deep sample well of competing refractometers is not needed when there is less than a 10°C difference between the prism temperature and air temperature because the temperature gradient across the sample is small.

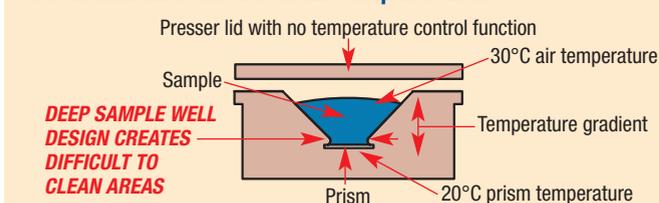
Measuring RI or Brix far from ambient air temperature

The J157/257/357 shallow well with temperature control from the sample presser and prism surface offers **superior temperature control while still maintaining ease of cleaning**. Rudolph's temperature controlled presser creates a mini temperature controlled environment where the entire sample is held at the measurement temperature. This design **minimizes the inaccuracies** created by temperature gradients across the sample as deep well prisms fight to control temperature from the prism surface while the air and upper part of the sample have widely divergent temperatures. (See Figure lower left)

Other manufacturer's compromise

From the pictures below one can see that **other manufacturers have to make a compromise with the depth and angle of sample well**. Since these manufacturers use one sample well and cover design for both temperature applications, they end up with a **sample well that is too narrow and deep**. The deep sample well makes **cleaning needlessly hard** at ambient temperature while failing to provide ideal temperature control when the sample and air temperature are more than 10°C from the desired measurement temperature.

Other manufacturers at all temperatures



Rudolph



Manufacturer 1



Manufacturer 2



SOCIAL NETWORKING SITE SOLVES TOUGH LABORATORY INSTRUMENTATION PROBLEMS AND MORE

Since their introduction a few years ago, social networking sites have increasingly attracted the attention of academic and industry researchers intrigued by their reach and effectiveness. If you are not one of those researchers visiting networking sites, you may question the value of an online site as opposed to networking in person. However, given the increased workload in most research facilities and fewer opportunities to meet with colleagues either at meetings or other research-related events, person-to-person networking opportunities have all but vanished. These days it is much more difficult to bounce ideas off of or brainstorm solutions with others in your field. Finding tools to support and carry on this communication is where the Internet has changed these dynamics. Whether you've taken the leap or not, the fact is researchers are doing much more online, from attending informational webinars and product press events to career building and networking.

Consider this:

- Researchers using social networking sites find discussion threads—specific to their research or equipment/instrument challenges—that provide real-world, hands-on solutions to their problems.
- Before making an equipment buying decision, researchers are changing the way they evaluate and engage in the buying process. The budget creation, solution criteria and RFP distribution phases are being supplemented with a more peer-oriented approach that now occurs within the social networking medium. Researchers can now engage with peers who have already addressed the challenge and are willing to share their knowledge.
- In an attempt to connect directly with vendors, researchers are beginning to post questions on social networking sites to accelerate the buying process.

With this in mind, the publishers of *Lab Manager Magazine* and LabX are excited to announce the “official” launch of LabWrench (www.labwrench.com).

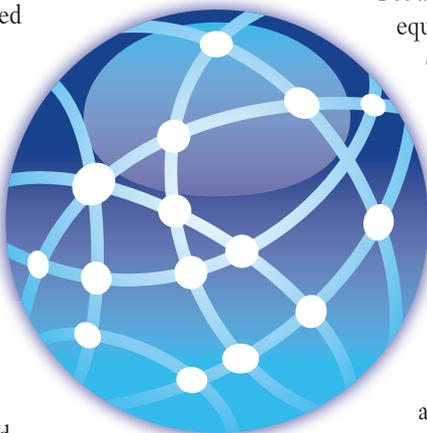
LabWrench provides a shared network for users of labora-

tory equipment and instruments. As a lab professional, you can get answers, find information about the equipment you use in your lab, and interact with others using those same instruments.

The LabWrench networking site provides a community forum around scientific equipment and instrumentation. The discussions are prompted by application notes, white papers, user manuals and videos, as well as questions and answers from other scientists—providing product-specific reviews and troubleshooting tips from end users and industry experts.

As a member of LabWrench you can:

- Get answers to your most pressing laboratory equipment questions from people with similar experiences and challenges.
 - Provide answers to others with problems you have already overcome.
 - Find opportunities to connect with other lab professionals who can help you overcome the equipment challenges you face in your lab, find solutions to common issues others have had with specific instruments, or read comments on laboratory products you are thinking about purchasing.
 - Build relationships and grow your network by having meaningful discussions with serious lab professionals who are using the same equipment you use now or are considering using in the future.
- Find quality vendors and service providers to help equip and maintain the best possible equipment for your specific lab. Equipment and instruments are categorized by product type and brand, and over time we will add a directory of applicable vendors meeting your needs for service, parts, accessories and related products and services specific to each instrument.
- Build a “My Bench” page and start managing the equipment you’ve bookmarked and receive notifications directly from vendors and users when new product information becomes available. It’s free to join! Visit www.labwrench.com to start building your lab bench of products and connect with your peers to post and answer questions about the lab equipment you use.



www.labwrench.com

Ask
Questions

Post
Answers

*Lab Equipment Troubleshooting,
Recommendations, Tips and Tricks*



LabWrench

Connect, share & work smarter.

TECHNOLOGYNEWS

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

ANALYTICAL

Portable FTIR Spectrometers

Exoscan and FlexScan

- Battery-operated, handheld spectrometers for field applications
- Identify minerals and soil components and quantify molecular compounds including oil contamination or degree of hydration in soil
- Feature a diffuse reflectance sampling interface



A2 Technologies

www.a2technologies.com

UV-Visible Spectrophotometer

8453

- Photodiode array (PDA) light path scans a complete spectrum from 190 to 1,100 nm in less than one second
- Fewer moving components reduce the need for recalibration
- Uses a deuterium discharge lamp for the full UV and visible range

Agilent Technologies

www.agilent.com

Liquid Chromatography Systems

1200 Infinity Series

- Available in three models: 1220, 1260 and 1290
- 1220 and 1260 LCs are standardized on 600 bar pressure and 80 Hz data acquisition speed
- 1260 Quaternary Bioinert LC offers highest performance in bio-analysis and bio-purification
- 1290 LC enables users to deploy any particle type, any column dimensions and any mobile/stationary phases



Agilent Technologies

www.agilent.com

Salts-in-Crude Analyzer

Model 2100

- Eliminates the hassle of manually reading charts and graphs
- Measures conductance, temperature and salts concentration in crude oils, pH and pH millivolts for aqueous samples
- Features 24K bytes of low power RAM dedicated to data storage, for later uploading to a computer through a serial interface



AMETEK Petrolab Company

www.petrolab.com

PRODUCT SPOTLIGHT

NEXT-GENERATION MASS SPECTROMETERS

HIGH-QUALITY RESULTS FASTER, AND WITH LESS EFFORT

The Xevo TQ-S and Xevo G2 QTof are the newest additions to Waters' Xevo family of mass spectrometers, offering high levels of sensitivity for compound identification, quantification and screening.

Xevo TQ-S allows the user to quantify compounds at concentrations lower than previously possible. It features an innovative ion source—StepWave™—which is constructed from two stacked ring electrode devices to provide a single, off-axis ion transfer lens. The diameter of the sampling cone's orifice is almost twice that of previous models, increasing the number of ions that enter the mass spectrometer.

"This design ensures that any neutral sample matrix contamination... is actively extracted from the system," said Dr. David Little, senior product manager for Quadrupole MS at Waters Corporation. "Ensuring that key elements remain clean and providing long-term robust operation."

The Xevo G2 QTof exact mass MS/MS mass spectrometer features Waters QuanTof™ technology, which can extend the dynamic range of previous generation Xevo QTof systems to greater than four orders of magnitude. It incorporates UPLC/MS^E, a simple method of data acquisition that catalogs complex samples in a single analysis, providing users with a complete record of the sample, allowing him/her to bring it up again at any time.

"The latest Xevo instruments provide... performance benefits," added Dr. Little. "Whilst maintaining the simplicity of operation associated with the Xevo family."

For more information, visit www.waters.com. Dr. Little can be reached at david_little@waters.com.



Raman Spectrometer

RamSpec™

- Identifies commonplace and rare chemicals through glass, plastic, transparent and translucent materials
- Features rapid automated calibration to ensure operational accuracy
- Volume Phase Grating (VPG) provides high-speed variable processing and continuous spectrum measurements
- Uses a fiber optic bundle or slit optics arrangement based on customer preferences

BaySpec

www.bayspec.com

Semi-Preparative HPLC Pump

CE 4150

- Dual-piston pump has a stepping motor drive
- Provides flow rates of 0.001 to 50 ml/minute at pressures up to 15 MPa
- May be used isocratically or with others, to create a high-pressure gradient
- May be used with third-party systems

Cecil Instruments
www.cecilinstruments.com





Together we can, eliminate the cost and danger of cylinder gas.



Hydrogen Generators to Replace Helium Carrier Gases



Purge Gas Generators for FT-IR



Zero Air Gas Generators for GC



Nitrogen Gas Generators for LC-MS

Whether it's directly on the laboratory bench or in a process monitoring application, Parker Balston® gas generators are the dependable standard to deliver safe, high purity gases. Parker offers a wide range of gas generators for many applications including GC, LC-MS, and FT-IR. The generators are designed to operate unattended 24 hours a day, 7 days a week. Parker's leading global presence and portfolio of product technologies is unrivaled within our industry.

aerospace
climate control
electromechanical
filtration
fluid & gas handling
hydraulics
pneumatics
process control
sealing & shielding



1-800-343-4048
www.labgasgenerators.com

ENGINEERING YOUR SUCCESS.

Chiral Stationary Phases (CSP)

CHIRALPAK® and CHIRALCEL® Series

- Offer fast analysis time, while maintaining column resolving power
- Available in 3 μm, 5 μm and 10 μm particle sizes
- May be used in conventional HPLC units without significant loss in performance
- May be used in reversed-phase, normal phase and supercritical fluid chromatography modes



Chiral Technologies
www.chiraltech.com

UHPLC Columns

1.7 μm

- Operate at high pH, as well as low and mid pH
- For use with Jasco X-LC™, Agilent 1290® or Waters Acquity UPLC® systems
- Small particles will not lose efficiency even at higher linear velocity
- Fully scalable with proprietary C18 analytical 3 μm, 5 μm and 10 μm particles

Fortis Technologies www.fortis-technologies.com

Reagentless Chlorine Analyzers

CLF10 sc and CLT10 sc

- Eliminates the need for routine reagent replacement and waste stream management
- Notifies user if instrument needs servicing due to a pH or chlorine calibration deviation
- Provides continuous readings that indicate when treatment conditions have changed
- Do not require complicated wiring or setup procedures



Hach Company
www.hach.com

ARC Sensor

pHeasy®

- ChekRef device provides feedback on accuracy of pH measurement and delivers an alert when an electrode needs replacement
- Features direct communication with process logic controller (PLC) without transmitters
- One calibration at the start is sufficient; the need for recalibration is eliminated



Hamilton Company www.hamiltoncompany.com

Raman Analyzer

RAMANRXN2™ 1000

- Provides the fluorescence rejection of a FT-Raman spectrometer and ease of fibre-optic interfacing of a dispersive Raman analyzer
- Provides an effective route for *in situ* monitoring
- Offered with either iC Raman™ 4.1 for reaction development and understand, or synTQ-Lite for process monitoring and control

Kaiser Optical Systems

www.kosi.com

Diffuse Reflectance Targets

PTFE-based Alucore Targets

- Available in five different reflectance values
- Provide constant high reflectivity over the wavelength range from 250 to 2,500 nm
- Thermally stable over the range of -50°C to 250°C, chemically inert and resistant to water and most solvents
- Maintain diffuse and lambertian characteristics regardless of environment



Labsphere

www.labsphere.com

X-Ray Powder Diffractometer

CubiX³

- Features high-intensity data collection and flexibility in sample handling for automated environments
- Supports full analytical X-ray powder analysis methodology from classical data analysis up to full pattern cluster analysis for statistical data interpretation and pass/fail determination



PANalytical

www.panalytical.com

Single-Quad LC/MS Detection System

Flexar™ SQ 300

- Provides a rugged ion source design and wide molecular weight detection range for HPLC and UHPLC applications
- Collision Induced Dissociation (CID) technology enables fragmentation for further confirmation of molecular structure
- Offers ease of switching between the Ultraspray ESI and Field-free APCI ion sources
- Features a grounded ion source for quick and safe probe installation

PerkinElmer

www.perkinelmer.com

Labconco Corporation

VERIFYING CONTAINMENT OF THE LABCONCO XPert® BALANCE ENCLOSURE



Protecting your
laboratory environment

LABCONCO

8811 Prospect Avenue
Kansas City, Missouri 64132
816-333-8811 or 800-732-0031
FAX 816-363-0130
www.labconco.com

ABSTRACT

An independent industrial hygiene laboratory tested the ability of a Labconco XPert Balance Enclosure to contain particulates.

INTRODUCTION

The purpose of a balance enclosure, such as the XPert Balance Enclosure, is to protect the user during weighing of fine, potent powders, including pharmaceutical ingredients. But just how well does an enclosure keep these toxic particulates contained? The Labconco XPert Balance Enclosure connected to a FilterMate™ Portable Exhauster was put to the test.

EXPERIMENTAL CONDITIONS

An industrial hygiene air-monitoring study¹, conducted by SafeBridge Consultants, Incorporated, Mountain View, California, verified the design and performance of the XPert Balance Enclosure. They selected naproxen sodium, a non-potent active pharmaceutical ingredient, as the surrogate for the study because it is safe to handle (the OEL is 5 mg/m³), readily detectable in air at low concentrations, has a high dustiness quotient and challenging electrostatic properties.

