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Where Science and Management Meet™

August 2007 Volume 2 • Number 8

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Lab Manager MAGAZINE®

Author Guidelines

Lab Manager Magazine® is a printed publication of resources, products, and information for today's laboratory manager. Articles should address some aspect of laboratory management from the perspective of a professional who is both a scientist and a manager. Topics areas would include: managing budgets, personnel, technology, information, funding, training, safety, risk, expansion, building or renovation, among others related to the role of a lab manager.

The article review process should begin with a query by e-mail or phone followed by a brief abstract or outline. Please state your topic and objective, and indicate your perspective as well as your professional relationship to the topic. Content must be unbiased and cannot promote a particular product or company. Article length may range from 1500-2500 words. All manuscripts must be submitted electronically by email or disk.

To submit an article query contact:

Patrice Galvin

Editor in Chief

Lab Manager Magazine

pgalvin@labmanager.com

603-672-9997 x112

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The Budget: a mathematical confirmation of your suspicions.

–A.A. Latimer

I began to realize how simple life could be if one had a regular routine to follow with fixed hours, a fixed salary, and very little original thinking to do.

– Roald Dahl

Our thanks to everyone who participated in the Lab Manager Salary and Budget Survey. The survey was conducted in May 2007 and the results are inside this issue. As the first survey, it's hard to make sweeping pronouncements about what lab managers make, or the best state or industry to work in but we have some data and a starting point for future salary surveys.

In the comments section of the survey, quite a few participants wrote in that they were looking for information to gauge how their earnings measure up to others locally or around the country. The salary information was sliced and diced in a few ways and some comparisons were made for region in the U.S. as well as by industry. (We hope to expand our coverage of the international lab management picture in the future.) The write-in remarks echoed a sentiment that lab managers' and scientists' salaries do not match their education or the true value of the work they perform. But from the way the percentages fell, that does not appear to be the whole picture. Altruism is also in the mix.

Despite the fact that most respondents said that more money would improve their job satisfaction, over 65% of people didn't pick money as the answer. Many checked off advancement, respect, and recognition over money.

One respondent wrote, "We feel lucky to have both of us employed in geology and the job has lots of freedom to plan my own schedule; thus the willingness to take a low salary." The words "lucky" and "low salary" are both in there. This is some of what we hoped to find in sending these questions out there – the unexpected answer.

In the budget results, we found that there wasn't much surprising about the data collected — bigger labs have more spending power. As with most things, the survey answered some questions which only led to more questions about things we want to find out. We hope to tailor future questions to take a closer look at where the money comes from, where it goes, and why.

One clearcut message did come through, however. The write-in remarks revealed an apparently universal cry for more lab space. Everyone seems to be feeling the crunch and looking for more room for staff and equipment. Though most respondents said that their budget for this year was more than allocated the previous fiscal year, money for physical plant improvements is not keeping pace with the need.

DID YOU MISS OUT ON TAKING THE SURVEY?

We will be conducting the salary and budget survey next year and other short surveys related to lab management throughout the year. If you didn't receive a link to take the survey, it probably means we don't have your email address. One way to participate in the next survey is to sign up for the Lab Manager E-Newsletter. Just like the print magazine, the E-Newsletter is free to qualified professionals. It's distributed every other week and contains a focus article, industry news, and two new features — the Lab Safety Tip and the Management Tip of the Week. You can sign up to receive the E-Newsletter and to access the archive at www.labmanager.com.

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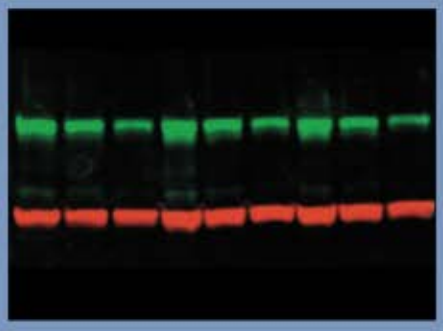

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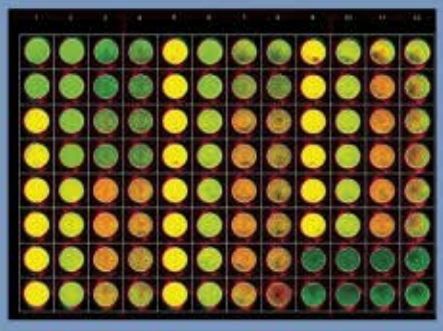

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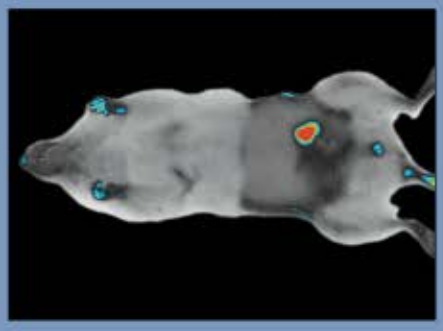

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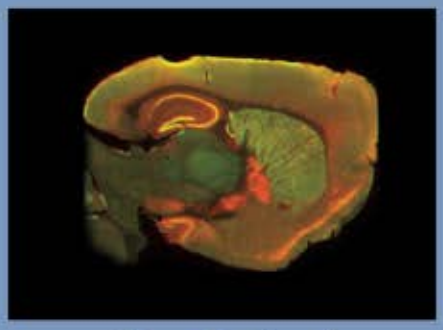
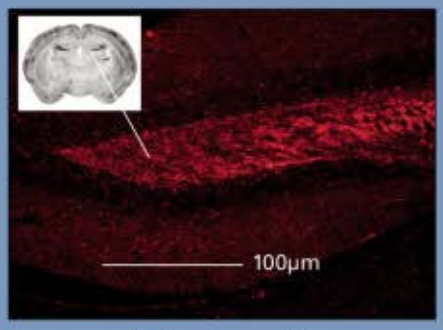


Tissue Sections*

Protein Arrays



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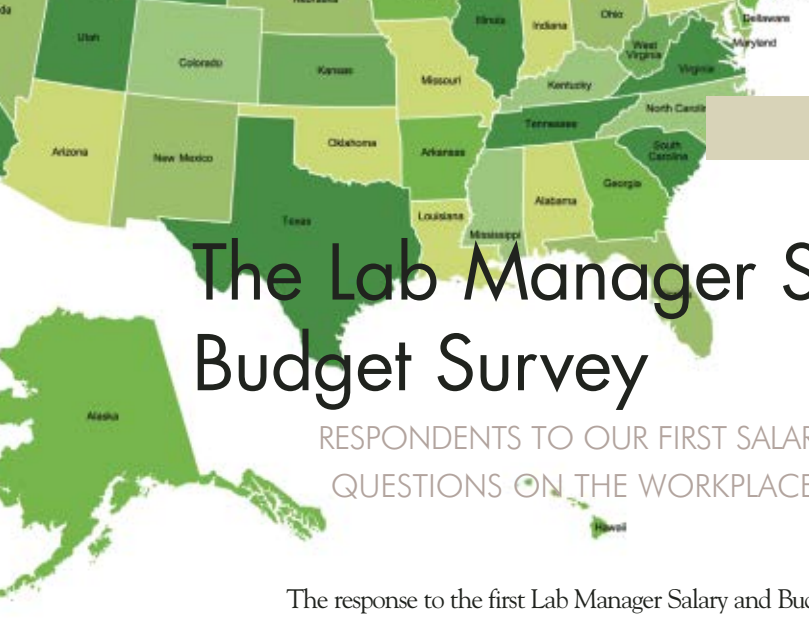


The Lab Manager Salary and Budget Survey

RESPONDENTS TO OUR FIRST SALARY AND BUDGET SURVEY ANSWERED QUESTIONS ON THE WORKPLACE, MONEY, AND JOB SATISFACTION.

The response to the first Lab Manager Salary and Budget Survey was excellent. Scientists and managers from the U.S. and internationally took part answering the 20 questions on where they work, how much they make and can spend, as well as some answers to less tangible but still important issues about job satisfaction and upward mobility.

When the survey closed, 884 respondents answered questions that gave a snapshot of some big picture items in lab management. The questions and results are listed on the following pages. Some of the correlation between dollars and workplace are made below along with some other interesting insights and comments that respondents shared. It is important to note that the survey results are based on the responses from subscribers to *Lab Manager Magazine*®. While the results from the data are accurate, we need to acknowledge that the survey was neither comprehensive nor exhaustive.

THE PAYCHECK

What industry pays the most? Does geographic location matter?

While the overwhelming percentage (85%) was from respondents in the U.S., 39 countries were represented in the overall results. Of that 15% outside the U.S., the largest response was from Canada followed by India.

Salary ranges and percentage results can be found in "The Results" section of this article. The big questions are how do industry and region relate to earnings?

Some of the correlation between dollars and workplace ... along with some other interesting insights and comments that respondents shared.

Salary by Industry: Salary by industry results offered interesting findings. Though it may come as no surprise that university lab salaries were reported to be generally lower than the rest, government labs seemed to pay relatively well. In the over $100,000 range, biotech and industrial labs seem to offer the most earning potential while most of the clinical or research lab salaries start and remain between $46 and $104K. Some sudden dollar drop-offs occur almost across the board at the $105 to $150K range with the exception of biotech labs where the percentage jumped by almost 9%.

AVERAGE SALARY BY INDUSTRY

Pharmaceutical Lab	$69,800
Biotech Lab	$69,040
University Lab	$46,760
Clinical or Research Lab	$62,910
Industrial Lab	$72,270
Government Lab	$69,040
Private Lab	$64,050
Other	$55,000

Salary by Region: Though admittedly the salary results should not be the basis to pack up your bags and move, a "top ten" list was calculated by comparing the number of respondents and the salary ranges by state. If we had asked people which state they would guess had the best pay ranges, most probably would have California (the number one state for highest pay from this survey) as in the top few. Covering mainly the eastern U.S., others in the top ten are Maryland, Colorado, New Jersey, Connecticut, Michigan, Minnesota, Massachusetts, and South Carolina.