The study was designed to assess potential exposure to airborne concentrations of naproxen sodium for three operators of varying skill levels and physical statures. The operators performed dispensing and weighing tasks in the XPert while monitors measured the concentration of naproxen sodium in the operators' breathing zones. Each operator performed the tasks at a Mettler Toledo AX-105 Delta Range Balance placed inside a Labconco XPert Balance Enclosure operated at 78 fpm. Labconco engineers selected the face velocity setting based on two objectives: 1) optimize the capture and containment of powders. 2) minimize the air turbulence that could interfere with balance operation.

The task performed involved the operators dispensing twenty, one-gram quantities of naproxen sodium from a bulk container. With a spatula, the operators placed the samples into 20 ml sealable glass scintillation vials.

Operator 1, an analytical chemist of small stature, exercised good technique with only minor spillage. Operator 2, an engineer of average stature, had the least amount of experience with dispensing. He spilled evident amounts of the sample onto the work surface inside the enclosure. Operator 3, an industrial hygienist of large physical stature executed the task quickly with excellent technique.

For each operator, SafeBridge collected air samples at the operator's collar (breathing zone) as well as other locations inside and outside the testing room. The samples were analyzed for naproxen sodium using HPLC and fluorescence detection.

RESULTS

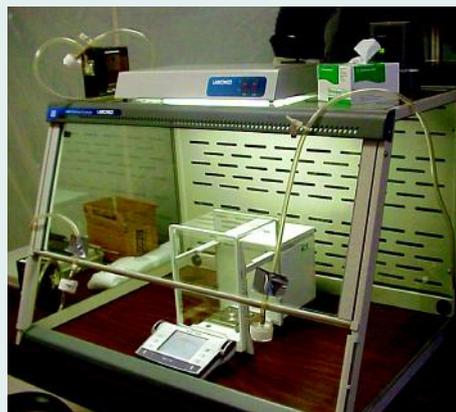
Test results showed a personal exposure ranging from non-detectable to less than 23 ng/m³ indicating no significant release of powder beyond the plane of the enclosure access opening or into the operators' breathing zones.

CONCLUSION

The XPert Balance Enclosure demonstrated excellent containment when used by an operator using excellent technique and good containment when used by an operator using marginal technique. While no enclosure can compensate for improper technique, these results confirm that the XPert Balance Enclosure provides a safe work environment.

REFERENCES

¹Haggerty, Edward J., CIH, Industrial Hygiene Exposure/Containment Study for the Labconco XPert Balance Enclosure & FilterMate Portable Exhauster, SafeBridge Consultants, Inc., October 8, 2003.



▲ SafeBridge Consultants monitored the concentration of naproxen sodium in various locations surrounding the 3' XPert Balance Enclosure, including in the operator's breathing zone.

See a complete application online, www.labmanager.com/appnotes/julyaug2010

Drivers

Symbion-DX and RX

- Designed for Kaiser Optical Systems' suite of RAMANRXN analyzers
- Integrate all the functions of the Kaiser analyzers into Symbion-DX and RX analytical instrument software suites
- Provide standardized platforms for controlling spectrometers and other analytical instruments
- Features extensive data manipulation and application development capabilities

Symbion Systems

www.gosymbion.com

Column Oven for Liquid Chromatography

200 and 300

- Column Oven 200 can accommodate up to 4 analytical HPLC columns with lengths up to 150 mm
- Column Oven 300 can accommodate up to 4 analytical HPLC columns with lengths up to 250 mm
- Either configuration can be mounted on a CTC autosampler or Thermo Scientific MS ion sources



Thermo Scientific

www.thermofisher.com

Time-of-Flight Mass Spectrometer

FasTOF™

- Provides tunable resolution of 4,000 to 7,000 at FWHM at m/z 281 Th and full range mass spectra up to 500 Hz (100 Hz typical)
- Mass analyzer is a classical reflectron with a 1.2 meter ion flight path
- Ion Source provides adjustable 0 eV to 100 eV electron impact ionization



Zoex Corporation
www.zoex.com

BASIC LAB

Containment Solution for Powder Milling

L1A Fitzmill Enclosure

- Features acrylic sidewalls and sash to maximize transmission of natural light and mill-process viewing
- Made of 3/4" Polypropylene; also available in stainless steel framing with safety glass sidewalls and sash
- Top-mount fan filter housing is equipped standard with a 4" HEPA filter media, which is 99.7% efficient

Flow Sciences

www.flowsciences.com

Gas Sensor

Carbon Dioxide

- Measures CO₂ in two ranges: 0 to 10,000 ppm and 0 to 100,000 ppm
- Monitors changes in CO₂ levels in surrounding air, respiration of organisms or reactions in a chamber
- Accuracy is ±100 ppm with resolution 3 ppm (low range) and 30 ppm (high range)
- Response time is 95% of full scale reading in 120 seconds



Forston Labs

www.forstonlabs.com

Total Organic Carbon (TOC) Analyzer

Sievers InnovOx On-Line

- Supercritical Water Oxidization (SCWO) technique offers enhanced reliability, ease of use and low maintenance
- Handles difficult samples such as brine, humic acid and cellulose
- Features a dynamic linear working range of 0.5 to 50,000 ppm

GE Healthcare

www.geinstruments.com

Temperature-controlled Vortexer

MultiTherm™

- Features a vigorous (2 mm) mixing motion that can reach up to 1,500 rpm
- Temperature control system accurately maintains temperatures from 0°C up to 100°C
- Sequential programming option can link stored programs together for multiple runs at different speeds and temperatures



MidSci
www.midsci.com

Compounding Aseptic (CAI) and Containment (CACI) Isolators

PharmaGard™

- "Pull down and out" trays allow for independently changing sharps and waste containers as they fill
- Locking mechanism helps create an airtight seal, maintaining a true ISO Class 5 environment
- Improved vertical sliding counter balance inter-chamber window creates a seamless transition when entering compounding materials into the work zone



NuAire

www.nuair.com

Waters ANALYTICAL HPLC TO PREPARATIVE HPLC:

Scale Up Techniques Using a Natural Product Extract

Waters

THE SCIENCE OF WHAT'S POSSIBLE.™

34 Maple Street
Milford, MA 01757
Tel: 508 478 2000, 800 252 HPLC
www.waters.com

INTRODUCTION

Chromatographic separation methods can be developed on any scale. To minimize consumption of sample and solvents there is a benefit in developing separation methods on a small scale and transferring them to a larger scale. Taking into account important parameters and applying appropriate scaling factors in a logical manner enables users to scale up from analytical chromatography to preparative separations easily and successfully. In this application note an analytical scale separation of Kudzu root extract is used to demonstrate the calculations and techniques used to move from a 4.6 mm i.d. analytical column separation through 10, 19, and 30 mm i.d. preparatory column separations.

EXPERIMENTAL CONDITIONS

Separations, at all scales, were carried out using the Waters® AutoPurification System consisting of the following components:

2545 Binary Gradient Module
2998 Photo Diode Array
3100 Mass Detector
2767 Sample Manager
System Fluidics Organizer

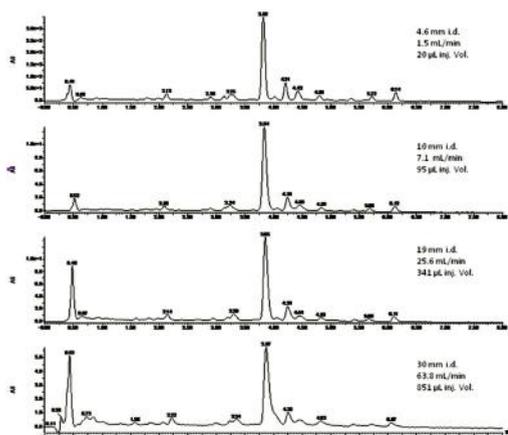
DISCUSSION

A systematic approach to scale up will provide the best possible result. The ultimate goals are to maintain chromatographic resolution between key components and enable users to better predict chromatographic performance between analytical and preparative chromatography.

Columns of the same particle size, length, and chemistry will provide similar resolution of critical pairs at all separation scales. Waters offers a wide range of column chemistry choices available in analytical and preparative scale dimensions.

To demonstrate the technique, an analytical scale separation was developed on a 4.6 X 50 mm Waters SunFire C18, 5 µm column. This separation was scaled to three different preparative dimension columns (10.0, 19.0, and 30.0 mm i.d.). The scaled flow rates, injection volumes, and gradient tables were all calculated using the Waters OBD Prep Calculator.

See a complete application online, www.labmanager.com/appnotes/julyaug2010



◀ Scaled Preparatory Separations, 4.6 mm i.d. (Top), 10 mm i.d., 19 mm i.d., and 30 i.d. mm (Bottom)

RESULTS

Regardless of the scale, the chromatography is very similar (figure 1). When compared to the original 4.6 mm i.d. scale, resolutions and retention times are very similar across all scales. This simple experiment demonstrates that a systematic approach to scale up meets the goal of maintaining chromatographic resolution between key components and enables users to better predict chromatographic performance between analytical and preparative chromatography. This exercise also demonstrates the unique capability of the Waters AutoPurification system which allows users to perform both analytical and preparatory chromatography on the same system with no performance compromise.

CONCLUSIONS

- Analytical chromatography can be successfully scaled to preparatory chromatography easily by using a systematic approach.
- The Waters Prep OBD Calculator aids in the scaling calculations.
- Using the Waters AutoPurification System, separation methods developed on an analytical scale can be transferred to preparatory scale on the same system.
- Developing methods on the analytical scale and transferring them to preparatory scale reduces solvent and sample consumption while reducing waste disposal cost compared to developing separation methods only at the preparatory scale.

Reference: Analytical HPLC to Preparative HPLC: Scale-up techniques using a natural product extract. June 2009 72000312EN

Portable Data Logger

RDXL120

- Features an internal memory of 16 MB as well as capacity for external storage such as CF or SD cards and USB memory
- Supports remote data acquisition
- Temperature and voltage can be set independently for each channel
- Designed for applications such as plant maintenance, environmental testing and process systems



Omega Engineering

www.omega.com

Helium Leak Detector

SmartTest

- Wireless remote can be operated at distances of up to 300 feet
- Data can be stored in the RC 500 or on a USB memory stick
- Roughing pump oil level can be viewed without removing cover
- Wireless remote is compatible with older models



Pfeiffer Vacuum
www.pfeiffer-vacuum.com

Pressure Reactor

Q-Tube™

- Features 200 psi working pressure
- Virtually eliminates the risk of pressure explosions
- Achieves 92% energy savings compared to using a microwave
- Purging systems can be used with a wide range of gases including ammonia, nitrogen, argon and hydrogen



Q LABTECH

www.qlabtech.com

Radiometer/Photometer

AccuMAX™

- Provides accurate readouts for UV irradiance, visible illuminance and luminance light readings
- Single-wavelength sensor detectors are available in both standard range and extended range
- Standard range provides UV readings from microwatts to milliwatts and extended range provides measurements from milliwatts to watts



Spectronics

www.spectroline.com

Automatic Dispensing System

eVol™

- Ideal for routine dispensing of volatile solvents and hazardous, corrosive or viscous chemicals
- Unifies two precision devices: a digitally controlled electronic drive and proprietary analytical syringe
- XCHANGE™ coupling allows syringes to be quickly and easily changed
- Supplied with three syringes in different volumes and a stand



Thermo Fisher Scientific

www.thermofisher.com

PRODUCT SPOTLIGHT

VARIABLE SPEED ROTOR MILL

ALL-PURPOSE MILL FOR MEDIUM-HARD TO SOFT SUBSTANCES

PULVERISETTE 14 from Fritsch is an all-purpose mill for rapid crushing of medium-hard, brittle and fibrous samples. It can also be used to disperse and homogenize dry samples. Difficult samples, including polyester, PVC and styrene, can be ground to analytical fineness by process of embrittlement (adding liquid nitrogen before grinding).



The mill features impact bars for grinding temperature-sensitive materials. "This avoids shearing of the material between rotor and sieve," said Simon Wolfgang, sales manager at Fritsch. "A special design of the disk below the rotor ensures a constant airflow to cool the rotor and the grinding material. This is especially necessary for some polymer samples."

A large fan blows cooled air into the instrument through a foam particle filter to create positive pressure that prevents the penetration of dirt particles from the ambient air.

The mill features a top speed of 20,000 rpm and a feed size of < 10 mm, achieving a final fineness of up to 40 μm. Rotors, sieve rings and collecting vessels are made of different materials and in different sizes, enabling a configurable option for various applications. Grinding components are made of stainless steel, pure titanium, tin-coated and WC-coated. Parts can be changed and cleaned easily, and without tools.

For more information, visit www.fritsch.de. Wolfgang Simon can be reached at simon@fritsch.de or by phone at +49 6784 70187.

LIFE SCIENCE

qPCR Reagents

Brilliant III

- Novel fast Taq mutant for qPCR results in under 35 minutes
- Deliver qPCR results in about 40 minutes
- Optimized fast cycling formulation ensures reliable and reproducible data with shorter run times
- Convenient pre-blended formulations compatible with any sequence-specific probe detection chemistry

Agilent Technologies

www.agilent.com

BUCHI Corporation

EXTRACTION AND CONCENTRATION SOLUTIONS

Extraction and concentration have reached the modern age with Buchi's Extraction and Concentration Solutions!



19 Lukens Drive, Suite 400
New Castle, DE 19720
1-877-MYBUCHI
www.mybuchi.com

NEW! The E-916 SpeedExtractor is now paired with the Syncore Analyst concentration system to accommodate extractions, SPE, and concentration all in the same glassware without any transfer steps.