The results of the average salary by region of lab managers who responded to the survey. The eight regions are:

REGION	AVERAGE SALARY
New England (CT, ME, MA, NH, RI, VT)	$74,689.65
South (AL, AR, FL, GA, KY, LA, MS, MO, SC, TN)	$64,923.08
PA/NY/NJ	$70,015.38
Mid-Atlantic (DE, District of Columbia, MD, NC, VA, WV)	$70,673.08
Midwest (IL, IN, IA, KS, MI, MN, NE, ND, OH, OK, SD, WI)	$67,239.13
West/Northwest (CO, HI, ID, MT, NV, OR, UT, WA, AK, WY)	$71,594.60
California	$91,884.61
Southwest (AZ, NM, TX)	$68,999.99
Overall Average:	$69,683.39

Salary by Organizational Size: The size of the organization did play a role in salary and budget dollars. In round numbers, 20% of the people who participated in the survey work in organizations of less than 100 people, 37% in organizations of 100 to 1,000 and 43% in large organizations of over 1,000 employees. The comparison of organizational size to salary and budget supported what might be expected — that the larger the organization, the larger the budget and salary ranges.

THE PEOPLE

The age old question, do men get paid more than women?

Though the numbers are getting closer, the survey showed more men are in the role of lab management than women by over than 13%. The U.S. National Science Foundation, Division of Science Resource Statistics does periodic data tracking of science degrees awarded by discipline as well as gender and minority status. The results from 2004[1] showed that 50.4% of the bachelor's degrees in all disciplines of science and engineering were awarded to women. That percentage holds true for the number of chemistry degrees as well.[2] Trends from the data indicate that the numbers are remaining somewhat static.

Table 1 shows males vs. females in the salary category. The numbers show more women earning in the lower ranges (48% earning $65K and less compared to 37% for males) and fewer in the higher ranges (23% earning $86K and higher compared to 37% for males). These are simply the straight response numbers, however, and while inferences can be made, more information is needed to answer why these differences exist.

Years with Current Employer: A surprising finding was the years with the current employer. Almost 40% responded that they have been with the current employer for more than 10 years. More than half of that number (20.14%) checked the "over 20 years" box. This result may merit questions in future surveys, such as, why people stay with a single employer? Is it tenure, great benefits, the projects? In a time when the trends indicate that loyalty is still alive but that the reasons for staying are shifting (from money, security, promotion to flexibility, responsibility, and company culture), this finding may be worth looking at more closely.

MONDAY – FRIDAY

Do you like your job?

Survey questions relating to inside the lab asked about job title, number of lab members, and some questions on job satisfaction.

It's good to work in a lab. An overwhelming majority (74.21%) indicated that their job satisfaction level was good to excellent (Table 2). Most findings on job satisfaction state that it's not all about the money. But our survey indicates that about 35% percent would want an increase. However, the survey allowed respondents to only pick ONE answer from the list. So the 18.49% who chose advancement and the 10.95% who checked off more recognition, skipped over the choice of more money. This means that 65% of the respondents say their job satisfaction level would rise with a non-monetary reward.

SPENDING MONEY

What's your lab's budget?

With 41% saying that their lab's budget is over a million dollars, the good news is that 44.54% reported that this year's budget is higher than last year and only 13.54% indicated a decrease. As expected, salary and compensation take the lion's share of the overall budget with approximately 75% of respondents saying that 25-75% of the budget is to pay staff.

The dollars available for purchasing equipment, products, and services is over $100,000 for more than 43%. While it probably feels like it's never enough, lab budgets have grown and buying power is higher.

AVERAGE LAB BUDGET BY INDUSTRY

Pharmaceutical Lab	$390,000
Biotech Lab	$437,500
University Lab	$222,000
Clinical or Research Lab	$630,000
Industrial Lab	$315,000
Government Lab	$560,000
Private Lab	$315,000
Other	$330,000

Table 1. Salary Range by Gender

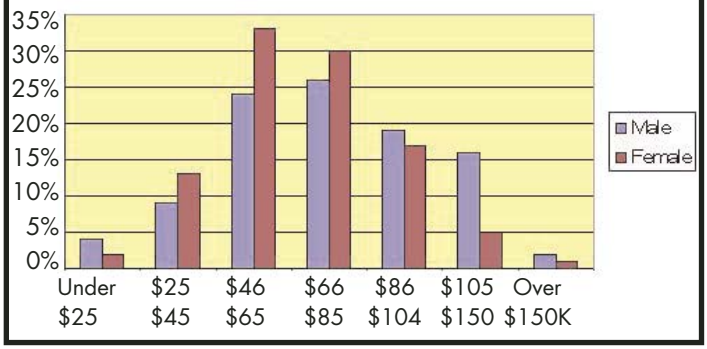
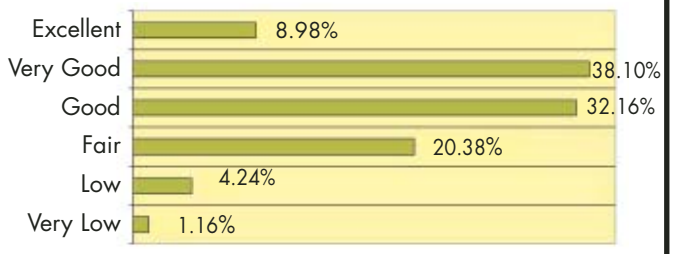


Table 2. Job Satisfaction



OTHER

Some of what was said between the lines…

It was in the "other" responses that some interesting results were gleaned. The question asking, "In order to earn more, do you feel like you would have to…" offered some insights. While 46.30% said earning more meant changing employers, many typed in the response "all of the above" (choices were change employers, take an upper management position, and further your education). Other responses included:

- Sell patents
- Improve efficiency and accuracy, fully utilize labor resources and automated equipment
- Move to another country
- Continue to bring in more business
- Publish more, secure federal grants, and earn tenure
- Attract more grant money
- Give myself a raise
- Work overtime
- Dependant on Clinical Trial success
- Change fields
- Move to a lab with a larger staff and more responsibility
- Get a sex change
- Own my own company
- Do more globally
- Develop new business, build clientele
- Present a detailed argument on reasons for pay increase
- Relocate
- Present administration with salaries from similar institutions

One respondent wrote, *"The entire discipline of basic science is underpaid. It is one of the few disciplines that require specific upper division education but has salaries still equivalent to that of a high school degree. I see the main salary issue coming from the granting agencies that set what portions of funding can go for what positions. Most knock down the request of payroll funding of a Research Lab Manager and substitute in the funding for the position of Post Doc. I believe the technicians/research scientists/lab managers will have organize and petition the current salary standards, very much like the nurses and teachers have already done, to raise their respective income to match the education required and level of responsibility required of their respective positions."*

Another question that generated many written responses was "If there was one item you could include in your budget, what would it be?" Though over 41% checked "Pay raises/bonuses," there was a very emphatic theme in the write-in responses. Almost without exception, the write-in responses were one of these three key items:

- More lab space or a new facility
- More money for staff training and continuing ed
- Automation

SUMMARY/CONCLUSION

So what do lab managers want?

The survey indicates that, overall, lab managers are a happy bunch. A little more money, a bigger or renovated lab, updated technology and automation would make most of them a little happier.

This first survey will be the basis for comparison for future surveys. We look forward to following the results over time and seeing the changes and trends. —PG, BV, LS

References

1. National Science Foundation, Science Resource Statistics, "Degrees awarded in all fields in science and engineering by degree level and sex of recipient: 1966–2004." http://www.nsf.gov/statistics/nsf07307/pdf/tab3.pdf
2. National Science Foundation, Science Resource Statistics, "Chemistry degrees awarded, by degree level and sex of recipient: 1966–2004." http://www.nsf.gov/statistics/nsf07307/pdf/tab38.pdf

THE RESULTS

THERE WERE 884 RESPONDENTS TO OUR FIRST SALARY AND BUDGET SURVEY. LISTED BELOW ARE THE SURVEY QUESTIONS AND RESPONSES.

WHICH ONE OF THE FOLLOWING BEST DESCRIBES YOUR TITLE/JOB FUNCTION?

- Laboratory Manager, Director, or Supervisor 67.76%
- Purchasing Manager, Director, or Supervisor 0.34%
- R&D Manager, Director, or Supervisor 3.28%
- Technical Manager, Director, or Supervisor 7.01%
- Executive Management/Administration 3.51%
- Scientist 3.39%
- Chemist 2.94%
- Research Scientist 3.05%
- Pathologist 0.11%
- Professor/Faculty 1.36%
- Consultant 1.13%
- Other 6.11%

WHICH ONE OF THE FOLLOWING BEST DESCRIBES YOUR BUSINESS OR INDUSTRY?

- Pharmaceutical Lab 8.54%
- Biotech Lab 5.69%
- University Lab 12.53%
- Clinical Research Lab 1.71%
- Industrial Lab 14.46%
- Government Lab 15.38%
- Private Lab 13.78%
- Other 27.90%

IS YOUR ORGANIZATION LOCATED IN THE UNITED STATES?

- Yes 85.55%
- No 4.45%

HOW MANY PEOPLE ARE EMPLOYED BY YOUR ORGANIZATION?

- 1–25 ..... 5.85%
- 26–50 ..... 7.11%
- 51–100 ..... 7.11%
- 101–250 ..... 10.55%
- 251–500 ..... 13.65%
- 501–1,000 ..... 12.39%
- 1,001–5,000 ..... 22.94%
- 5,001–10,000 ..... 8.14%
- Over 10,000 ..... 12.27%

HOW MANY PEOPLE WORK IN YOUR LAB?

- 1–25 ..... 61.58%
- 26-50 ..... 18.46%
- 51-100 ..... 10.55%
- Over 100 ..... 9.40%

GENDER:

- Male 56.15%
- Female 43.85%

HIGHEST DEGREE RECEIVED:

- Bachelor's 47.77%
- Master's 28.80%
- PhD 14.17%
- MD/PhD 2.06%
- Other 7.20%

YOUR AGE:

- Under 25 ..... 0.57%
- 25–29 ..... 3.66%
- 30–39 ..... 25.49%
- 40–49 ..... 33.49%
- 50–59 ..... 29.37%
- 60–65 ..... 6.74%
- Over 65 ..... 0.69%

HOW MANY YEARS HAVE YOU BEEN WITH YOUR CURRENT EMPLOYER?

- 0-1 year 5.50%
- 1–2 years 20.14%
- 6–10 years 21.55%
- 11–15 years 9.60%
- 16–20 years 9.84%
- Over 20 years 20.14%

ARE YOU WORKING FULL-TIME OR PART-TIME?

- Full-time (more than 35 hours per week) 98.27%
- Part-time (less than 35 hours per week) 1.73%

DO YOU TELECOMMUTE?

Never	61.30%
Occasionally, but not on a regular basis	30.94%
One day per week	1.97%
More than one day per week	3.71%
Only when overtime is needed	2.09%

WHAT IS YOUR SALARY RANGE?

Under $25,000	2.92%
$25,000 – $35,000	3.16%
$36,000 – $45,000	7.60%
$46,000 – $55,000	13.10%
$56,000 – $65,000	14.85%
$66,000 – $75,000	14.04%
$76,000 – $85,000	13.92%
$86,000 – $95,000	10.99%
$96,000 – $104,000	6.78%
$105,000 - $125,000	6.78%
$126,000 – $150,000	4.44%
Over $150,000	1.40%

HOW WOULD YOU RATE YOUR OVERALL JOB SATISFACTION?

Very low	1.18%
Low	4.24%
Fair	20.38%
Good	32.16%
Very good	33.10%
Excellent	8.95%

WHICH ONE OF THE CHOICES BELOW WOULD MOST IMPROVE YOUR JOB SATISFACTION LEVEL?

More money	34.51%
More recognition	10.95%
More advancement potential	18.49%
More budget influence	4.59%
More corporate influence	6.01%
More collaboration	9.19%
More autonomy	6.24%
More respect	10.01%

IN ORDER TO EARN MORE, DO YOU FEEL YOU WOULD HAVE TO:

Change employers	46.30%
Move to upper management	34.78%
Further your education	9.99%
Other	8.93%

WHAT IS YOUR LAB'S ANNUAL BUDGET?

Less than $100,000	11.73%
$100,000 – $250,000	12.20%
$250,000 – $500,000	17.42%
$500,000 – $1,000,000	17.65%
Over $1,000,000	41.00%

HOW DOES YOUR BUDGET COMPARE TO THE PREVIOUS YEAR?

Higher	44.54%
Lower	13.54%
No change	41.92%

WHAT IS YOUR APPROXIMATE BUDGET FOR PURCHASING LAB EQUIPMENT, PRODUCTS, AND/OR SERVICES?

Less than $5,000	4.29%
$5,000 – $10,000	5.13%
$10,000 – $25,000	9.77%
$25,000 – $50,000	12.51%
$50,000 – $100,000	24.31%
Over $100,000	43.98%

WHAT PERCENT OF THE ANNUAL BUDGET IS SPENT ON WAGES/SALARY/ COMPENSATION?

Under 25%	17.05%
25–50%	39.06%
51-75%	36.52%
76–100%	7.38%

IF THERE WAS ONE ITEM YOU COULD INCLUDE IN YOUR BUDGET, WHAT WOULD IT BE?

More staff	29.93%
Pay raises/bonuses	41.36%
New equipment	22.51%
Other	6.20%

"Manage by exception. When things are going well, leave them alone. When a problem occurs, then help."
--From www.liraz.com/tpeople.htm.

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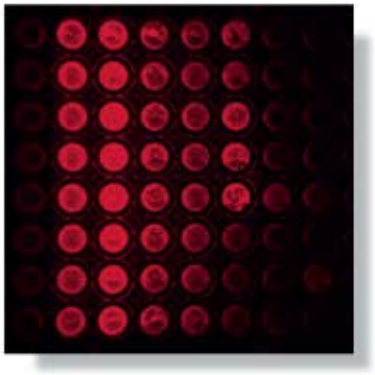

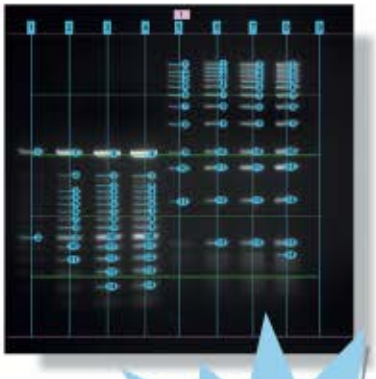

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How to Retain Key Employees

COMPANIES THAT DO A BETTER JOB OF ATTRACTING, DEVELOPING, AND RETAINING THEIR TALENT CAN BOOST THEIR PERFORMANCE DRAMATICALLY.

Talent is a critical driver of corporate performance and a potential competitive advantage. McKinsey & Company research indicated that companies scoring high in their ability to manage talent earned, on average, a 22% higher return to shareholders than their industry peers. The 1997 landmark paper called "The War for Talent" involved surveys of 13,000 executives at more than 120 companies and detailed case studies at 27 companies.

This "The War for Talent" report evolved into a 2001 book of the same name authored by McKinsey consultants Ed Michaels, Helen Handfield-Jones, and Beth Axelrod. Their central premise was that effective talent management is critical to every company's success. However, the authors found that high performing companies did not have better human resources processes than their lower-performing peers. Instead, what distinguished them was a pervasive talent mindset held by company leaders at all levels that competitive advantage comes from having superior talent.

The authors state that everyone from the CEO down to line managers must believe that talent is a top priority and that it is part of their job to manage talent effectively. How can companies do this? This issue was explored in a recent symposium held at the American Chemical Society National Meeting (March 2007) and sponsored by the Division of Business Management & Development, "General Papers Relating to Management of the Chemical Enterprise."

ASSESSING PERFORMANCE

To develop people, managers must first be able to accurately assess performance. This process should begin with your first discussion with a new hire. Discuss the job description with the new hire. Modify the job description as appropriate to take advantage of the new employee's strengths and your expectations for this individual.

...competitive advantage comes from having superior talent.

Discuss your expectations with the new hire. Define a list of action items for each new employee to accomplish in their first six months. This will help them stay focused on their most important goals and tasks. Emphasize that the employee will be evaluated on the basis of accomplishing these goals and mastering these tasks.

Many employees resign during their first few months on the job. Megan Driscoll, President, PharmaLogics Recruiting, advises that it is important for managers to understand the new hire's expectations and address them effectively while demonstrating that you have their best interests in mind. She suggests, "Have the new employee outline for you what he or she would like to accomplish as an addendum to your list of expectations. If you are aware for instance that gaining experience in lab design and layout is something the employee would like to do, you might come across a project where you could invoke their participation. If you don't know what that employee is looking to learn, you don't have the opportunity to expose and develop that candidate in ways that interest them." This reduces their job engagement and increases the possibility of their departure to work elsewhere.

Put all the mutually agreed upon expectations in writing. Be sure the candidate has a copy. This will serve as a roadmap for both of you assuring that the new hire has an individualized development plan. As the new hire gains experience and progresses in their career, work with them to update the roadmap to reflect their changing circumstances.

Managers must communicate continuously with their employees in order to assess

John K. Borchardt

their progress. Waiting until the date of a scheduled formal review may allow problems to develop and erode the employee's job satisfaction and motivation. For some employees, an open-door policy may suffice to promote this communication. However, for less assertive individuals, the manager needs to take the initiative in "managing by walking around" and engaging employees in discussions to learn how they are progressing in meeting their goals. Indeed, given how busy managers are and that they may often be tied up in meetings, managing by walking around is a good strategy to adopt for all one's employees.

These informal progress assessments are valuable. However, also schedule a formal six month progress review. This in-depth discussion will let you to assess if candidates are living up to your expectations. It also will allow employees to communicate whether the job — and you as manager — are living up to their expectations. Driscoll notes that at the time of this first formal review both of you can change your approaches to each other before they become counter-productive, ingrained habits.

DEVELOPING PEOPLE

This should be done on an individualized basis by "working with each employee to create a personal path forward for them," says Lisa Prior, Principal, Prior Consulting. This means setting goals consistent with their current job assignment and what they need master to take the next step in their careers. These goals must also be consistent with what motivates each individual employee. For one, it may be promotion. For another, it might be raises or bonuses. For a third, it might be independence and flexibility. Making each employee's goals consistent with their "prime motivators" helps assure that the employee's commitment to mutually agreed upon goals is more than mere lip service.

Managers should then determine the experiences that will enable them to achieve these goals, Prior advises. These experiences could be assignments to specific projects or work teams. It could also be education and training. The manager and employee need to agree upon a timeframe to accumulate these experiences and accomplish these goals. Finally, the employee needs to take responsibility for achieving their goals. While managers should be supportive, they should not have to constantly prompt employees to take the steps needed to accomplish these goals. The number of employees most managers supervise makes this an impossible task.