E-916 SpeedExtractor is the latest in Pressurized Solvent Extraction technology, providing time savings, solvent savings, and exceptional reproducibility and documentation. Capable of extracting 6 samples simultaneously, for up to 96 samples in a day.

Syncore Analyst expands upon Buchi's expertise in evaporation to allow the simultaneous concentration of up to 12 samples at unprecedented speeds, while placing an emphasis on results.

B-811 Extraction System offers the flexibility of four types of Soxhlet extractions, all automated for minimal system handling.

ABSTRACT

The Extraction System B-811 and the Syncore Analyst parallel concentrator as well as the Pressurized Solvent Extractor were evaluated for the pretreatment of samples containing polycyclic aromatic hydrocarbons (PAHs). Recoveries of extraction and subsequent concentration using acetone + n-hexane (1+1) were 70-95% for 2 ring and 90-100% for the less volatile 3-5 ring PAHs. A good precision (95% confidence level) of less than 6%, naphthalene excluded (12%), was found. No significant difference was observed between the two extraction methods.

INTRODUCTION

Polycyclic aromatic hydrocarbons (PAHs) are organic pollutants primarily formed by incomplete combustion and incineration. PAHs adsorb strongly to small carbonaceous particles but are also present in the vapor phase. Therefore, they can undergo long range transport. Typical concentrations are in

the sub-ppb to ppm range. PAHs also bioaccumulate in food webs and are partially mutagenic and carcinogenic. Therefore, PAH analysis is requested by regulatory bodies.

The US Environmental Protection Agency (EPA) introduced a priority pollutant list of 16 PAHs (EPA610) in 1982. For solid and hazardous waste testing, the EPA approved method reference is SW-846. The analyses of PAHs contamination at the trace level includes sample extraction and extract concentration. Both automated Soxhlet extraction (EPA3541) and pressurized solvent extraction (EPA3545) are approved extraction techniques (EPA3500) for solid samples. The extract volume is reduced to 1 ml for maximum sensitivity (EPA8100).

2-3 ring PAHs can be lost by evaporation and the heavy volatile PAHs due to adsorption to glass walls. Therefore, concentration and extraction procedures as well as cleaning of the glass equipment are crucial factors to be optimized. Cross contamination between samples of high and low concentrations is one of the critical points in trace analysis. This is particularly valid for simultaneous sample concentration. Reasons can be sample transfer by vapor phase or contaminated glass surfaces. Therefore, frequent analyses of blanks are mandatory check procedures.

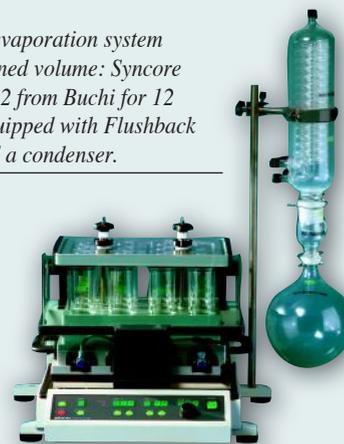


▲ SpeedExtractor E-916, the successor of the fastPSE system from Applied Separations.



◀ Buchi Vacuum Pump V-700 with Vacuum Controller V-855 and post-pump condenser.

▶ Parallel evaporation system to a predefined volume: Syncore Analyst R-12 from Buchi for 12 samples equipped with Flushback module and a condenser.



See a complete application online, www.labmanager.com/appnotes/julyaug2010

Biorepository of Tissue Products

Genomic and Proteomic

- Source tissues include human normal and diseased tissues and various genetic model organisms including mouse, rat, primate and plant species
- Provided ready-to-use, enabling immediate study of molecules of interest in many different tissues and eliminating the need for sample preparation

AMSBIO

www.amsbio.com

Flow-Validated Antibodies for Multiparametric Signaling Cytometry

Cell Lab Signaling Cytometry

- For the detection of phosphorylation state of signaling proteins in cells via flow cytometry
- Can be used in combination with extracellular markers to study signaling patterns in specific cellular subpopulations



Beckman Coulter
www.beckmancoulter.com

PCR Starter Kits

mLINE

- Includes three pipettes covering the standard volumes used in PCR along with sterile and certified SafetySpace Filter™ tips
- Also includes a pipette holder, color-coded caps, microtube opener/calibration tool, cooking rack and cryo pen



Biohit
www.biohit.com

qPCR Reagents

SsoFast Probes Supermix

- Enables researchers using fluorogenic probes to enhance the speed, reliability and sensitivity of their qPCR experiments
- Yields fast duplex qPCR results in 30 minutes or less
- Fully compatible with universal cycling conditions and a wide range of primer/probe concentrations without requiring additional optimization

Bio-Rad

www.bio-rad.com

Cell Migration Assay

CellPlayer™

- Features automated data collection over a period of hours or days
- Generates data sets that are optimal for studying pharmacological agents and gene silencing technologies
- CellPlayer is run on the Essen IncuCyte, a compact automated microscope that resides inside a standard tissue culture incubator

Essen BioScience

www.essenbioscience.com

Cycler

FC1™

- Provides users with the ability to double the number of microfluidic chips that can be processed in a day
- Features a self-contained vacuum source and touch-screen interface
- Designed to reduce thermal cycling time by a factor of three



Fluidigm
www.fluidigm.com

PRODUCT SPOTLIGHT

SINGLE-USE BIOREACTOR

MOVING SPARGER PROVIDES ENHANCED GAS EXCHANGE

The Integrity™ PadReactor™ from ATMI Lifesciences combines portability with simplicity to provide a bioreactor that offers features available on larger, stationary units. The scalable, efficient bioreactor can be installed in less than an hour, and its single-use technologies provide an economic benefit over stainless steel systems.

The PadReactor system incorporates key proprietary elements, including Integrity TK8 film polymer, which is animal-derived component free (ADCF), integrity tested and gamma irradiated. The system also provides enhanced gas exchange, due to a moving sparger, and low shear mixing due to the vertices of the square tank, which act as natural baffles.

“Designing a square tank affords more efficient mixing and gas transfer,” said Roman Rodriguez, global product manager, Bioreactors, ATMI Lifesciences. “The square design also means a better exchange surface area, allowing better CO₂ stripping and thus a more stable process over the batch.”

With the ability to accommodate a range of volumes from 20 liters to 1,000 liters, the PadReactor boasts many cost-efficient features, such as reduced power and validation requirements. It also comes with a compact footprint; the 25-250 liter model stands at 1.17 m² while the 500-1,000 liter size occupies 2.4 m².

For more information, visit www.atmi-lifesciences.com. Roman Rodriguez can be reached at roman_rodriguez@atmi.com or by phone at +33 478 35 2946



"GREEN CHEMISTRY" IN THE LABORATORY

Using Mills as Efficient and Ecologically Friendly Synthesis Reactors

The term "green chemistry" is commonly used to describe chemical procedures which meet specific requirements with regards to the conservation of resources and protection of the environment. The objective is to avoid undesired by-products by selecting adequate reaction procedures and media. A typical example is the production of bio fuel, which has become an ecologically friendly alternative for many drivers.

The chemical industry is making great efforts: to reduce the required amounts of chemicals and energy, more and more innocuous reactants, alternative solvents and new synthesis procedures are used.

A critical factor in chemical synthesis procedures is the use of organic solvents as these are often harmful and expensive. Moreover, it should be taken into account that solvents and educts that have not reacted require subsequent separation from the product. The ideal would be to carry out syntheses without solvents and with a yield of 100%.

In the 1980s, a first review of the advancements in tribochemistry and mechanochemistry was published. These terms comprise chemical reactions that take place under the influence of mechanical energy (IE friction or ultrasound). These reactions occur on the interfaces of solid materials, therefore no solvents are required. Moreover, with stoichiometrical net weights, yields of 100% can be achieved which were not possible with conventional methods. Solid-solid reactions require large surfaces and a close contact of the educts. Therefore, laboratory mills are especially suitable for this type of reaction because size reduction enlarges the surface of the particles; moreover, a constant mixing with high-energy input takes place. Ultrasonic applications are similarly effective, however it is rather difficult to extend the production to a technical or industrial scale.

Mortars have been used for ages to grind and homogenize solid substances. With the introduction of the first motor-powered mortar grinding in 1923, the "Retsch Mill" dramatically simplified the grinding process. The Retsch Mill has been updated and optimized; the latest model, RM 200, is equipped with a high-performance drive with electronic controls. A mortar grinder has the advantage of being an open system, which enables the material to be fed continuously (similar to a dropping funnel in classic laboratory synthesis). However,

the synthesis conditions such as pressure, temperature, degree of size reduction and particle size reduction can only be controlled in a limited way.

This is why closed systems are more widely used as reactors. For laboratory scale procedures, ball mills are best suited, primarily mixer mills and planetary ball mills.

The grinding jars of the planetary ball mill are arranged eccentrically on the sun wheel. The rotational movement of the sun wheel is contrary to the rotation of the jars. The grinding balls inside the jar are subjected to superimposed rotational movements, or Coriolis forces.

The speed differences between the balls and jar result in the interaction of frictional and impact forces, releasing high dynamic energies. The interplay of all these forces result in the very effective energy input of planetary ball mills.

It has to be taken into account that a high-energy input always causes a temperature increase inside the grinding jar. This is especially undesirable for exothermal reactions, which is why Retsch offers the Planetary Ball Mill PM 100 CM which operates in a centrifugal motion.

The speed ratio of the sun wheel to grinding jar is 1:1, in contrast to 1:2 or higher with Retsch's classic Planetary Ball Mills. In practice, this means that the temperature inside the grinding jar is much lower if the mills work in a centrifugal manner (Figure 2).

The powerful and maintenance-free drive of the Retsch Planetary Ball Mills guarantees a constant speed, even for continuous operation for many hours. Thanks to the programmable starting time, the mills can be set to begin running at night so the grinding process will be finished in the morning.

A built-in fan with standstill monitoring cools the jar during operation. The extraction volume per hour is greater than 20 times the grinding chamber volume. To control the synthesis conditions more effectively,

Retsch®

Solutions in Milling & Sieving

74 Walker Lane
Newtown, PA 18940
1-866-4-RETSCH
www.retsch-us.com

the measurement system GrindControl can be used to monitor and document the temperature and pressure inside the jar during operation. This is especially useful for condensation reactions where gas is released because the end of the reaction process can be deducted from the pressure curve.

In Mixer Mills, synthesis times are shorter due to the more effective mixing process compared to Planetary Ball Mills. The grinding jars perform radial oscillations in a horizontal position. The inertia of the grinding balls causes them to impact with high energy on the sample material at the round ends of the grinding jar. The movement of the jars combined with that of the balls results in a thorough mixing of the samples. Therefore, Mixer Mills are especially suitable for laboratory-scale screening.

Together with researchers and scientists, Retsch develops new ideas for mechanochemistry. Their work does not only concentrate on new synthesis methods, but also on the development of mills to improve the reaction process. Retsch's new MM 400 offers the possibility to produce sample series and influence ambient conditions, for example, pre-cooling samples and grinding jars with liquid nitrogen.

SUMMARY

Mechanochemistry is a very effective method to carry out syntheses without solvents and by-products. The technical literature describes a great number of reactions where a conversion of 100% is achieved. A precondition for the establishment of mechanochemistry in the industrial sector is the availability of suitable laboratory mills. A decisive factor is that – similar to conventional preparative chemistry – ambient parameters such as pressure and temperature can be documented and monitored. The Planetary Ball Mills and Mixer Mills from Retsch fulfill these requirements.

See a complete application online, www.labmanager.com/appnotes/julyaug2010

Bioreactor

WAVE™

- Uses disposable bags instead of permanent stainless steel reactors, eliminating the need for cleaning and sterilization
- A facility with the WAVE Bioreactor in use can reduce its consumption of ultra-purified water by more than 66,000 liters a year and energy use can decrease by 42%

GE Healthcare

www.ge.com

Double-Quenched Probes

ZEN™ Quencher

- Increases the accuracy and reliability of 5' nuclease qPCR experiments
- Stabilizes duplex formation which allows for its use in previously validated sequences
- Double-quenched probes maintain a consistently low background even at 40 base pairs or longer

Integrated DNA Technologies

www.idtdna.com

Rapid Microplate Solvent Removal

MiniVap™

- Designed to remove traditional laboratory 'bottleneck' of solvent evaporation from microplates prior to analysis or reconstitution in buffer
- Installation just requires connection to a gas supply and standard mains socket
- Designed to accommodate any SBS/ANSI 96-well microplate



Porvair Sciences

www.porvair-sciences.com

Microplate

3+D Microplate-96 Screening Plate

- Combines Direct Analysis in Real Time (DART®) mass spectrometry with standard laboratory automation
- Provides an independent desorption ionization region for each of the 96 locations on the standard microtiter plate
- Can function as a high-throughput screening system in rapid analysis mode, or provide quantitative results using longer exposure periods

IonSense

www.ionsense.com

Web Portal for Assays and Reagents

GeneGlobe®

- Enables users to explore and order gene and pathway products for a range of applications
- More than 400 pathways are available for a wide variety of organisms
- New products include miScript Target Protector for miRNA research, FlexiTube siRNA premix for gene silencing, and PyroMark™ CpG for DNA-methylation

QIAGEN

www.qiagen.com

LIMS & SOFTWARE

Excel-based Software Tool

ATL XL BOD Master™

- Automatically calculates and reports the BOD/CBOD results based upon Standard Methods criteria in seconds
- Features a user-friendly drop-down menu for adding samples, dilutions, or replicates
- Can be integrated into proprietary LIMS for automated data management

Accelerated Technology

www.atlab.com

Informatics Platform

Pipeline Pilot™ 8.0

- Supports a greater number of users working individually or as collaborative teams across the enterprise
- Component Collections contain numerous components that allow users to perform science-specific and generic data-processing functions
- Features role-based authorization and remote server monitoring

Accelrys

www.accelrys.com

Automation Control Software

VWorks

- Enables research enterprises to integrate various devices such as liquid handlers, readers and microplate handlers
- Intuitive graphical interface makes it easier for users to create new protocols, connect and configure devices and monitor progress
- Offers full 21CFR Part11 compliance support

Agilent Automation Solutions

www.chem.agilent.com

MVA and DoE Software

The Unscrambler® X

- Provides a flexible and adaptable approach to Multivariate Data Analysis (MVA) and Design of Experiments (DoE)
- Features an interactive design setup with full descriptions and beginner/expert modes
- Features enhanced mixture designs including Axial, Simplex Lattice and Simplex Centroid
- Interacts with third-party software platforms and instrumentation



CAMO

www.camo.com

HCP Quantitation and Characterization Software

DeCyder 2D 7.1 SPN

- Designed to support 2-D DIGE for the characterization and quantitation of Host Cell Proteins
- Offers an antibody-independent procedure to enable direct comparisons of individual target protein/HCP profiles between samples taken from distinctly different steps of a process

GE Healthcare

www.gehealthcare.com

MICRO-VOLUME PICOGREEN® DNA QUANTIFICATION USING BIOTEK'S TAKE3™ MULTI-VOLUME PLATE

by: Peter Brescia, MSc. and Peter Banks, Ph.D.,

INTRODUCTION

The Take3™ Multi-Volume Plate has proven to be a flexible tool, providing the ability to perform absorbance measurements over a wide range of applications and sample volumes in a BioTek microplate reader. Microvolume determinations of up to sixteen 2 μ L samples of extracted, undiluted DNA, RNA and protein-based on native absorbance measurements have been demonstrated with precision and accuracy suitable for downstream applications such as sequencing, qPCR and protein analysis^{1,3}.

The Take3™ Multi-Volume Plate also lends itself to colorimetric assays, where the color-producing reagent is added to the plate subsequent to sample addition. The microspots of the Take3 plate act as both reaction and measurement vessel, which simplifies workflow and conserves sample. It has been demonstrated that quantification accuracy is significantly improved using this workflow relative to workflows requiring reagent incubation in a separate vessel⁴.

Here we extend the utility of the Take3 plate by demonstrating micro-volume fluorescent assays of DNA using the Synergy™ Multi-Mode Microplate Reader product line and Quant-iT PicoGreen® reagent to extend the linear dynamic range of dsDNA quantification to low ng/mL concentrations.

MATERIALS AND METHODS

Materials

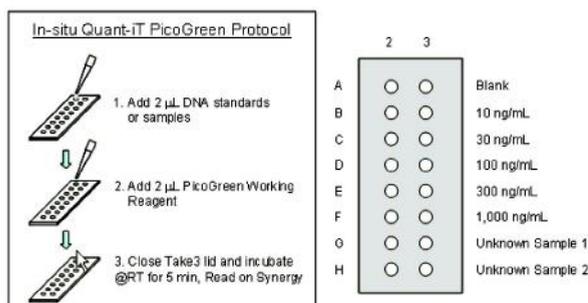
A Quant-iT™ PicoGreen® dsDNA reagent kit was obtained from Life Technologies, Molecular Probes Division (Eugene, OR, PN-P7589). The PicoGreen reagent was freshly prepared by diluting 15 μ L reagent with 2 mL of TE buffer (~133X) and stored in the dark for no longer than 2 hours. DNA standards were prepared from concentrated stock herring sperm dsDNA (Sigma, PN-A3294) in TE buffer (tris-EDTA, pH 7.0).

Protocols

All PicoGreen reactions and measurements were performed in the Take3 plate. A protocol was defined similar to that already demonstrated with the in-situ BCA protein assay⁵. The protocol and Take3 plate map are demonstrated in Figure 1. Briefly, 2 μ L aliquots of standard or unknown sample were added to the respective microspots of the Take3 plate. The diluted solution of PicoGreen reagent was then loaded to each microspot in a 1:1 ratio (2 μ L/microspot) using a manual 8-channel pipettor with mixing. The blank consisted of 2 μ L of TE buffer reacted with 2 μ L of PicoGreen working reagent in the appropriate microspots of the Take3 plate.

After closing the top lid of the Take3 plate, the reaction was incubated for 5 minutes at room temperature

(~22° C), in the dark, then read on either a Synergy H4, using both monochromators and spectral filters or on a Synergy HT Microplate Reader. All measurements were made with Gen5™ Software.



▲ **Figure 1.** Take3 plate map depicting positions and concentrations of Lambda dsDNA standards and positions of up to four unknown samples. This map provides a 6-point calibration curve run in duplicate over rows A-F, which covers the in-situ micro-volume assay working range of 10- 1,000 ng/mL.

Subsequent to each analysis, both top and bottom slides were wiped 2-3 times with a methanol saturated laboratory wipe to remove any residual reagent and air-dried.

Instrument Settings and Data Analysis

Both dual-monochromator and filter-based optical systems of the Synergy™ H4 Hybrid Multi-Mode Microplate Reader and top reading fluorescence of the Synergy HT was used to quantify the DNA solutions. Monochromator bandwidths of 9 nm were used in all measurements: the excitation monochromator was set to 495 nm and the emission monochromator to 526 nm. It was also determined that a z-axis vertical offset of 6 mm provided highest signal-to-noise ratio when using the monochromators. Spectral filters used by both Synergy H4 and HT were 485 nm, 20 nm band-

width for excitation and 528 nm, 20 nm bandwidth for emission. All Synergy measurements relied on the Xenon flash lamp as the excitation light source (high lamp energy was selected for spectral filter determina-

tions on measurements). The automatic sensitivity adjustment feature in Gen5 was used for all data collection with scaling using high DNA concentration wells F2:F3 (1000 ng/mL) to 60,000 relative fluorescence units with 255 measurements per data point.

Take3 plates with white Teflon-printed slides defining the microspots can be used with Synergy monochromator optical systems as the cross-section of the detection volume defined by the optical system is smaller in size than the microspot dimension. For spectral filter optical systems, significant fluorescent background was evident which reduced the analytical performance at lower DNA concentrations to unacceptable levels. This issue was alleviated by using black Teflon-printed slides which served to significantly reduce background. All measurements made in this work utilized black Teflon-printed slides.

All DNA measurements were blank corrected. Signal to noise (S/N) determinations at each DNA concentration were made using blank subtracted mean fluorescence divided by the standard deviation of the DNA fluorescence signal. Standard curves were fit using a linear function in GraphPad Prism.

Continued online, www.labmanager.com/appnotes/julyaug2010

See a complete application online, www.labmanager.com/appnotes/julyaug2010

BioTek®

Get a Better Reaction.

P.O. Box 998, Highland Park
Winooski, VT 05404
TEL: 888-451-517
www.biotek.com

LIMS for Drug Metabolism Studies

Debra 5.7.7

- Compound received data can be displayed in micrograms and milligrams in dosing data report
- Treatment concentrations are displayed to four decimal places on all screens
- Dilutions can be created in the protein binding module from the designed stage of a stock without having to analyze the existing stock/dilution first

LabLogic Systems

www.lablogic.com

DNA Research and Analysis Software

QuickGene

- Features a digitized catalog of all commercially available restriction enzymes with additional information, including methylation sensitivity
- Database is updated automatically, with optimal reaction conditions included for each enzyme
- All search results, including enzymes, genetic sequences and translations, are organized into tabs



Micronic North America
www.micronicna.com

Data Analysis Software

Omics Explorer 2.1

- Log function lets users keep a step-by-step record of what they have done in an experiment by storing points in a detailed log file, allowing them to revert back to an earlier stage in the process
- Each log point contains information needed to “snap back” to the stage when the point was created, with all plots and settings reset accordingly

Qlucore

www.qlucore.com

Software Tool

FTS SMART Freeze Dryer™

- Features a feedback loop that provides detailed data on the pharmaceutical product and the freeze-drying process, including product resistance, heat flow and product thickness
- Enables the developer to generate the right cycle on the first attempt
- Efficiency can eliminate production bottlenecks, expand capacity and reduce production costs



SP Scientific
www.spscientific.com

LIMS

Exemplar Version 4.0

- Improvements in performance and scalability so a single server instance can now support several hundred concurrent users
- Includes enhancements to freezer management with support for configurable freezers and easy viewing of samples in shelves/racks/boxes
- Features a configurable data model and user interface with zero programming required

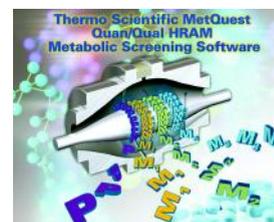
Sapio Sciences

www.sapiosciences.com

Metabolic Screening Software

MetQuest

- Enables researchers to routinely perform quantitative and qualitative analyses in the same run
- Collects and stores high-resolution, accurate mass full-scan data—no information is lost from mass filtering
- Does not require time-consuming MS/MS method development and optimization

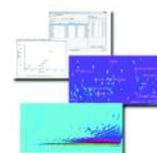


Thermo Scientific
www.thermoscientific.com

Gas Chromatograph Software

GC Image and GC Project R2.1

- GC Image Investigator allows users to analyze multiple chromatograms interactively
- Features a mass calibration tool that performs local mass calibration based on chromatographic peaks
- Batch mode for performing library searches improves performance up to ten times faster than interactive mode



Zoex Corporation

www.zoex.com

MICROSCOPY

Camera

miniVue

- Attaches to any microscope trinocular head with C-mount threading
- Features a 3.1-megapixel CMOS camera and two-inch LCD screen
- Includes MicroCap 2.0 software, with a 4x digital zoom feature
- Users can choose between snapping images via wired or wireless remote control



Aven
www.aveninc.com

Rice Lake Weighing Systems

ORDERING WEIGHTS AND WEIGHT SETS

Weights are a tricky subject. To be certain you have the right equipment for the job, consider the following during your next weight or weight-set purchase.

RICE LAKE
WEIGHING SYSTEMS

230 W. Coleman St.
Rice Lake, WI 54868
800-472-6703 fax 715-234-6967
www.ricelake.com/orderweights

1. How will you be using your weights?

Maybe you simply need a quick reference standard or perhaps you have a Legal-for-Trade application. Use is a big factor in the type of weight(s) and certification you'll require.

2. What is the minimum/maximum amount of weight you will need at any one time?

Calibration is properly performed using a certain percentage of the scale's capacity. You'll need to know the capacity range for your equipment. Also important is the typical range of use. If, on average, you use about half of your scale's capacity, a weight of a similar value would verify that your accuracy is being maintained.

3. What tolerance are you looking for?

How small is the resolution of your balance or scale? Weights will need to be three to four times more precise to ensure valid calibration and performance. After determining the correct value, refer to the weight tolerance chart in the Rice Lake's Precision Catalog or reference section of our website to find the correct class of weight.

4. Are there other factors that would impact your resolution needs?

Some industries and agencies are more tightly regulated by the government. This may affect what class of weights you purchase.

5. Do you have requirements such as NIST, ASTM or OIML?

Depending on what country you do business, requirements for traceability and certification may vary.

6. Will you need ISO/IEC 17025 or ISO 9000 laboratory documentation?

Just as weights vary in size, shape and material, certification comes in many forms as well. Understanding your organization's documentation and traceability needs will help in selecting weights with the proper class of calibration and documentation.

7. What style of weight will work best?

Obviously weights vary in size and mass but they also come in many shapes and materials. Depending on space limitations and application you may be looking for hanging, grip handle, stacking, leaf, or other styles.

8. What is your environment like?

- Indoor/outdoor?
- Wet/dry?
- Breezy/still?
- Corrosive, hazardous, or explosive?
- A clean room?
- Are there biohazard, electrostatic, or magnetic conditions to consider?
- What else is noteworthy?

Environmental factors play a big part in the limitations of your equipment's accuracy. Weights must be carefully selected to balance both precision and durability needs.

Your existing weights and weight sets should be re-certified on a managed periodic basis. The recertification period is determined by a number of factors, including but not necessarily limited to, the environment, frequency of use, demands of the process, quality of the weighing devices in question, age of the weights in question, and handling during use.



For more information on this topic, refer to Rice Lake's webinars titled *ABC's of Weights or Tolerances and Certificates*, featuring industry expert Ann Crowley. Both presentations can be viewed through the Rice Lake website at www.ricelake.com/webinars.