Prior notes that one has to determine how one measures success. This can be set by the manager or mutually agreed upon with the employee. Either way, the employee must accept the measures for success. These will determine if the employee has

met his/her goals. Disagreement on this can be very corrosive to the manager-employee relationship and, should the employee complain to co-workers, cause broader morale problems as well.

Managers can best motivate employees to achieve goals when these goals tap into their personal interests. For example, I've long been passionately interested in improving the environment. One of my managers tapped into this by assigning me to a project to develop biodegradable detergent chemicals to remove ink from pulped wastepaper for paper recycling. The alignment of my personal goals with my employment goals was a great motivator.

In developing employees, assessment can determine an employee's strengths that need to be capitalized on and weaknesses that need to be remedied. Prior comments, "Many managers tell me that there is no time for development because they are stuck in an old paradigm: that sending people to training programs is the way to develop them." However, a classic problem with many training courses is how to transfer what one has learned from the classroom to the job. Without the manager's support, it is often difficult to do this due to the press of immediate assignments.

There are also other ways to develop employees. One is "action learning" opportunities associated with one's job. For example, in developing paper recycling chemicals, I had to learn a lot about paper industry technology. This led to my developing other paper chemicals business opportunities outside of paper recycling. Other action learning opportunities are associated with working on multi-functional project teams — particularly those that include company employees from other departments or suppliers and customers.

For some employees, providing external exposure through visits to customers and suppliers, professional society activities and attending conferences are both educational and motivating. For other, presentations or writing articles for publication is educational and motivating.

Assignment as a team leader can be a first step in developing valuable management experience and developing leadership skills. Job rotation into other assignments is valuable but can be difficult to justify. Reassignment may be good for both the individual and organization in the long term. However, in the short term it can cause a loss in productivity as the transferred employee learns a new job. A lateral shift can make some employees feel less secure as they temporarily lose their expert status until they master a new job and its associated technology.

"Business as usual" can result in substantial barriers to action learning. Prior noted that these include an attitude that there is no time for action learning activities. Some managers will not support these activities for fear of reducing productivity. Others — and their employees as well — may lack the imagination to devise constructive action learning opportunities.

COACHING AND FEEDBACK

Prior observed that for employee development to succeed, managers have to effectively provide feedback and coaching. Barriers to doing this include a desire to avoid appearing overly critical and to avoid conflict. If one is uncomfortable with the process, finding the "right" time and place to do this can be difficult. Some managers are reluctant to fully engage in the process because they view it as time-consuming. Before sitting down with the employee, the manager should be sure that he/she has a complete picture of the employee's job responsibilities and performance before giving feedback.

OVERALL DEVELOPMENT STRATEGIES

Companies such as General Electric differentiate between the career opportunities and financial rewards offered to employees based on their performance. Exceptional (A) performers are rewarded with fast-track advancement opportunities and substantially higher salaries than average performers. Average (B) performers should be given the training and support they need to become A performers. Below-average (C) performers must be given opportunities to improve their performance. Should this not occur, they must be separated from the organization. Typically, C performers are often in the same job for many years. Some managers prefer to give C performers a second opportunity in another job assignment that may be more suited to their skills.

Driscoll depicted this differentiation of opportunities in Figure 1. The X-axis of Figure 1 represents the progression of new hires progressing from novice with much to learn to mastering the requirements of their current assignments and exhibiting outstanding performance.

The Y-axis represents something often harder to assess than performance — the potential for outstanding performance both in one's current assignment and at the next level. As Driscoll explains in Figure 1, the career planning activities differ for each stage of the individual's progression in their job assignment until, at the right of Figure 1, the employee is ready for promotion or other career enhancing experiences. Potential represents a combination of the individual's learning ability and adaptability to

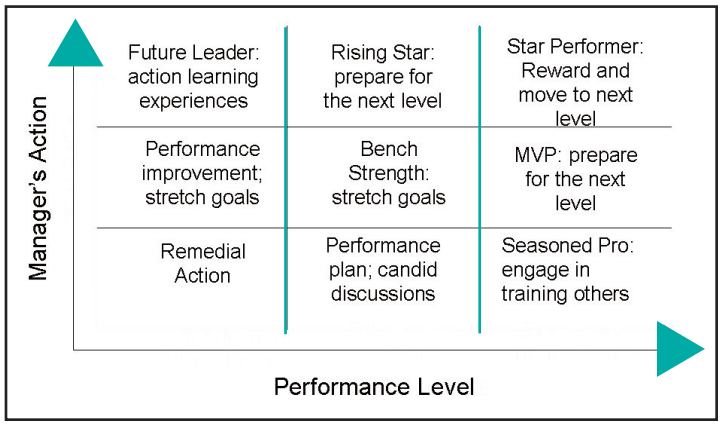


Figure 1. Strategies to strategically develop people.*

new assignments. If one's potential is low, even an individual performing very well in their current assignment may not be suited to move to the next level if that level is an extremely challenging one. Indeed, some individuals in this situation, with other priorities such as balancing their work and personal lives, may decline advancement to the next level. In this situation, managers much develop a strategy for the individual to use his/her skills more effectively at their current job level. One obvious way to do so depicted in Figure 1 is to train others.

Overall, this approach can make your work unit or your company more attractive to highly talented people. However, it can also have a disadvantage in possibly making B performers feel undervalued. Certainly, the C performers will fill some pain associated with reassignment or job loss.

THE MANAGER'S ROLE

Managers must accept their roles in developing talent along the lines depicted in Figure 1. This means coaching and mentoring employees as needed. To do so effectively, managers must learn what motivates each person. They must be good communicators to have productive career planning and talent development discussions with their employees. By doing all this and having passion for the process, managers will create engaged employees.

Driscoll calls rewards "tools for retention." Rewards help keep employees engaged and satisfied reducing employee turnover increasing company costs and delaying projects. She notes that rewards are more than the monetary ones of receiving raises and year-end bonuses. Another tangible reward is promotion.

Intangible rewards are often easier to provide. Their effectiveness largely depends on the manager's knowledge of what

motivates each employee.

As a recruiter, Driscoll says, "I have found that there are two main reasons why employees either stay with their company or conversely why employees choose to leave.

1. Whether the employee has positive feelings about their manager or negative feelings about their manager.
2. Whether the employee feels there is growth potential within the company or a lack thereof."

She notes, "Neither of these reasons for an employee leaving is addressed with a monetary or tangible reward." However, intangible rewards, judiciously used can increase employee satisfaction to the point where they do not consider leaving. One is informal monthly discussions focusing on what the employee is doing very well and praising them for it. Just knowing they are appreciated goes a long way to increasing employee satisfaction and improving motivation.

Periodic awards recognizing outstanding contributions need not be expensive. These plaques are often highly visible in the recipient's office motivating both themselves and their co-workers who resolve to win one too.

The act of working with each employee to create personalized development plans goes a long way to instilling loyalty. They feel that have a place to go within an organization. To increase engagement, ask each employee during their annual performance review what they hope to achieve over the course of the next year or two. Then work together to create a plan accommodating at least some of their goals. The employee feels you, as manager, support their professional growth. Their ideas may indicate new ways they can contribute to the organization.

WRAP-UP

Effective talent management applies to non-profit organizations, such as educational institutions and government laboratories, as well. Like industry, they are engaged in a war for talent. As industry, science and applied technology become increasingly globalized, this war of talent is becoming a worldwide struggle.

*Note: Figure 1 is used with permission by Megan Driscoll, taken from her presentation at the ACS national meeting in Chicago.

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

Managing and Meeting Challenges With Multiple Fluorescence Probe Images

DEVELOPMENT OF A COMPUTATIONAL APPROACH TO QUANTITATIVELY UNMIX OVERLAPPING SPECTRA

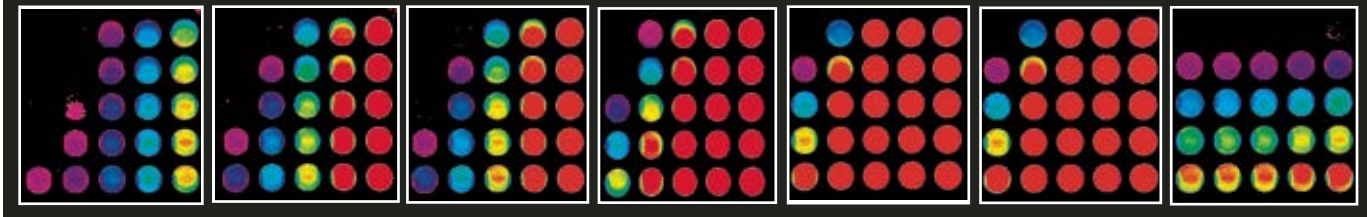
We present here a reliable methodology to identify and quantify the individual components from multichannel fluorescent signals.

Multichannel fluorescence imaging is becoming an indispensable tool for post-genomic biological research. Most of the techniques being applied, both *in vivo* and *in vitro*, tend to require multiple labeling to visualize different events or to probe various aspects of the same subject. Overlapping emission spectra from multiple fluorescent probes complicates the acquisition and accurate analysis of individual labels and corresponding targets. To address this issue, a computational approach was developed to quantitatively unmix overlapping spectra. We initially constructed models of excitation spectra of individual fluorescent imaging agents as a superposition of multiple Gaussian functions. These models were then used to perform a quantitative unmixing of the combined spectra *in milieu* using a non-linear least squares optimization technique. We present here a reliable methodology to identify and quantify the individual components from multichannel fluorescent signals. Our results can be easily incorporated into any routine multispectral analysis.