See a complete application online, www.labmanager.com/appnotes/julyaug2010

Digital USB Microscope Handheld

Handheld

- Plugs into USB port of PC or laptop; images can be viewed at up to 500x magnification
- Active Pixel Technology produces crisp, sharp images and accurate color reproduction
- Features six built-in lights with adjustable brightness
- A model is available with a polarizer for reducing glare on reflective items



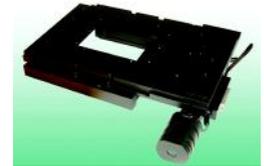
Cole-Parmer

www.coleparmer.com

Motorized Microscope Stage H117P2IX

H117P2IX

- For Olympus IX series of inverted microscopes
- Maximizes access to the nosepiece for correction collar adjustment
- Allows for scanning using various sample holders, including petri dishes and well plates
- Miniaturized drive boxes occupy a fraction of the space of previous models



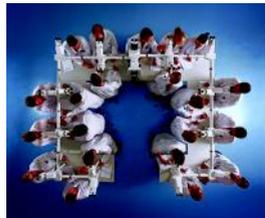
Prior Scientific

www.prior.com

Multidiscussion System

For Axio Scope and Axio Imager

- Enables up to 21 individuals to view the same microscope image field at the same time
- Every observer has the ability to see the same image with the same orientation
- All configurations can be implemented with standard stages
- Each tube is supported by its own column in its center of gravity



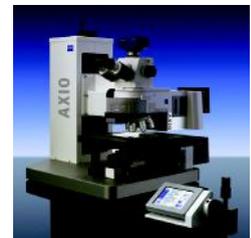
Carl Zeiss

www.zeiss.com

Microscope Module

Axio Imager Vario

- Adapted to object sizes up to 300 mm lateral and 250 mm vertical extension
- Sample stages with travel distances of up to 300 mm can be used on the stable aluminum base plate
- Available in three versions: A2 is a manual/encoded module; Z2 features a motorized turret focus; a third version is available without a focus drive



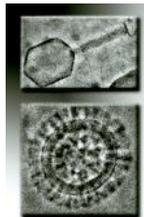
Carl Zeiss

www.zeiss.com

Imaging Technique for Transmission Electron Microscopes

Thin Film Phase Plate

- Increases specimen contrast by orders of magnitude
- Employs a $\pi/2$ -phase plate that shifts the phase of only the scattered electrons, resulting in amplitude contrast rather than phase contrast as these electrons interfere with the unscattered electrons in the image plane



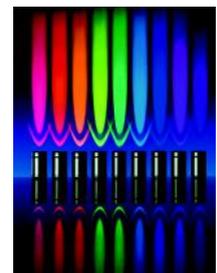
JEOL

www.jeol.com

Laser Scanning Microscope

LSM 700 MAT

- Allows for very precise, 3-D imaging of surfaces
- Combination of fluorescence and reflection techniques enables examination of semiconductors, metal, glass and polymers with high information content
- Permits precise capture of 3D topography without damaging the surface



Carl Zeiss

www.zeiss.com

Microscope Automation System

ProScan™ III

- Controls up to 16 axes including a motorized stage, focus drive, three filter wheels and three shutters
- Features a true USB with direct HID connection available; compatible with Windows and Mac
- Interactive Control Center (ICC) provides centralized manual control of all equipment
- Programmable TLL can control movements



Prior Scientific

www.prior.com

Scanning Electron Microscope

Helios NanoLab™ 50 Series DualBeam™

- Features a new, high-performance focused ion beam (FIB)
- Features an advanced 16-bit digital pattern generator for very fine and complex patterns to be written directly with the FIB
- Customized detectors let users access precise topographic, chemical or crystallographic information from the sample



FEI Company

www.fei.com

Mettler Toledo, Inc.

AUTOMATED ANALYSIS OF FLUORIDE BY DOUBLE STANDARD ADDITION, TORE FOSSUM

METTLER TOLEDO

1-800-METTLER

www.mt.com

ABSTRACT

This application note describes an automated method for the measurement of fluoride, incorporating a METTLER TOLEDO T70 Titrator, Liquid Handler autosampling device and a perfectION™ combination fluoride ISE (Figure 1).

INTRODUCTION

This test was designed so that a user can easily obtain accurate fluoride concentrations by inserting a tube in a sample bottle and clicking on a method shortcut icon on the T70 titrator to start the analysis. In this application, the Liquid Handler accomplishes the tasks of automatically sampling, rinsing, purging and draining.

EXPERIMENT

- The Liquid Handler device and sample tube leading to the analysis vessel are rinsed with water and the rinse is sent to waste.
- The sample transfer line is primed with fresh sample and sent to waste.
- The analysis vessel is rinsed with water and sent to waste.
- The Liquid Handler primes with sample, and then delivers the sample to the analysis vessel, followed with the precise amount of water needed to bring the total volume to 25 mL.
- The volume is brought to 50 mL with the addition of 25 mL Tisab II using a T70 dosing unit with 20 mL burette (Tisab II contains acetic acid/sodium acetate to adjust the pH to about 5.5, and CDTA, a chelant, to sequester iron and other divalent metals to keep them from combining with the fluoride).
- The fluoride electrode measures a mV potential, the original fluoride ion activity. It uses very strict equilibrium conditions of no greater than 0.1 mV change in 15 seconds, with a minimum/maximum time of 30 and 300 seconds.

- A 0.01 M NaF solution (prepared in 50:50 mixture of water and Tisab II so as not to change the solution's ionic strength) is added until the potential has changed by 17 mV, indicating the fluoride ion content has doubled. The electrode takes a second mV reading.
- Double the amount of the NaF solution is added, followed by a third potential reading.

- After the calculations, the titration vessel is drained and rinsed and the system is ready for the next sample.

RESULTS

Table 1 below lists the results of some samples that were taken for analysis.

TABLE 1.

Sample	Results (mg/L F-)			Avg.	St. Dev.	RSD
Drainage water	99.2	97.2	98.1	98.2	1.0	1.0%
Pond water (1:50 dilution)	3611	3635	3631	3631	18.8	0.5%
H3PO4 raw (1:25 dilution)	3055	3088	3072	3072	16.5	0.5%
10 ppm F- standard	11.1	10.3	10.7	10.7	0.40	3.8%
10 ppm F- standard	10	9.6	9.7	9.7	0.23	2.4%

* neutralized with NaOH to pH 5 – 5.

- Calculations are performed based on the equation in Figure 2, averaging the two results obtained from the three mV values:

FIGURE 2.

$$C_u = C_s \left[\frac{V_s}{V_u + V_s} \right] \left[10^{\Delta E/S} - \frac{V_u}{V_s + V_u} \right]^{-1}$$

where: C_u = concentration of the unknown;
 C_s = concentration of the standard;
 V_s = volume of the standard;
 V_u = volume of the unknown;
 ΔE = change in electrode potential in mV;
 S = slope of the electrode in mV

CONCLUSIONS

This procedure provides a reliable method for the automated analysis of fluoride content using double standard addition, and it can easily be modified for other ions (e.g. NO₃⁻, NH₄⁺). It requires minimal user interaction, and can be further automated with a Rondo 20, 30 or 60 sample changer.

See a complete application online, www.labmanager.com/appnotes/julyaug2010

SUPPLIES & CONSUMABLES

Adhesive Sealing Films

Roll-Seal™

- For use with high-throughput automated microplate sealers
- Currently offered in Roll-Seal format are: ThermalSeal RTS™ clear films for qPCR and sitting-drop protein crystallization; AlumaSeal® aluminum foils for PCR, HTS and cold storage, and breathable AeraSeal™ for cell and tissue culture



Excel Scientific

www.excelscientific.com

Storage Tubes

DNA-Free

- Storage tubes are available in 0.50 ml, 0.75 ml, 1.10 ml and 1.40 ml sizes
- Unique code on the bottom of each tube provides an unambiguous means of identifying samples
- Designed to fit 96 individual tubes into a standard footprint rack
- Made from medical grade polypropylene, in a class 7 clean room environment



Micronic

www.micronic.com

Pipette Tips

GripTips™

- Deliver low attachment and ejection forces, enabling comfortable pipetting even over extended periods
- Available in five volumes: 12.5 µl, 125 µl, 300 µl, 1,250 µl and 5,000 µl
- Feature color-coded inserts that correspond to volume ranges of proprietary pipettes
- Made from certified virgin medical grade polymer materials



INTEGRA Biosciences

www.integra-biosciences.com

Algae Inhibitor

Clear Bath®

- Does not contain poisonous copper compounds that can accumulate in groundwater after disposal
- Easily rinses away, leaving no residue and does not harm lab equipment
- Ideal for use with any circulating or static water equipment including water baths, incubators and humidifiers
- Only 12 drops per gallon (3 drops per liter) are needed to keep water algae-free



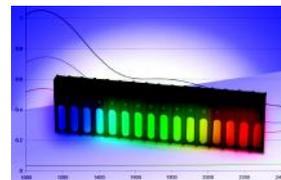
Spectrum Labs

www.spectrumlabs.com

Traceable Photometric Linearity Reference Sets

Near Infrared

- Offer Operational Qualification (OQ) and Performance Qualification (PQ) of the transmittance scale in the NIR using "industry standard" protocols
- Covered wavelength range is from 1,100 to 2,850 nm, with a %T (A) range of 1.5 %T (1.82 A) to 61 %T (0.21 A)



Starna Scientific

www.starna.com

HPLC Columns

Hypersil GOLD (new phases)

- Include options for the analysis of polar compounds by ion exchange, HILIC and normal phase chromatography
- New additions include: C4, a low-hydrophobicity column; Amino, for the analysis of sugars and carbohydrates; AX, for the separation of proteins, peptides and polar molecules; SAX, for nucleotides and organic acids; and Silica, for the analysis of non-polar and moderately polar organic compounds



Thermo Fisher Scientific

www.thermofisher.com

Aluminum Heat Seals

For PCR, Storage and Life Science

- Pre-cut foil sheets are marked to ensure that they are always used right side up, minimizing possible damage to the head of a thermal heat sealer when a foil is inserted incorrectly
- Available in 20-micron pierceable foil, 38-micron pierceable and peelable foil, 70-micron non-pierceable foil, and 85-micron foil for heavy-duty foil



Porvair Sciences

www.porvair-sciences.com

Cryogenic Vials

CryoELITE™

- Feature a permanent 2D Data Matrix bar-coded bottom insert
- Vial sizes include 1.2, 2.0, 3.0, 4.0 and 5.0 mL volumes
- All vials are batch certified DNase- and RNase-free, non-pyrogenic and endotoxin-free
- V-shaped internal bottom ensures maximum sample retrieval for automated and manual liquid handling systems



Wheaton Science Products

www.wheatonsci.com

IMPROVED HOMOGENEOUS IMMUNOASSAYS WITH ENSPIRE MULTILABEL PLATE READER WITH ALPHA-TECHNOLOGY

ABSTRACT

AlphaLISA® technology is the state of the art in immunoassay and biomarker detection. Its homogenous (no-wash) nature, outstanding assay performance, simplicity and versatility have encouraged the adoption of this technology by an increasing number of researchers.



Separate 940 and Winter
Waltham, MA 02451
P: (800) 762-4000 or (+1) 203-925-4602
www.perkinelmer.com/lifesciences

This application note demonstrates the performance of the EnSpire with two AlphaLISA assays: human Interleukin-17 (IL17) and amyloid β 40 (A β 40). IL17 is a pro-inflammatory cytokine that enhances T cell priming and stimulates a variety of cells to produce mediators of inflammation. The A β 40 peptide is generated by β -secretase driven cleavage of the amyloid β precursor protein, resulting in a peptide implicated in plaque formation associated with Alzheimer's disease.

INTRODUCTION

The principle of AlphaLISA detection assay technology allows the detection of molecules of interest in buffer, cell culture media, cell lysates, serum and plasma in a highly sensitive, quantitative, reproducible and user-friendly manner. AlphaLISA assays are extremely flexible using several different formats adapted to different applications. The formats used in this application note are:

A biotinylated anti-analyte antibody is captured by the Streptavidin Donor beads while another anti-analyte antibody is directly conjugated onto the Acceptor bead. The presence of the analyte brings the beads into close proximity.

The detection is based on the excitation-induced release of singlet oxygen from the Donor bead. If this short lived molecule is released in close proximity to an Acceptor bead, it triggers in the later bead a cascade of energy transfers which results in a sharp and intense peak of light emission at 615 nm.

MATERIALS AND METHODS

The AlphaLISA IL17 (Cat. No. AL219) and A β 40 (Cat. No. AL202) detection kits are available in 500 or 5,000 assay point format from PerkinElmer. PerkinElmer 96-well Optiplate® (Cat. No. 6005290) and 384-well Optiplate (Cat. No. 6007299) microplates were used. For the incubation steps, the plates were sealed with PerkinElmer TopSeal-A™ Adhesive Sealing

Film (Cat. No. 6005185). The assay buffer (available from PerkinElmer, Cat. No. AL000) is composed of 25 mM Hepes pH 7.4, 1 mg/mL Dextran T-500, 0.5% Triton X-100, and 0.1% casein.

In a total volume of 50 μ L, the reagents were added in the following order:

- Add 5 μ L of each analyte standard dilution.
- Add 20 μ L of a 2.5X mix of AlphaLISA anti-analyte Acceptor beads (10 μ g/mL [final]) and biotinylated anti-analyte antibody (1 nM [final]).
- Incubate 60 minutes at 23 °C.
- Add 25 μ L 2X Streptavidin Donor beads (40 μ g/mL [final]).
- Incubate 30 minutes at 23 °C.
- Read using the EnSpire AlphaPLUS reader.

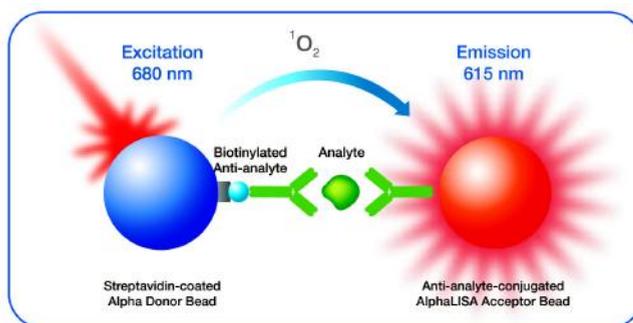
Standard curves were analyzed by non-linear regression using a 4-parameter logistic equation (sigmoidal

RESULTS

Sensitivity and high dynamic range are important requirements for a high quality AlphaLISA assay. Standard curves were performed for the IL17 and the A β 40 AlphaLISA assays. Standard curves were done in triplicate, in 96- and 384-well Optiplates.

Interleukin-17 AlphaLISA assay: Figure 2 presents the EnSpire readout produced with the IL17 detection kit. The AlphaLISA kit allows measurement of IL17 with a LDL of 32 pg/mL and of 16 pg/mL in 384- and 96-well plates, respectively. The large dynamic range, a general characteristic of AlphaLISA technology, exceeds 3 logs, and intra-assay variation is low, <5%.