Several visible and near-IR fluorescent nanoparticles have recently been developed and commercialized. These nanoparticles are made of organic "non-toxic" materials and contain multiple fluorochromes that are embedded into the core of the nanoparticle. Two different nanoparticles (X-SIGHT 650: Absorption 650nm; Emission 673nm and X-SIGHT 691: Absorption 691nm; Emission 715nm) were used individually or in combination for the purpose. 0, 2.5, 5.0, 7.5, and 10 pmoles of the nanoparticles were dispensed into five wells of each plate.

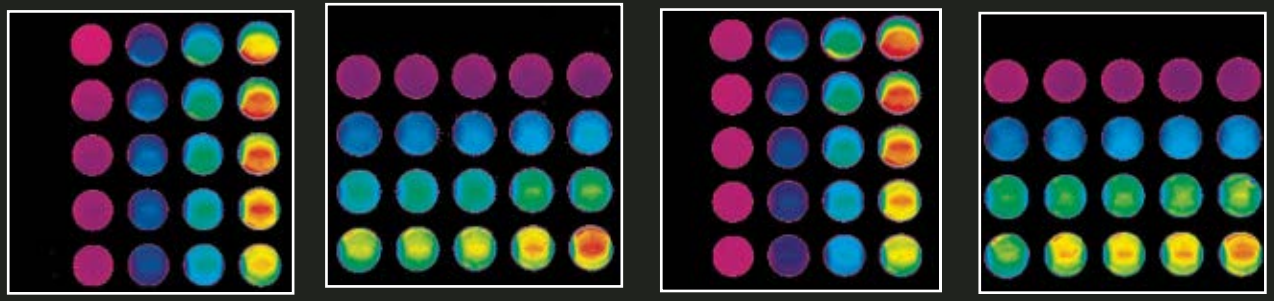
Clear/black bottomed 96-well plates were used and the final volume in each of the 5×5 wells were 0.2 mL. The three plates were imaged using a multispectral imaging system. This multimodal system enables high-sensitivity optical imaging with high-resolution digital X-ray to enable quantification and localization of biomarkers in small animal imaging. It has a 29-excitation filter position wheel ranging from 380-830nm enabling a wide range of fluorescent applications.

Figure 1: Representative images from the raw data cube showing the 5×5 grid of sample wells containing various mixtures. Each image was obtained using a different excitation filter with the emission filter for all images set to 750 nm. The intensity scale is identical for all images that have not been corrected for illumination variations.



Rao V. L. Papineni, Ph.D., and Douglas O.S. Wood, Ph.D.

Figure 2. Validation of the unmixing procedure. The left panels show the calculated, unmixed images of the probes. The right panels show images taken of a plates with a 5x5 grid of plates containing only a single probe.



For this application, we used an exposure time of one minute with 4×4 binning on the sensor. The f-stop was 2.8 and the camera's zoom lens was set to image a field of view of 63mm. A 750nm emission filter was used for all image capture. A stack of 15 images was captured at excitation wavelengths from 410nm to 690nm.

The first step in the process of unmixing the overlapping signals from the two probes is to measure the excitation spectrum of each probe individually and then construct a numerical model spectrum using a sum of Gaussian functions. This is accomplished with the use of an interactive software tool and takes less than one minute. The models can be saved in a library and used when analyzing subsequent image captures.

EXCITATION SPECTRA AND GAUSSIAN MODELS

Unmixing is accomplished using the Levenberg-Marquardt method to perform a non-linear, least squares fit of the numerical models of the probes to the measured excitation spectrum at each pixel in the raw data cube. This process must be guided by the automatic selection of initial values for the fitting parameters in order to optimize the results. The fit produces two images, corresponding to the amount of each probe that must be used to produce the best fit to the measured spectrum at every pixel of the input. This process can be extended to any number of probes as long as the problem is mathematically well determined (i.e., there must be at least n+1 independent points in the spectrum in order to unmix n separate probes).

The unmixing results are presented in Figure 2. As a test of the validity of the procedure, we created two additional 96-well plates each with a 5×5 grid with the corresponding dilutions for the individual probes. These grids were imaged under the same conditions as the original 96-well plate where the grid had various combinations of both probes mixed together. The comparison in Figure 2 shows that the unmixed images closely match the images of the two probes taken separately, validating our method. It is important to draw attention to the fact that the left panels of Figure 2 are synthetic; they were created by the numerical analysis and were not captured by a camera. The panels on the right in Figure 2 are images taken from separate 96-well plates that have a 5×5 grid of wells with dilutions. The close resemblance of the images demonstrates the success of the unmixing methodology.

The process of capturing the images and performing the unmixing analysis takes only a few minutes. The tools described here can be used routinely to analyze multiple fluorochrome-based micro or macro biological images.

Note: The results were obtained using the KODAK X-SIGHT Imaging Agents and imaged using the KODAK In-Vivo Multispectral Imaging System FX.

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Marquardt, D.W., 1963, Journal of the Society for Industrial and Applied Mathematics, v. 11, p. 431-441.

Rao V.L. Papineni, Ph.D. *is a biochemist in Research and Development, Carestream Molecular Imaging and can be reached at rao.papineni1@carestreamhealth.com.*

Douglas O.S. Wood, Ph.D. *is the manager of software development, Carestream Molecular Imaging and can be reached at douglas.wood@carestreamhealth.com.*

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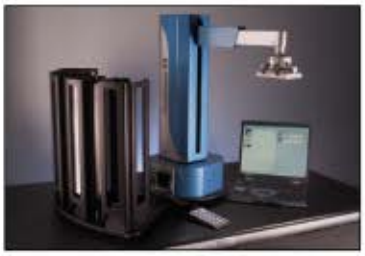

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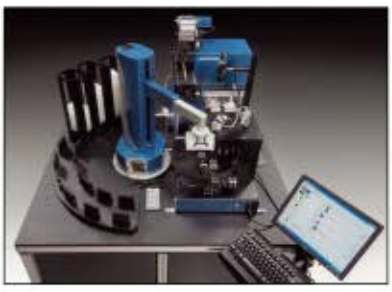

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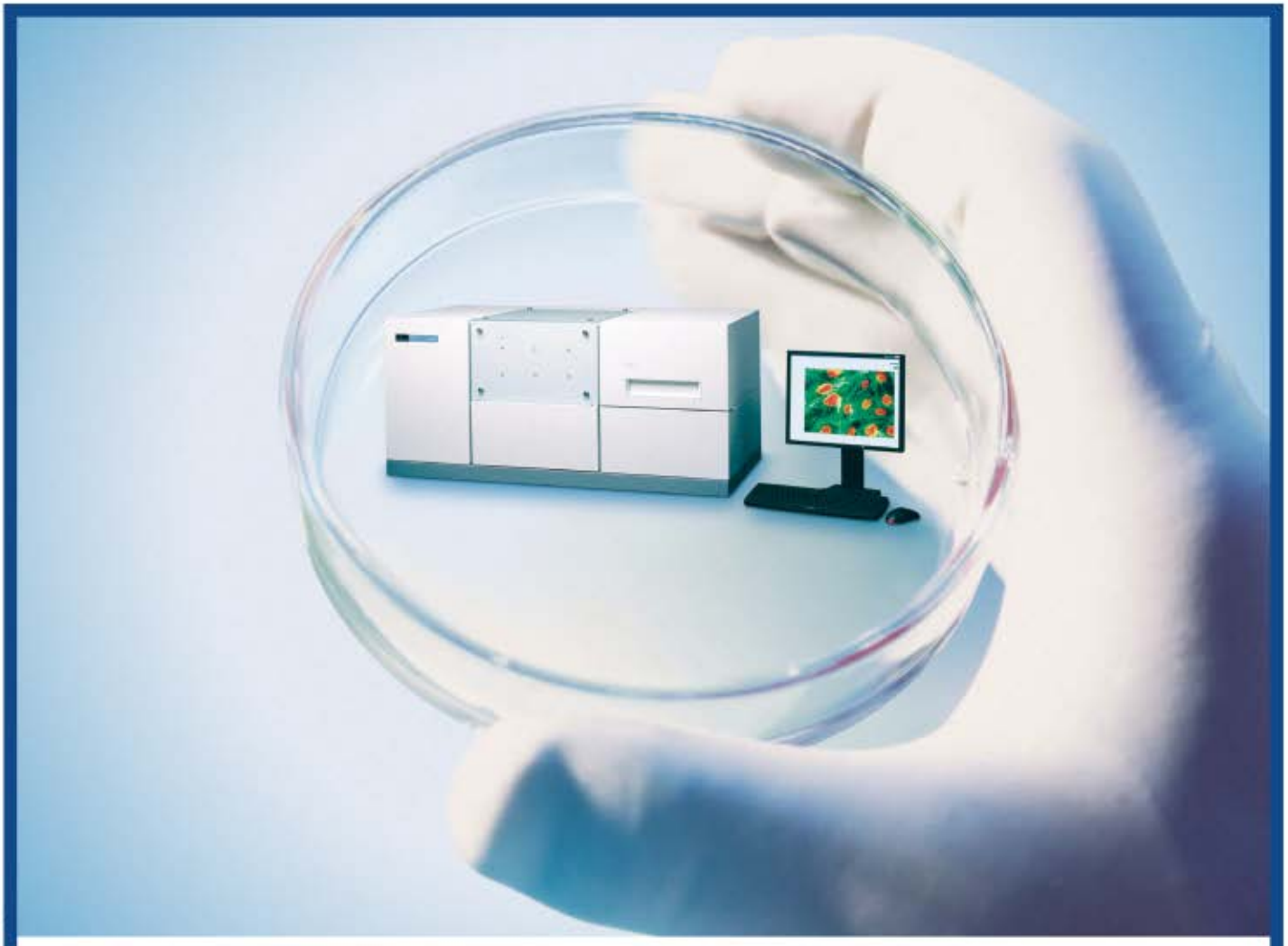