Amyloid β 1-40 AlphaLISA assay: The LDL obtained in both 384 and 96-well plates, 126 pg/mL and 131 pg/mL, respectively, are in agreement with those obtained with the EnVision (Figure 3). As for IL17, the dynamic range exceeds 3 logs and intra-assay variation is approximately 5% for both plate formats.



◀ **Figure 1:**
Assay format
for the IL17 and
A β 40 detection
assays.

dose-response curve with variable slope) and a 1/Y² data weighting. The lower detection limit (LDL) was calculated by interpolating from the standard curve the sum of background (bkg) counts (average of 12 wells without analyte) and 3 times the standard deviation (SD) value.

SUMMARY

Taken together, the results confirm that excellent assay performance can be achieved with the EnSpire for both AlphaLISA IL17 and A β 40 kits. See the complete application note online for all figures, as well as the plate consistency, Z'-factor and crosstalk results.

See a complete application online, www.labmanager.com/appnotes/julyaug2010



High-speed Microplate Moving

Problem: The automation of workflows is becoming commonplace in the vast majority of drug discovery research facilities and in an increasing number of academic laboratories. It is of extreme importance therefore, that automated instruments are as reliable as possible. As a key device in many automated systems, the microplate mover transfers microplates between different instruments within the workflow. However, the reliability of some movers has become an issue and researchers' time is being occupied by clean-ups and re-starts following collisions, for example. It has also been noticed that during transfer, plate gripping may not always occur efficiently, resulting in samples being dropped. This not only causes an unnecessary mess, which instantly poses a safety risk, but can also result in the loss of precious samples. If a plate is not picked up for transfer, the mover is not always aware and continues regardless, causing laboratory inefficiencies. Furthermore, abrupt and jerky movements, in combination with hard stops, can have a negative influence on experimental integrity. This is especially true when working with live cells, where sudden motions have the potential to disrupt vital signaling processes, leading to a significant decrease in experimental integrity.

Solution: In order to provide an effectively streamlined workflow with walk-away capabilities, each piece of equipment needs to be extremely reliable at operating without any adverse effects. As such, the Thermo Scientific Orbitor™ RS has been designed as one of the most reliable movers in its class. This high-speed microplate mover offers reliable performance in combination with highly flexible plate handling. With the ability to feed up to four instruments with ease, this plate mover can detect any collisions with other instruments, and resolve them quickly. Since the mover automatically stops when it encounters minimal resistance, safety is ensured at all times while the occurrences of breakages and spillages are greatly minimized. After a collision has occurred, there is no need to re-home the arm or re-start the assay. Instead, the error is simply cleared and operation resumed, minimizing instrument downtime. Since the mover is PC-driven, operational efficiency is maximized and all functions are easily executed via a user-friendly interface.

With plate sensors located within the gripper, the mover is able to accurately

detect whether or not it has picked up a plate. This eliminates the inconvenience of plates being dropped, in addition to the inefficiencies associated with moving an empty gripper. As a highly flexible plate mover, the Orbitor RS is compatible with the vast majority of available plate types, from shallow to deep well, in addition to tip boxes and lids, tubes and racks. Random or sequential access is supported, and both stacks as well as hotels accommodate most SBS standard plate types in portrait and landscape orientations, facilitating the ability to mix modes of storage as assay requirements change.

A bi-directional telescoping arm provides continuous 360° rotation, in addition to fast and efficient movements, improving user safety. Its extensive vertical reach allows multiple-stacked or high-density instruments to be loaded

in a small footprint. The arm has the ability to travel horizontally through the base unit tower, remaining inside while turning, to provide smooth and fluid actions with no hard stops. Additionally, the Orbitor RS encompasses motion blending techniques to eliminate any jerky movements, providing cell-based researchers with the confidence that their samples will not be subjected to any harsh and potentially damaging movements.

For further information, please visit www.thermo.com/automate.



▲ Thermo Scientific's Orbitor RS can access complicated set-ups, including stacked instruments, as well as reach virtually any benchtop instrument. It also fits comfortably in most biosafety

Siloam Biosciences, Inc.

OPTIMISER™

The Next Generation Of Microplates



413 Northland Blvd
Cincinnati, OH 45240-3210
513-429-2976
www.silobio.com

PRODUCT DESCRIPTION:

The Optimiser™ integrates the Power of Microfluidics with traditional microplate architecture to offer tremendous performance gains. The Optimiser™ is SBS/ANSI compliant and can be used without any specialized liquid handling equipment and can be read by conventional microplate fluorescence readers. The high surface area to volume ratio and short diffusion distances of the microfluidic channels allows for rapid reactions (~ 5 min incubation/step for ~ 30 min sandwich immunoassays). The Optimiser™ can be used either in static mode (low sample volume) or flow-through mode (high sensitivity); with significant reagent savings in either case.

ABSTRACT:

The Optimiser™ microplate combines microfluidics with the conventional 96-well architecture to deliver significant performance benefits for immunoassay applications; as illustrated for an IL-6 assay on the Optimiser™ using the static mode (for sample savings) and flow-through mode (for improved sensitivity).

INTRODUCTION:

The Optimiser™ incorporates microfluidic geometries to maximize the efficiency of assay reactions. Figure 1 shows a schematic of the Optimiser™ with view of one cell. For operation, reagents are sequentially added to the loading well, drawn into the channel by capillary forces and excess drawn out by absorbent pad. The microfluidic design ensures that the channel is not emptied by pad allowing for static incubation step. Subsequent liquid addition breaks capillary barrier at inlet and flow resumes. Additional details on web version.

EXPERIMENT:

IL-6 assay was tested on the Optimiser™ in a static incubation and flow-through mode and performance is compared to a standard 96-well plate. IL-6 antigen and antibody set was purchased from

ebioscience, secondary antibody (HRP labeled) from KPL and Pierce QuantRed Substrate.

Assay protocol on conventional microplate: (suggested) 2 µg/mL capture Ab; wash; 300 µL of blocking buffer; wash; antigen in 8 concentrations from 10–800 pg/mL and 0 pg/mL; wash; 2 µg/mL detection Ab; wash; 5 µg/mL secondary Ab; wash; finally 50 µL of chemifluorescence working substrate. 100 µL each step unless specified; each incubation step = 1.5 hour at 37 °C; each wash step 300 µL x 3 wash buffer.

Assay protocol on Optimiser™ (static mode): 2 µg/mL capture Ab; blocking buffer; 30 µL antigen in 8 concentration from 10–800 pg/mL and 0 pg/mL; 2 µg/mL detection Ab; 5 µg/mL HRP conjugated Streptavidin, 30 µL of washing buffer twice, finally chemifluorescence substrate. 7 µL each step unless specified; each incubation step = 5 min at room temp (~ 23 °C); only 1 wash step.

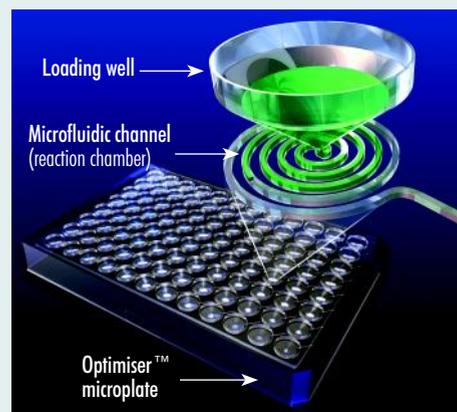
Assay protocol on Optimiser™ (flow-through mode): Same protocol as static mode except 100 µL sample volume (33µL x 3) added and allowed to flow through, no incubation time between repeat loads or after final load of sample.

RESULTS:

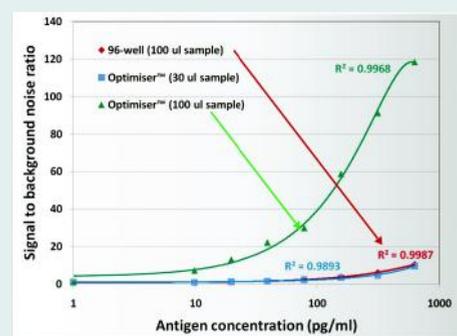
As shown in Figure 2, the Optimiser™ achieves similar sensitivity (MDL ~ 150 pg/ml) as a conventional microplate using less than a third of the sample volume in static incubation mode. In the flow-through mode, the pre-concentration effect of flowing antigen (sample) boosts the sensitivity by ~ 15x (MDL < 10 pg/ml).

CONCLUSION:

The revolutionary Optimiser™ microplate design can allow users to optimize assays either with significant sample savings or with significant sensitivity gains. In either case, reagent consumption is reduced ~ 14x and total assay time is less than 30 minutes!



▲ **Figure 1.** Schematic illustration of the Optimiser™ with magnified view of one cell.
Note: absorbent pad is not shown for clarity (see web version).



▲ **Figure 2.** IL-6 assay results. The Optimiser™ shows similar sensitivity as 96-well plate with only 30 µL sample and ~ 15x higher sensitivity with 100 µL sample volume.

See a complete application online, www.labmanager.com/appnotes/julyaug2010



Verifying Liquid Handling Instrumentation Performance

Problem: Laboratory workers often assume that their liquid handling instruments—from pipettes to automated liquid handlers—are operating within specifications. However, because data integrity for applications—from drug discovery to molecular diagnostics—relies on accurate and precise liquid delivery, this is a risky assumption with potentially high failure costs.

Liquid-delivery instrumentation can be verified using gravimetry, which measures liquid weight on analytical balances. This method is adequate for larger volumes, but does not verify low volumes effectively. Indeed, the accuracy of gravimetric processes is impacted by a variety of environmental factors, including evaporation, static electricity and vibration. This uncertainty grows as test volumes decrease.

Other methods, including fluorometry and single-dye absorbance photometry, have limitations as well. In single-dye absorbance QC methods, the dynamic range of the chromophore is too narrow to evaluate all of the dilution steps required to make the dose response curve. In contrast, fluorometry provides the required sensitivity, but lacks the traceability associated with absorbance methods. These limitations often force users to make assumptions about the repeatability of the liquid handler over multiple aspiration and dispense cycles.

Solution: Ratiometric photometry—measuring light absorption to verify volume—has emerged as a reliable solution to the accuracy risks posed by other established methodologies. Highly accurate and precise, even at low volumes, ratiometric photometry provides laboratories with an easy-to-use process to validate assay results quickly and enhance laboratory efficiency. This translates into greater data confidence, more reliable regulatory compliance, and cost reductions due to elimination of repeated assays and remedial action.

While the science behind ratiometric photometry for volume verification is complex, Maine-based Artel has been using it to lead the way in liquid handling quality assurance technology for the past 28 years. The company has evolved ratiometric photometry into the core of its technological strengths by integrating it into easy-to-use, robust, and rapid measurement systems

for liquid handling equipment. Artel's volume verification systems—the PCS® (Pipette Calibration System) and the MVS® (Multichannel Verification System)—employ ratiometric photometry through dual-dye, dual-wavelength absorbance measurements to determine a target volume of sample solution dispensed from a pipette or liquid handler.

Two colorimetric dyes, with distinct absorbance maxima at 520 nm (red dye) and 730 nm (blue dye), are used to make this measurement possible. Volume measurements are determined by applying the Beer-Lambert Law, which states that the measured absorbance of a dye is proportional to the concentration of a dye, the molar absorptivity of the dye, and the pathlength of the sample holder. If both the molar absorptivities and concentrations of the dyes are known and closely controlled, which is the case with Artel Sample Solutions, the law can be used to deter-



▲ Artel's MVS Multichannel Verification System determines both the precision and accuracy of each channel in a multichannel liquid delivery device in one experiment.

mine an unknown pathlength traversed by a photometric light beam. By measuring the pathlength through the solution and by knowing the dye concentrations in the Artel Sample Solutions, the unknown volume can be calculated through a series of equations.

The need for liquid delivery quality assurance is more critical than ever. Even as the regulatory environment in the life sciences becomes more stringent, budgets and staff continue to shrink. More than ever, laboratories require a more accurate, precise and convenient methodology to verify the performance of liquid handling instrumentation.

By providing labs with a user-friendly approach to ratiometric photometry, Artel's volume verification systems strengthen confidence in assay results and enhance data quality.

For more information, visit www.artel-usa.com

Marvel Scientific

REFRIGERATION FOR HEALTH, SCIENCE AND INDUSTRY

SERIOUS ABOUT STANDARDS

In laboratories worldwide, household refrigerators are pressed into duties they were not designed to fulfill. When these units operate inconsistently or fail, consequences can range from inconvenient to costly to dangerous. At Marvel Scientific, we believe

it's time to get serious about standards. Marvel Scientific refrigeration products are engineered and constructed to meet or exceed the stringent standards required by health, science and industry. Each general purpose, flammable material storage and explosion proof product has been designed specifically for the lab with a Commercial UL Listing for your peace of mind. Let Marvel Scientific help you professionally protect your research, your specimens and your lab.

SUPERIOR TEMPERATURE CONTROL, ACCURACY AND MONITORING

Marvel Scientific refrigerators have always been the most dependable and reliable, maintaining stable temperatures to protect valuable research and costly materials. Now, that reliability is measurable and recordable.

New general purpose lab refrigerators feature the exclusive MicroSentry™ Scientific refrigeration control, with the ability to control, confirm and capture temperature performance, giving you the ultimate confidence in your refrigeration.

The MicroSentry™ Scientific control is an interior-mounted digital electronic control that allows you to set temperature, high/low alarm values and alarm delay period. Temperature is confirmed via the large LED display and audible/visual alarms notify if there is a high/low temperature event or if the door is left open. A remote alarm interface allows communication of any alarm event, including power failure, to a remote or central monitoring system.

There is a history record of high/low temperatures for monitoring programs, and notification of periodic maintenance and diagnostic codes.

Lab refrigerators with the MicroSentry™ Scientific control are available in 15" and 24" undercounter models, with either a solid or glass door. All models are front vented so they can be built into casework with zero clearance.

INNOVATIVE TWO-DRAWER LAB REFRIGERATOR

Marvel Scientific's 6CRDE is the first Two-Drawer Undercounter Lab Refrigerator with a Commercial UL Listing. The unique configuration allows full access even from a seated position. Two super glide, full-extension drawers store all types of containers and provide superior visibility and access—no more reaching to the back of a crowded refrigerator shelf.

The two-drawer lab refrigerator features interior lighting, automatic defrost, hidden touchpad controls with LED digital display, extra deep drawers and heavy duty drawer slides for full loads. Full-wrap drawer fronts come in white or stainless steel with matching handles.

ADA HEIGHT LAB REFRIGERATOR

Designed to comply with the height standards set by the Americans with Disabilities Act (ADA), Marvel Scientific's 6CADM general purpose laboratory refrigerator addresses the differing physical needs of individuals.

Title III of the ADA requires that all new construction of, or modification to, public and commercial facilities be accessible to individuals with disabilities. Because the 5.4 cu. ft. laboratory refrigerator is built for lower countertops and users of all abilities, its design includes numerous unique features. Two slide-out shelves feature safety stops to prevent shelves from being disengaged from the refrigerator. The top shelf includes an ingenious flip-up section to vertically store tall items on the shelf below.

The model 6CADM now features the MicroSentry™ Scientific controller, ultra efficient compressor, lifetime fan motor, and Commercial UL and C-UL listing to ensure optimum performance and unwavering reliability. An optional door lock and access port are available when product security or alarm probes installation require them.



P.O. Box 400
Greenville, MI 48838
Tel: 1-800-962-2521 | Fax: 1-616-754-0970
E-mail: lferguson@agamarvel.com
www.marvelscientific.com



◀ Measurable and recordable reliability



◀ Two-drawer lab refrigerator provides superior access.



◀ Marvel Scientific's full-line catalog includes refrigeration for general lab, FMS, EP and hazardous location applications.

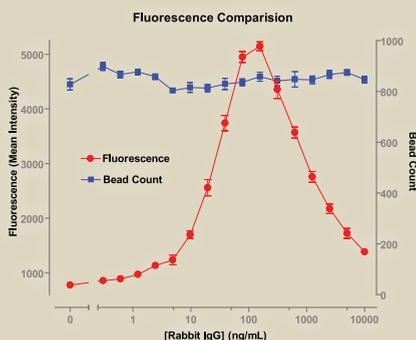
See a complete application online, www.labmanager.com/appnotes/julyaug2010



Fluorescence Mix-and-read Assays for Antibody Discovery

Problem: The therapeutic use of monoclonal antibodies has grown over the last decade and their availability has profoundly modified the treatment of a number of conditions including cancer and autoimmune diseases. The generation of thousands of highly diverse cells secreting antibodies with a range of affinities and concentrations presents a challenge for the rapid selection of those cells producing antibodies of interest. Traditionally, the enzyme-linked immunosorbent assay (ELISA) has been the screening assay of choice. However, with the numerous wash and incubation steps, this process can be tedious and time-consuming. Moreover, this method has limitations when it comes to detecting low abundance proteins, such as cell surface antigens, and there have been concerns that adsorption of antigens onto microtiter plates can alter the protein conformation and lead to failure of identifying antibodies for target epitopes. For these reasons, alternative screening technologies are being sought as the biopharmaceutical industry faces the challenges presented by increasingly complex therapeutic targets.

Solution: Efficient antibody screening requires an assay that is flexible, robust and suitable for automation. TTP LabTech has developed both bead- and cell-based fluorescence methods for the screening of antibodies against soluble and cell surface antigens. These methods combine fluorescence probes with novel laser scanning instrumentation to produce so-called 'mix-and-read assays'. The basic assay set-up involves the mixing of three components: a sample of cell supernatant containing test antibody; fluorescent tracer to report binding (typically a labelled anti-species antibody); and either cells expressing the antigen of choice or beads coated with the relevant soluble antigen. All assay constituents are incubated together until they have reached equilibrium. Analysis is then performed on Mirrorball™, a new high-sensitivity laser scanning microplate cytometer, which reports the amount of fluorescence bound to each bead or cell, thus providing an index of the degree of antibody binding. The unique feature of these mix-and-read protocols is that there is no requirement to remove unbound fluorescent tracer once equilibrium has been reached—the plates are simply analysed after the required time



period. These assays thus eliminate the need for wash and incubation steps, resulting in higher throughput, reduced cell loss and lower assay costs due to the smaller volume of reagents used.

Mirrorball has a unique set of features that make this system especially well-suited to perform mix-and-read assays. The system has high performance low-loss optics which are sensitive enough to enable detection of low abundance proteins. The simultaneous laser scanning functionality results in enhanced multiplexing and allows direct correlation of data across lasers leading to more rapid and robust data generation. An independent laser scatter channel permits label-free detection and this can run concurrently with fluorescence measurements

resulting in improved object recognition and fewer false negatives based on object count. This also enables beads of different sizes to be detected in addition to beads with different fluorescence encoding, resulting in unrivalled levels of multiplexing. The option to have dual laser excitation (488 and 640 nm) and four fluorescence data channels extends the range of commercially available dyes that can be combined in a single assay adding to the versatility of this system.

Mirrorball directly measures cellular or bead-based fluorescence on a well-to-well basis and also on an individual cell/bead basis. As such, Mirrorball lends itself to rapid screening for positive clones generated by hybridoma, SLAM and phage-dis-

◀ *The laser scatter channel enables the determination of both the fluorescence intensity and the fluorescence-independent bead count for a bead-based sandwich immunoassay for rabbit IgG.*

play techniques. Only a small sample of cell supernatant is required (about 10µL), allowing multi-specificity profiling at the screening stage. Both whole antibodies and antibody fragments can be screened and the cellular assays can be performed on live or fixed cells from either adherent or suspension cultures. The automation-friendly benchtop design means it can be seamlessly integrated into existing workflows to ease screening bottlenecks. When combined with the abundance of compatible fluorescence reagents, Mirrorball offers a simple and easy solution to automated screening in laboratories developing antibody-based therapeutics.

For more information, visit www.ttplabtech.com.

A2 Technologies

EXOSCAN FTIR TRANSFORMS FROM VERSATILE BENCHTOP LAB SPECTROMETER TO POWERFUL HANDHELD, AT-SITE ANALYZER



INTRODUCTION

Infrared spectroscopy has long been recognized as a selective and sensitive technique, however, with current benchtop infrared spectrometers, it is often necessary to remove a sample from a large object and bring the small piece to the spectrometer located in the laboratory. Thus, a potentially non-destructive methodology for large objects becomes a destructive one due to the necessity of small sample size coupled with the location of the FTIR system.

The availability of A2 Technologies' Exoscan™ changes how true non-destructive analysis is carried out, since Exoscan can be brought to the sample, rather than the reverse. Though size and portability is important for these applications, equally important is overall spectroscopic performance, since measurements such as surface analysis, for example, can be very demanding. Exoscan has a performance envelope equivalent to or better than analytical benchtop systems and, with the availability of interchangeable sample interfaces and docking station, is a versatile system which can easily be used for routine analysis and methods development in the lab, as well as taken to the field for on-site analysis.

SAMPLE INTERFACES

The Exoscan can measure surface samples with four different techniques: internal reflectance (ATR), specular reflectance, grazing angle reflectance and diffuse reflectance. The four interchangeable sample interfaces are shown in Figure 1 and provide a wide variety of options for many different sample types.

- The ATR interface is ideal for the analysis of solids, liquids, pastes and gels. The interface uses a diamond ATR element which makes it impervious to corrosion and scratching.
- The Specular reflectance enables the analysis of films and coatings on reflective metal surfaces such

as aluminum or steel. The angle of incidence is 45 degrees. The infrared energy either passes completely through the sample before being reflected by the substrate, or the energy is reflected off the front surface of a smooth sample.

Exoscan Sample Interfaces:



▲ *Figure 1. Exoscan interchangeable sample interfaces.*

- The grazing angle reflectance interface is similar in concept to the specular reflectance interface, but differs in the angle of incidence. The Exoscan grazing angle has a nominal angle of 82 degrees, which is ideal for the analysis of very thin (sub-micron) films, such as trace contamination on reflective metal surfaces.
- The diffuse reflectance interface is used for samples that tend to scatter light such as rough surfaces or granular materials. Samples can be measured without sample preparation and thus samples of geological interest or carbon fiber rich composite material are best measured by diffuse reflectance.

EXOSCAN DOCKING STATION

The docking station converts the handheld Exoscan into a versatile benchtop instrument (Figure 2), and allows development of methods by collecting data on representative samples before taking the instrument out to the field. Thus, Exoscan is effective for analyzing routine lab samples and method development as well as at-site analysis or troubleshooting.

CONCLUSION

A high performance, hand-held, portable FTIR spectrometer provides true non-destructive analysis of a wide range of samples, from routine powders and solids to large, immovable objects. The versatility of the Exoscan arises from its performance, interchangeable sampling interfaces and innovative docking station and enables the system to provide significant value in laboratory and field environments.

▼ *Figure 2. Exoscan handheld FTIR system; External reflectance equipped Exoscan in docking station showing removable sample stage.*



See a complete application online, www.labmanager.com/appnotes/julyaug2010



Moisture and Ash Analysis

Problem: Moisture analysis is normally done using a precision balance with an incorporated heater. Ash analysis is done using a furnace or oven at a fixed temperature, requiring initial sample and crucible weighing, burning the sample in the furnace, cooling crucibles, and weighing again in a precision balance for final weight and calculation. Single-sample and multi-sample instruments exist to perform these analyses.

The major limitation of the single-sample balance method is that it is labor intensive. In addition to the operator involvement and possible errors made during manipulation, a large amount of bench space is needed for multiple balances.

The primary limitation of the multiple-sample TGA batch method is the long batch processing time. With samples of varying size and composition, the cycle time is determined by the processing of the slowest sample. In addition, much time is wasted while waiting for the furnace to cool after analysis. This is because of the danger of burns, as well as the fact that no new samples can be loaded until the furnace cools to room temperature since the moisture lost by loading samples into a hot furnace will affect the final results of the analysis.

Solution: A new multiple sample TGA method developed by Navas Instruments allows samples of different composition, size, and/or weight to be analyzed while eliminating all of the previous limitations. The MMS-4000 will save laboratories money by reducing energy consumption, increasing productivity, and improving the accuracy and reliability of the results. In addition, the MMS reduces the likelihood of operator injury, since users will not have to work with tongs or high temperatures.

Principle of Operation:

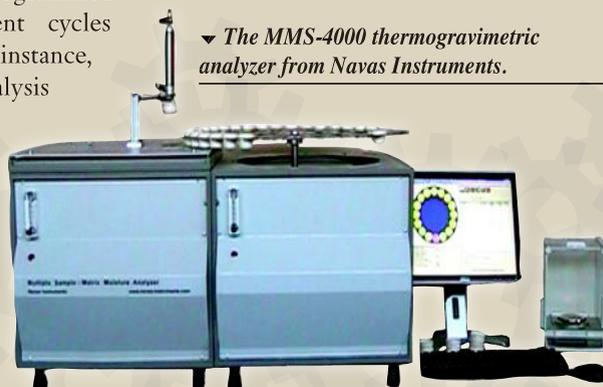
1. Crucibles and samples are weighed on an external balance. The system has 2 balances that are calibrated to provide identical weight results.
2. Weighed crucibles with samples are then positioned by the operator in a fixed position in the external carousel auto-loader that will accommodate up to 83 crucibles.
3. Crucibles with samples are automatically introduced into the furnace with constant temperature (always hot); the furnace will accommodate 15 crucibles at any given time.
4. Multiple samples of various compositions and weights can be analyzed. Samples are processed individually for constant weight and are automatically removed when a specified number (1 – 15) of samples have reached constant weight. New samples are then automatically introduced. Slower or larger samples simply stay longer in the furnace, but do not delay the whole batch.
5. The system does not require constant operator attendance; therefore, it can work at night, or any time. The instrument can be programmed to perform different cycles sequentially; for instance, complete the analysis of moisture in all samples and then start the ash analysis cycle. The samples are automatically reloaded into the furnace, which then ramps to the ash temperature.

6. For labs with an even larger volume of samples, a system with 2 furnaces can be supplied to analyze moisture and ash simultaneously. Each furnace maintains a constant temperature; for instance, 130 and 600 degrees centigrade. The carousel auto-loader stays between the 2 furnaces and transfers crucibles from one furnace to the other.

This new patented instrument will considerably reduce analysis time and cost by eliminating previous macro batch TGA limitations and provide the food, minerals, environmental, and fertilizer industries, as well as many other fields, with a valuable tool previously unavailable.

For more information, visit www.navas-instruments.com.

▼ *The MMS-4000 thermogravimetric analyzer from Navas Instruments.*



Scottsdale ARIZONA

31ST ANNUAL CONFERENCE

NOVEMBER 3 - 5, 2010

Out of Box Solutions to Managing Today's Laboratory

Location: **Hilton Scottsdale Resort** Registration Deadline: **October 1, 2010**

Program Chair: **Kelly John Mason, ExxonMobil Research and Engineering Company**



Inspiration and innovation comes from a vast variety of sources, which today's laboratory manager needs to develop and nurture. Too often laboratory staff and management are constrained by traditional strategies while the business and performance expectations are for step-out or revolutionary solutions. Through the selection of speaker topics, workshops and roundtable discussions, the 31st annual conference focuses on out-of-the-box solutions for improved laboratory performance in the three axes of laboratory management: technology, leadership and laboratory asset management. Subject matter experts will provide attendees with the game changing skills to embrace and engage innovation within their organization. This conference will challenge the attendees to explore non-traditional solutions to laboratory management problems. Your attendance at ALMA's 31st conference will help ensure continued success of your laboratory and your management career.