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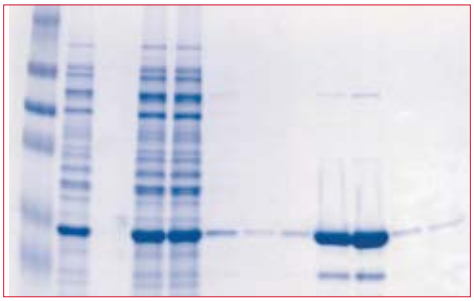

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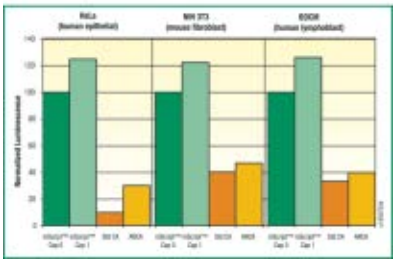

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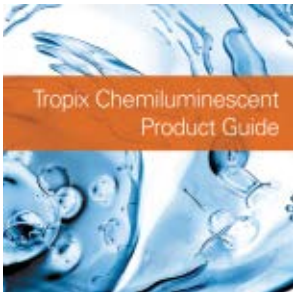

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Model for Writing SOPs

So, you've been assigned to write a Standard Operating Procedure. What a bummer! Or worse, you've been told to look over all the SOPs right before an important external audit or a regulatory inspection. No doubt a recipe for disaster!

Last month, we told you the basics about SOPs. We said, "Never start a new task or project unless you can see your way to the end." Know the who-what-when-where-how to get to the why. This month, we're showing you the path forward and the best place to start your SOP journey. This article introduces the SOP Writing Cycle and its time-honored four phases — Plan, Do, Check, and Act. And, we lead you to the origin of great procedures that work like a charm, give opportunity for change and improvement, and pass anybody's scrutiny (even the auditor's). It's all about planning.

Figure 1. Plan-Do-Check-Act (PDCA): Time-honored Model for Continuous Improvement

Many SOP writers assigned to develop a new SOP or revise an old one jump straight into the first draft without thinking through the real SOP writing cycle. The result? A disorganized, dysfunctional product with serious omissions, excess irrelevant content, and other health problems. The SOP produced is at best only marginally useful. In fact, the SOP and the writer jeopardize each other's credibility from this one simple oversight.

Devoting time to planning how the SOP will be written, from conception to final product, is a surefire way to avoid problems in staying organized and on task. It shortens the draft stage, the review stage, and the writing stage. It starts you out with substance that can self-generate into finished product. Proper preparation avoids the many and sometimes massive rewrites at the end, just when you think you're done.

Figure 2. SOP Writing Cycle Using PDCA: Unbroken Cycle of Continuous Improvement

SOP WRITING CYCLE

Writing or revising any SOP leads to change. Things were done one way before the SOP and another way after. Responsibilities, process flow, action steps, interfaces — any one of these can be affected. Every SOP is the sum of architecture, organization, and infrastructure.

One of the earliest and perhaps best known models for managing change is the Plan-Do-Check-Act cycle (PDCA). Originally conceived by Walter Shewhart in the 1930s and later made popular by Dr. W. Edwards Deming, the PDCA is a simple four-step method for managing change (see Figure 1). First, you plan the activity. Next, you

Norm Moreau, PE

do what you planned then check what and how you did. Then, you act on what you learned and what you know about the good and bad and ugly of how things went. The result is an opportunity for improving any one step, any combination of steps, the whole cycle, and even the product.

Just as a circle has no end point, the PDCA is actually a continuing spiral of improvement. The PDCA is a framework for managing change to improve a process, a system, a way of doing business, even a philosophy. Look at the four steps:

PLAN the change for improvement.

DO what you planned or change for improvement.

CHECK what you've done and change for improvement.

ACT on what you learn and change for improvement.

Both success and failure using the PDCA involve the good, bad, and ugly. The good that results you want to keep and nurture. The bad you want to avoid or reduce. The ugly you want to get rid of or put to good use. It is what it says it is, a cycle, static and influenced by its construction as well as the environment where it is used.

For SOPs, a few embellishments are called for. The PDCA as a guide for improvement through developing or revising SOPs becomes the blueprint for building products that last. Let's call it the SOP Writing Cycle (Figure 2). It is useful whether you're developing a single or several SOPs. Follow its path and the results are both change and improvement.

PLAN

The SOP Writing Cycle starts with preparation, a plan. It can be simple or complex, basic or extensive, based on the scope, the number of SOPs, whether it's to develop or revise them, time frame for completion, who and how many people need to be involved — each factor contributes to how detailed you need to be. Remember, time spent on planning will shorten the draft and release phases and, in fact, the time the PDCA takes to complete its cycle.

To plan an efficient SOP effort, start with a purpose — what product is expected? Your upper management can help here. Ask them what they have in mind, who they have in mind, and when they want it. Having the purpose leads to defining the scope of the SOP; purpose plus scope give you a working title.

Easy work so far. You captured the purpose of the SOP (why), gave it a scope of application (who-what-when-where), know when you have to finish — now comes the fun part of planning — setting a schedule, figuring out what resources you have to have for research, interviews, writing, reviewing, rewriting, getting approvals, and putting the product in the hands and minds of the users.

Planning means design. It is the action of devising a way to realize or achieve a goal, an objective. It means to have in mind and to arrange the parts accordingly. In simpler words, you plan in order to build an SOP. Teachers plan lessons. Architects plan buildings. People plan retirement (ha ha ha). You, the SOP writer, plan the procedure.

KEY POINTS?

Understand the purpose of the SOP: Decide the function and intention of the procedure, what it is to accomplish, and write it down. Keep in mind the golden rule, Ask not what users can do for the procedure; ask what the procedure can do for the users.

Define the scope of the SOP: Arrange the parts and pieces in your mind and on paper. Fit them into a flow that shows the expected process — the structures, systems, and components that interrelate and interface and together take the user to victory.

Come back next month for a new taste of the SOP Writing Cycle, the DO phase when you breathe life into your plan. After that, we'll get to the CHECK and ACT phases. Like a great SOP, this series of articles is about helping you be the SOP authority of choice.

Norm Moreau *is a consultant and trainer known for developing SOPs and implementing SOP programs that demonstrate GLP/GMP and nuclear QA compliance. His products and services are used to achieve ISO 9001 registration and ISO 17025 accreditation or by organizations that simply want to improve their operational efficiency and effectiveness. Since 2000, Norm has been offering the "Writing SOPs that Work" workshop at the National Meetings of the American Association for Laboratory Animal Science (AALAS). He welcomes comments, questions, even criticisms and can be reached at nmoreau@theseuspro.com.*

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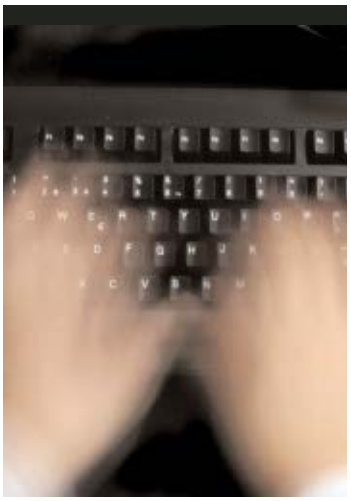
Safety Beyond the Lab: Ergonomics in the Office, Part 2



Previously, we explored the ergonomic risk factors associated with the use of computers. Three of the fundamental ergonomic risk factors are: position/posture, repetition/duration, and force. These can all be influenced by the work area setup and the activities being performed. The good news is that these risk conditions that may cause pain and potential injury can often be easily controlled if one understands basic ergonomic concepts and how to apply them.

To recap, the take-home message in Part 1 was "balanced" and "neutral." Your monitor should be directly in front of you with the upper edge of the screen at eye-level or slightly below. Any hardcopy you work from should be placed in front of you on a document stand (not on the desk at your side) either between the keyboard and monitor or immediately to the side of the monitor. The keyboard and mouse should be in front of you and generally as close as practical to prevent over-reaching. Your wrists should be straight in both the vertical and lateral axis.

In this issue we will discuss repetition/duration and force as it applies to ergonomic risk in the office setting and some possible solutions to get you through the day pain-free.

REPETITIVE MOTION

Repetition by definition involves doing things over and over again. In repetitive work, these same types of motions are performed using the same parts of the body in the same fashion time and time again. In activities such as typing, using a mouse, or referencing paper source documents, the affected muscles, tendons, and joints can be used thousands of times a day, week after week, year after year. The risk of injury is even greater when repetitious jobs involve awkward postures (e.g., bent or flexed wrists) or forceful exertions such as repetitive overreaching for the mouse (shoulder and neck pain).

In conjunction with neutral and balanced as discussed in Part 1, our goal from an ergonomic standpoint is to reduce the number of repetitions experienced by each set of muscles, tendons, and joints throughout the workday and to allow time for recovery. The body has a great capacity to repair itself. Problems arise, however, when the amount of damage or stress accumulated over the course of time outpaces the body's ability to repair. This is when we experience pain, and if the cumulative damage continues, so does the potential for serious injury.