Conference Highlights:

• Conference Presentations:

The Economic Realities of Lab Automation, Joe Liscouski, Institute for Laboratory Automation

Getting Your Staff and Boss to Think Outside the Box, Sam Liggero, Tufts Gordon Institute

Success Stories on Implementing LEAN to Improve Lab Output, Jan Borge Jakobsen, Algeta

Networks and Lab Management: It's All About the Beer, Mike Neag, AkzoNobel

Interdepartmental Laboratory Equipment Teams, Forum for Equipment Standardization, Process Optimization, Time Savings, and Cost Reduction, Mike Mathiesen, Dial Henkel

Managing Flexible Capacity Resources, Dave Pilosof, The Clorox Company

Keeping Capabilities Current and Running Within a Limited Capital Budget, Marina Despotopoulou, Arkema Inc. and Phil Edwards, NOVA Chemicals

• Roundtable Discussions:

Out of the Box Technologies, Out of the Box Leadership, and Out of the Box Management of Assets

• Supplier Exhibits, Presentations, and Discussions

• Opening Reception and Exclusive Tour at the Dial Henkel Corporate Laboratory

• Conference Banquet with Guest Speaker Alan Cabelly, "One Leader, Four Generations: The Four Directions of Leadership"

Keynote Address: **Biomimicry: Using Nature's Stories to Spark New Thinking**



Dr. Mary Viola, Tufts Gordon Institute and Dr. Jeanette Eberhardy, Wiv, Inc.

Biomimicry and other fields of inquiry are studying nature's designs to help us solve human problems in a sustainable way. Remarkable discoveries and innovations have followed, for example:



- The scum produced on the surface of rainforest ponds contains a key nutrient for malnourished babies
- The study of leaves informs solar cell development
- And modeling the swarming of ants has led to breakthroughs in operational efficiencies in organizations like Southwest Airlines

Today's nature scientists and thought leaders are challenging our current definitions of resources, growth and economy. Can the study of nature's patterns lead us to new ways of thinking and allow us to re-energize our

Pre-Conference Workshops November 2 - 3, 2010

Introduction to Lab Automation

Unlocking Your Teams Creative Potential: Improving Productivity Using Resources You Already Have

Building Business and Technology Strategies in Your Organization

Manage Your Boss: Secrets from the Best

The Best of HRMA: Hire and Retain by Motivating and Acknowledging

Making Innovation Work in Your Organization

Applying LEAN to Laboratory Operations

Visit www.labmanagers.org for details on registration, fees and workshop dates.

Special Exhibit and Sponsorship Opportunities Available

Please contact ALMA at 505.989.4683 or alma@labmanagers.org for detailed information.

Association of Laboratory Managers

2019 Galisteo St., Bldg. I-1, Santa Fe, NM 87505

505.989.4683

www.labmanagers.org

FIND exciting Deals!

Register today to run ads, bid in LabAuctions, or contact buyers and sellers. LabX showcases over 190,000 listings of new, surplus, pre-owned lab equipment, and supplies. Visit LabX today and get the product you've always wanted NOW!



www.labx.com

BUY & SELL EQUIPMENT • ONLINE AUCTIONS
NEW PRODUCT INTRODUCTIONS • GREAT DEALS

labX
AUCTIONS, CLASSIFIEDS & NEW PRODUCTS

ADVERTISER INDEX

Company	URL	Page
A2 Technologies LLC	www.a2technologies.com	65 & 101
ALMA	www.labmanagers.org	103
Applied Scientific Instruments	www.asiimaging.com	27
Aries Filterworks	www.ariesfilterworks.com	19
BEVCO Ergonomic Seating	www.bevco.com	45
BioTek Instruments, Inc.	www.biotek.com	9, 89 & PPG
Buchi Corporation	www.mybuch.com	37 & 85
W.A. Hammond Drierite Company	www.drierite.com	25
ELGA Labwater	www.elgalabwater.com	51
Eppendorf North America	www.eppendorf.com	33
Helmer Inc.	www.helmerinc.com	71
Horizon Technology Inc.	www.horizontechinc.com/labmgr	52 & 53
IKA Works	www.ika.net	107
KNFNeuberger Inc.	www.knflab.com	63
Labconco	www.labconco.com	39 & 81
LabWrench	www.labwrench.com	77
LabX	www.labx.com	104
Marvel Scientific	www.marvelscientific.com	11 & 99
Mettler Toledo Inc.	www.mt.com/one-click-weighing	7, 61 & 93
Molecular Devices Corporation	www.moleculardevices.com	2 & PPG
Nippon Instruments North America	www.hg-nic.us	6
Nuaire Inc.	www.nuaire.com	31
Parker Balston	www.labgasgenerators.com	79
PerkinElmer	www.perkinelmer.com/catchthewave2	5, 95 & PPG
Qorpak/Alkem Lab Products	www.qorpak.com	17
RDM Industrial Products, Inc.	www.labspacesolutions.com	41
Retsch	www.retsch.com/superheroes	28, 29 & 87
Rice Lake Weighing Systems	www.ricelake.com/weights	35 & 91
Rudolph Research Analytical	www.rudolphresearch.com	74
Sakura Color Products of America Inc.	www.sakuraofamerica.com	69
SBS Society for Biomolecular Sciences	www.sbsonline.org/advancedapps/	67
SE International Inc	www.seintl.com	23
Sigma-Aldrich	www.sigma-aldrich.com/supplyrewards	43
Siloam Biosciences, Inc.	www.silombio.com	15, 97 & PPG
Sonntek Inc.	www.sonntek.com	105
Styeta Scientific	www.easychem.com	105
Terra Universal Inc.	www.terrauniversal.com	13 & 108
Thermo Fisher Scientific Inc.	www.thermoscientific.com/centrifuge	21
Waters Corporation	www.waters.com/prep	3 & 83

www.labmanager.com

Marketplace

SONNTEK – “STAY FOCUSED”

Still the *Best Selection* of
Research Lamps *Anywhere!*

201-236-9300
www.sonntek.com
sonntek@aol.com



discussing current
issues and topics in
lab management.

Lab Management Matters
A Blog by John K. Borchardt

www.labmanager.com/blogs/Lab-Management-Matters

Lab Manager
MAGAZINE

Publish your announcements in the Lab Manager Marketplace

Lab Manager^{MAGAZINE}

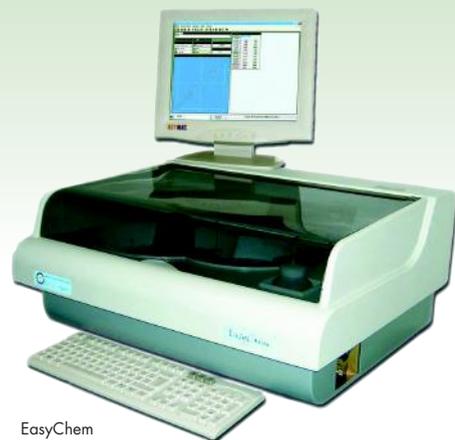
888.781.0328

www.labmanager.com/advertising.asp

Wet Chemistry Made Easy!

**USEPA
APPROVED!**

**“GREEN”
NITRATE**



EasyChem
Discrete Analyzer

**NO₂, NO₃, NH₄,
PO₄, TP, TKN...**

- Guaranteed 5 year trouble-free operation.
- Easy to use; no experience required.
- Easy run flexibility; individual parameters can be selected for each sample.
- Easy operation; no hydraulic problems, no pump tubes.
- Easy preparation of standards from a stock solution, auto-dilutions.
- Reduced analytical costs; minimal waste generation.
- True unattended operation.
- Replaces USEPA methods 353.1 and 353.2



Systema Scientific

Call 630-645-0600 NOW

www.easychem.com

PARTING POINTS

Takeaways from this month's issue:



GLOBAL MANAGEMENT

Thanks to modern communications technology, an increasing number of lab managers are able to supervise researchers working all over the globe. Challenges associated with global management are many, but here are some suggested solutions:

- Accept and embrace language and culture differences
- Use videoconferencing as a backup to face-to-face meetings
- Use VoIP connections and webinars to watch and perform presentations
- Design small projects within large ones in distant labs to build a sense of common purpose and trust between team members

10



COMPETING PRIORITIES

COMPETING PRIORITIES

A lab manager's goal is to maximize long-term revenues while minimizing costs. Since a lab manager's resources are limited, establishing the right priorities is critical to that lab's productivity and profitability. Here are some priority-setting guidelines to follow:

- Break down overall organizational goals into goals for your work group and then into individual goals for staff members
- No more than one project can be your top priority at one moment
- Never delegate something that is a critical factor to your personal success
- Determine your top priorities and spend the first 90 minutes of the day dealing with them
- *laccus nestius, to magnam faccum et*

16



BIOTECH CENTER DIRECTOR AND PI, JONATHAN SWEEDLER, MANAGES IT ALL

PERSPECTIVE ON: A BIOTECH LAB

The Roy J. Carver Biotechnology Center (CBC) at the University of Illinois at Urbana-Champaign provides research infrastructure to investigators to enable life science research. Director Jonathan V. Sweedler keeps morale up among his employees by following a few general rules:

- Project a positive outlook: Compliment workers on the good job they're doing
- Well-trained workers can easily find jobs elsewhere; give them freedom to keep them happy
- Let workers try new things; empower employees to feel ownership

48



INTO THE FIELD

INTO THE FIELD

Trends in miniaturization have brought about a revolution in analytical instrumentation. Benchtop instruments pack greater functionality into ever-smaller footprints and components. Some innovations in portable instrumentation include:

- FTIR: Handheld units can operate in any position and without any sample prep
- GC-MS: Some portable models can achieve heating/cooling results in a run cycle of 3 to 5 minutes
- TOC: Converts carbon materials into CO₂ through low-wavelength violet light

22



FINANCIAL INTELLIGENCE

FINANCIAL INTELLIGENCE

In smaller labs, the manager is often responsible for the science *and* the finances. It is highly unlikely that he or she is an economist turned lab manager, so the financial side of the job has to be learned on the fly. Avoid these common mistakes made by some managers trying their hand at CFO for the first time:

- Resist the temptation of trying to build a state-of-the-art laboratory right off the bat
- A costly mistake is purchasing the newest instrumentation without measuring its effectiveness
- Not planning for how long it takes to get a new employee to be productive

66



Sensational
Price
Celebration
Sensational
Price
Celebration

RV 10 Rotary Evaporator

- 10 Year Warranty
- High quality with integrated safety features
- Basic, Digital & Control models available

RV 10 Rotary Evaporators

- 10 Year Warranty, „stand alone“ option
 - High quality with integrated safety features
 - Basic, Digital & Control models available
 - Motorized lift
 - Heating bath with „stand alone“ option
 - Easy to use
- 100 Year Specials starting at **\$ 2499.00**



RW 16 Basic Kit

- (Strap Clamp & glassware excluded)
- Up to 10 liters / 2.5 gallons
- 10,000 mPas

RW 16 Basic Kit

- (Strap Clamp & glassware excluded)
 - Up to 10 liters / 2.5 gallons
 - 10,000 mPas
 - Simple stirring tasks
- 100 Year Special **\$ 699.00**
ID#9013607



RW 16 Basic Unit

- 100 Year Special **\$ 629.00**
- ID#2572101

T18 Basic Kit

- (Strap Clamp & glassware excluded)
- 1000, 500 ml
- 5000 mPas

T18 Basic Kit

- (Strap Clamp & glassware excluded)
 - 1000, 500 ml
 - 5000 mPas
 - Ready-to-use Package
- 100 Year Special **\$ 870.00**
ID#9016901



C-Mag HS7 Kit

- (glassware excluded)
- Excellent chemical resistance
- Digital display up to 500°

C-Mag HS7 Kit

- (glassware excluded)
 - Excellent chemical resistance
 - Digital display up to 500°
 - Up to 10 liters
- 100 Year Special **\$ 565.00**
ID#L005457



RCT Basic Unit

- Up to 20 liters / 5 gallons

RCT Basic Unit

- Safety magnetic hotplate stirrer
 - 20 liters / 5 gallons
 - Digital display
- 100 Year Special **\$ 795.00**
ID#3810001



MS 3 Basic Shaker

- Wide range of attachments
- Continuous and touch operation

MS 3 Basic Shaker

- Wide range of attachments
 - Continuous and touch operation
- 100 Year Special **\$ 339.00**
ID#3617001



MS 3 Digital Shaker

- Digital display
- Including several attachments

MS 3 Digital Shaker

- (96 well plate excluded)
 - Digital display
 - Including several attachments
 - Timer Function
- 100 Year Special **\$ 386.00**
ID#3319001



Order now: 800 733 3037 (US)

Order now: 800 733 3037 (US)

Please visit IKA at ACS, booth 1311



Designed
to work perfectly

IKA® Works, Inc.
2635 Northchase Pkwy SE Wilmington, NC 28405-7419
Phone: (910) 452-7059 · Fax: (910) 452-7693
E-Mail: usa@ika.net · http://www.ika.net



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



Purifier® Logic™ Class II Biosafety Cabinet provides the utmost in efficiency and ergonomics. Unique LCD Information Center monitors operation, including filter life.

Starting at \$7,020

- 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

Laminar Flow Hoods



Vertical Laminar Flow Station includes PLC control over motorized shield, FFU and lighting to meet Class 100 standards.

Starting at \$4,937



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