Short breaks in repetitive tasks can be of significant benefit. Break up data entry with variations in activity such as a bit of work at the bench, reading, or any other type of task that uses different muscles and motions than does computer use. It is good to include micro-breaks of just a minute or two every half hour during data entry campaigns. There is good software currently available that tracks keystrokes and mouse movements and alerts you when breaks are appropriate. It is often better to take many small breaks than one long break during the work day.

It is important to examine and analyze the work being performed. Look at this along the same lines as a job hazard analysis where the parts of the job are examined on a task-by-task basis. In many cases that we have seen, there is much unnecessary repetitive work because of poor process design (or the process was really not designed at all — it just grew).

Questions that should be considered: Can parts of this process be automated? Can equipment be linked directly to CPUs for data

collection? Can databases be programmed to "talk" to each other? In some instances, barcodes and readers might be used to reduce data entry. For other types of information collection and entry, readable/scanable forms are an option. It is often well worth investing a little time to engineer a solution that will save significant time and effort in the long run.

Often we can trace pain to mouse over-use. This is often combined with poor mouse location. The conventional mouse requires a great amount of work to be directed through one arm, shoulder, and hand. It is often best to try to distribute this work and share it between both sides. One approach is the use of keyboard commands. Most of the commands commonly used can be accomplished by using keyboard commands (for those of you that remember those keyboard commands from the DOS days, they still work). For example in Windows, Ctrl-A will "select all," Ctrl-C can be used to copy text and Ctrl-V will paste. Look at the menu bar at the top of your document next time you are on the computer; all the selections have one letter is underlined (e.g., File, Edit, View, Table, etc.). If you hit Alt and the underlined letter, the drop down menu will expand just as if you mouse clicked on it. Ctrl and underlined letter on the commands in the drop down menu will perform that function. This can greatly reduce mouse use and, once you get familiar with them, will actually speed up your work.

There are now actually at least a couple of "alternative-mice" that places the tracking device between you and the spacebar. This allows one to use both hands for moving the mouse — again sharing work between hands.

Some software programs also allow you to automate common tasks with scripts called macros. These can significantly reduce the amount of typing you need to do.

FORCEFUL EXERTION

Force is the amount of muscular effort expended to perform work. Exerting large amounts of force can result in fatigue and contribute to injury. The amount of force exerted depends on a combination of factors, including:

- The effort with which one strikes an object (e.g., pounding the keyboard)
- The shape and dimensions of an object you are working with
- How you grip an object or tool
- The preciseness of motion required doing the task
- Duration of force applied by the muscles (e.g., the amount of time spent without a muscle-relaxation break)
- Awkward postures (over-reaching)

In addition to the "pounding the keyboard" example, some areas where we find unnecessary force applied are in writing and filing/shelving. There are two general types of grips people use; a "pincher grip" where you press your finger against you thumb and a "power grip," like you would hold a suitcase. The pincher grip requires much more force and should be avoided when possible (e.g., instead of pulling large files out of a cabinet by grasping with a pincher grip from the top, slide your hand beneath the folder and lift it from the bottom using a power grip).

People often use quite a bit of force holding those standard skinny pens and pencils. Because writing is precise work (you must be able to read what you wrote), there is some resistance between the writing surface and your pen, and the difficulty gripping a thin barrel, you must hold it tightly to maintain control. Much better are those wide-barrel pens and mechanical pencils with the soft grip at the end. One does not need to grip nearly as hard thereby reducing strain on the muscles and tendons. Personal preference does come in here so you might audition a couple of different types to see what feels most comfortable to you. Try to hold the pen as loosely as practical yet still maintain control.

There is not usually a single golden bullet that will be a panacea for one's ergonomic woes. OSHA provides an excellent review through their eTool on ergonomics.[1] The State of Washington also has some very good self-evaluation checklists and guides.[2] One has to recognize and be cognizant of reducing all these risk factors both on and off the job to effectively reduce the potential for pain and injury. In future articles we will also explore ergonomics in the laboratory.

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1. http://www.osha.gov/SLTC/etools/computerworkstations/index.html.
2. http://www.lni.wa.gov/Safety/Topics/Ergonomics/default.asp.

Glenn Ketcham *is a Certified Industrial Hygienist with 22 years experience in the health and safety field. He is currently the Risk Manager for the University of Florida with responsibility for the loss prevention, ergonomics, disaster preparedness, and the occupational medicine surveillance programs. He has managed the laboratory safety programs for both the University of California, San Diego (UCSD) and the University of Florida. In addition, he served as an industrial hygienist with federal OSHA compliance and has a Master's degree in environmental engineering sciences with a health physics concentration.*

Vince McLeod *is a Certified Industrial Hygienist and the senior IH with the University of Florida's Environmental Health and Safety Division. He has 17 years of occupational health and safety experience in academic research with focus in the research laboratory. His specialties are in hazard evaluation and exposure assessments.*

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Retaining Institutional Knowledge When Key Employees Head For the Exits

One of the biggest challenges life sciences organizations have begun to face — and one that will extend through each of the next several years — is the task of retaining critical institutional know-how at a time when the most experienced lab managers have or are about to retire or depart for greener pastures.

Sure, experienced lab professionals have left before. But never before have so many qualified for retirement in such a relatively short window of time. And the increasing competition for top lab talent only exacerbates what has already been termed a serious generational brain drain.

The real challenge for today's laboratory environments is two-fold. First, to retain (possibly by transitioning them to more flexible working schedules) as many of the most experienced lab managers as possible. Second, to capture as much of their on-the-job learning over the course of their careers as practical and reflect that institutional and professional knowledge to a new generation of lab managers.

For too many organizations, the retention of key lab talent often boils down to making a counter offer to someone who has already decided to leave. That may convince them to turn down another job offer, but it also won't keep them around for long. At best, the counteroffer buys a bit more time to leverage the skills, experience, and leadership of the individual lab manager.

But even that misguided "retention" investment will be squandered if the organization doesn't initiate a process — however formal or informal — to extend the individual's intellectual capital to potential successors.

But that's no easy task. Often, key, long-time employees of an organization don't themselves know exactly what parts of their lab experience and knowledge is contributing the highest value to their organization.

Carlota Vollhardt, the former head of knowledge retention and transfer for Pfizer, recently told an audience from the International Association of Corporate and Professional Recruitment that although key contributors may not realize the value they drive for the organization, the people around them typically do.

She says that a key manager's explicit knowledge usually stays with the organization when they leave, but that it's their tacit knowledge that has huge potential for creating a knowledge-based edge over the competition.

"It's the tacit knowledge that's really very hard to replace and hard to acquire because it requires a [continual commitment]" to extract it and pass it along to others in the workplace, says Vollhardt, now the principal of Executive Knowledge International, LLC.

One way for organizations to decide whether to make an investment in knowledge retention and transfer may be to gauge the departing lab manager's willingness to share their learning. Vollhardt says that's because, "Knowledge can only be volunteered, it can't be conscripted."

What It Means For Your Career: As an increasing number of organizations wrestle with knowledge retention and transfer, it's important to understand where you're contributing the most value to the organization and how you might drive your own career by empowering the growth and development of co-workers' careers. Employers appreciate team play and especially now, an experienced manager's willingness to advance the interests of the organization by sharing what you know with others. If you're already doing that, be sure to explain (specifically, if need be) just how you're doing that when it comes time for your next performance review. And if you're not, now may be just the time to accelerate your own career by reflecting what you know before you go.

Joseph Daniel McCool *is a writer, speaker and independent consultant on workforce management, recruiting best practices, and corporate management succession. He is the author of a forthcoming book about global executive recruitment and its impact on corporate performance, culture and profits. He is also a senior contributing editor with ExecuNet, a leading executive business, recruiting and referral network, and his perspectives on recruiting best practices have been cited in BusinessWeek, The Economist, The Financial Times, The Wall Street Journal and other media around the world. Contact him at JoeMcCool@comcast.net*

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- The approvals needed to work with select biological and toxic compounds
- The Standard for Protection against Radiation and the Chemical Facility Anti-terrorism Standard

***George Bleazard** is currently the Corporate Director of Environmental Compliance, Health, Safety, and Security for Sigma-Aldrich where he is responsible for worldwide environmental compliance, occupational health and industrial hygiene, safety, and security functions. In 2003, he led the environmental waste minimization efforts resulting in the company's St. Louis facility receiving the EPA's Region Seven "2003 Pollution Prevention Award". He obtained his Bachelor of Science and Masters of Science from Central Missouri State University and has also worked for Pfizer, Hoechst-Celanese Corp., Monsanto, and the St. Louis County Health Department.*

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Concepts in Asset Management, Maintenance, and Compliance

I wrote about a forty-year logarithmic growth of technology in the April 2007 issue of *Lab Manager*. It talked about increasing numbers and kinds of instruments, the increasing number of analytes, the need for greater and greater sensitivity, and the need for data validation and normalization. Let's now tackle that first facet — instrumentation. Instruments are developed for a few basic reasons:

1. R&D-driven needs for QA and QC of new products
2. The need for greater sensitivity
3. The need for greater productivity, efficiency, and profitability
4. Instrument manufacturers' entrepreneurial fight for market share

Instrument manufacturers are happy to surge forward to meet these ever-demanding needs for industry, environment, and academia.

In good old bookkeeping terms, manufacturers provide assets. We can fill out the concept of assets by including your physical plant, all of your employees, and your contracts or job orders. You, the lab manager, can be entrusted with the protection, nurturing, and management of all these assets.

THE INSTRUMENTS ASSET

Instruments and equipment are the backbone of your lab. You can't accept orders if you don't have the instruments to process samples. Have you seen the cost of an ICP these days? With different instruments costing from $25,000 to $1 million, you can have more money wrapped up in equipment than in your physical lab itself. Big investment means big responsibility; and all of this requires a comprehensive working plan.

By "working plan" we mean a maintenance schedule for everything. Let's tie those three words together from the top of this article. Asset management means knowing where everything is — on a bench, in a closet, in a truck, or at a remote location. Asset management also means that the maintenance and repair records are readily available and that the state of readiness is documented. Instruments that are not fully maintained should not be on-line. Having this information readily available is one major measure of compliance.

Every instrument and every piece of equipment even remotely related to sample acquisition (sample storage, sample preparation, and/or analysis) must be conscientiously maintained to the manufacturer's recommendations. Compare your lab to a symphony orchestra. Every instrument must perform to the manufacturer's specifications. This, in part, is how we keep an orchestra playing in tune. This is also how we keep analytical instruments and equipment performing to the specifications that were important when they were purchased. These performance characterizations help guarantee that the data will be significant according to the standards of each specific project.

Certifying agencies pay you routine visits (inspections). In part, they want to verify that all your instruments and equipment are indeed being maintained to the manufacturer's recommendations. Maintenance records must be current, complete, and legible. A forward-looking plan demonstrates your level of control. Forward-looking maintenance programs are a demonstration of compliance and also are a great management tool.

As you think in terms of being compliant and demonstrating this compliance, you must keep more in mind than just your main-line analyzers. The laboratories' chemical showers, eye wash stations, and hoods all need routine inspections. Vents and HVAC systems need periodic attention. And all sample handling, sample storage, and sample pre-treatment equipment have recommended or required maintenance checks and actions.

SAMPLE PREP EQUIPMENT

Maintenance of sample prep equipment is just as important as is maintenance for main-line analyzers. It's impossible to get good TKN results if half of the digestion block fails to reach full temperature or if you

Gerry Hall

don't achieve even heating. The same is true for microwave digesters, autoclaves, and even your everyday pipetters and balances.

More and more laboratories are setting up programs for testing both fluid delivery systems and their balances. The challenge here is to enact a consistent and rigid program. You must insure weights, volumes temperatures, and pressures are always within specified limits. And data must be reported in a defensible manner. More and more auditors are paying attention to the handling and preparation stages prior to analysis. And keep in mind — there is a significant difference between generating meaningful data and just running samples that have been prepared in a process that is not fully documented.

TODAY'S CHALLENGES

Newly acquired analyzers or equipment are either state-of-the-art or are a technologically new breed of analyzer. Both require the same demonstrations of equivalency or of capability. Where the real challenges arise are when you try to introduce new technology to a certifying agency — especially one that does not have the resources to validate new technologies. Another certifying agency disaster is when you try to introduce a "modified" version of a test. But that is not necessarily an instrument issue. We will not delve into PBM.

I, personally, have faced the issue of bringing new technology on-line in a licensed laboratory. Sure you have to do a fair amount of testing. Quite a bit of data needs to be generated. All possible matrices need to be run. Crossover studies, serial dilution studies, recovery, linearity, and correlations all need to be run. All this work should be done with any new analyzer — existing technology or new technology. But this work should be run to bring on any analyzer — with either new or existing technology —on-line. Only through persistence does new technology become existing technology

WHERE DO YOU GO FOR HELP?

Instrument manufacturers know and understand the challenges of adding a new analyzer to your lab — with both standard and new technologies. They also know what actions are required to keep your (any age) analyzer performing as-new. A well-written manual will devote one section to addressing routine maintenance. As a lab manager, you need to put your trust in the instrument companies. Do your homework. Check their performance claims. Check their references. And check their support systems. In the end, they want to make sales and they want happy users (i.e., positive referrals). A new tool in today's marketplace lies with some of the software products that are entering the marketplace. Some of the new software pays special attention to asset management, tracking maintenance, and demonstrating compliance. So, as a lab manager, how are you managing your assets?

Gerry Hall *is President of TimeKeeper® America. He took an early retirement from DuPont in '85 and has involved himself in many experiences since. He currently owns a software company specializing in asset management and various demonstrations of compliance. Contact: gerry@timekeeperamerica.com or at www.timekeeperamerica.com.*

Deborah Miller
President
DMJ Miller & Associates

If you can't stand the heat, stay out of the lab.

After over thirty years of lab management, Deborah Miller knows all about laboratory warming. She's savvy about meltdowns and boiling points, techno hot spots, budgetary blow-ups, and why change is potentially combustible and must be handled with care. She's put out enough lab fires to merit comparisons to Red Adair, a legend in his own time who snuffed the world's worst oil infernos.

Her book on risk assessment is learned wisdom, born of extensive experience and occasional visits to the infernal underside of lab life. But the essence of good management is dealing effectively with "gray area issues" not found in any library, and the art of evaluating "multiple inputs and outcomes."

Miller was gifted with the confidence to act, and a penchant for partnering. Outgoing and personable, Miller ranges far and wide on the subject of lab management skills, but decisiveness and teamwork are refrain lines of Miller's managerial mantra.

"People say, 'Oh, you're that way because you were in the military,' " says Miller, whose 1977 commissioning as an Army laboratory officer was set in motion by her marriage to an Army lieutenant. But Miller believes her foundation was instead "inculcated by seeing how my parents lived their lives — with a sense of service and emphasis on integrity — and not so much anything they told me."

Her first assignment was Hawaii's Tripler Army Medical Center managing a lab staff of 100, where "I was an anomaly all the way around." Being "junior to everyone in the hospital," and perhaps America's one and only female military lab officer at the time, didn't deter her. She disarmed other department heads through partnering and mentoring arrangements, but when the time came "to make hard decisions, they'd probably say I was no pushover."

Miller's mentoring style is similar to the question-based Socratic method; she poses inquiries to uncover contradictions in the reasoning process of the mentored and herself — a "win-win."

The catch? "You must be willing to take the time to step through all the questions." But the end result is "a stronger sell, because they arrive at the conclusions on their own, and it also teaches them problem solving techniques."

Staff empowerment, says Miller, is often perceived as a threat by middle management. Supervisors typically have good technical skills, but may lack the managerial skills to understand that power derives from staff.

Miller is a reciprocal altruist in the sense that "I understand we all sink or swim together. Not once in all my years did I ever make a decision based on what was best for me first. Even if you have to jump in front of a bullet, you cannot let people mistreat your staff."

Empowerment "ensures an environment where staff, instead of being afraid of making mistakes, is ever vigilant to catch mistakes at the earliest possible stage in the process." Miller tells the story of her flawed standard presentation to nurses about the finer points of taking and transporting blood samples: "I kept doing my dog and pony show, but knew there was some kind of communication block. I wasn't getting through. Then another nurse told me why there was a wall. She said with all the details you give them, the nurses think you're telling them they'll screw things up. They got defensive. They weren't hearing it's a partnership."

It was a moment of truth for Miller, who amended her spiel. "I'd carried that same problem across three different hospitals. I learned to listen for the little clues, like that nurse gave me."

When mistakes do occur, she encourages those involved to determine the cause and suggest corrective steps. "Mistakes are most likely caused by problems involving more than one process. It is least likely you'll fix anything by blaming an individual."

Or, if you're new to a situation, you can turn the mistakes of others to your advantage. "Find

F. Key Kidder

something that is causing aggravation that you can fix quickly, to gain the trust of your staff. I learned that in Army basic training."

The peripatetic Miller, now a quality management systems consultant, left the military hospital world in 1997 to work for the American Red Cross in different capacities. Included in her list of management tools are personal qualities to lead by example:

- Integrity: Know what's right. ALWAYS act accordingly.
- Values: You must believe in the mission of the organization and your lab's ability to support it. There should never be a question of what your standard is. Do things right the first time. The fix usually takes longer. Support your staff; you cannot be watching their backs if you're watching your own.
- Candor: Sometimes you have to be the bearer of bad news. Don't delay. Be clear and direct, and appropriately sensitive.
- Diligence: You cannot expect your staff to be dedicated if you don't work hard.
- Self Confidence and Resilience: When things are tough you need to keep your cool, act decisively, and keep people focused on the solution.
- Keep Learning: From formal training and mentors; get a sense of what works for other managers (and what a bad manager looks like). Be willing to learn from your mistakes, constructive criticism, your subordinates and customers, peers, journals, meetings, and workshops.
- Celebrate: Don't wait for the exceptional to recognize good work and individual and group success.
- Organization: Control your time and paperwork. Don't be late to meetings.

Francis Key Kidder *started out as a journalist before moving on to politics and government relations, where he still keeps his hand in writing. He may be reached at 410-828-6529; info@labmanager.com.*

ADVERTISER INDEX

Effectively Interviewing Employment Candidates

The most common mistake when hiring new employees is failing to define and assess their qualifications in terms of the job roles most crucial to successful employee performance. This was the finding of a 2006 survey of 273 companies by management consulting firm Javitch Associates (Newton, MA). The cost of poor hiring decisions can be substantial. Rick Smith, Senior Vice President of organizational consulting firm Right Management (Philadelphia, PA) notes that it costs an average of 2.5 times an individual's salary to replace a hire who doesn't work out. These include recruitment, training, and severance costs according to a 2006 Right Management survey of 444 companies. In addition, employee morale and productivity can also suffer.

To reduce these adverse effects and minimize poor hiring decisions, hiring managers should employ more careful and formal candidate assessment processes. Yet Lou Adler, author of "Hire With Your Head" (John Wiley & Sons, 2002), notes that relatively few companies have a formal, deliberative process in place to ensure the best hiring decisions are made.

BEFORE THE INTERVIEW

Before beginning to review résumés, identify the most important knowledge areas, skills, and abilities the ideal candidate should possess. Create specific questions to determine if each candidate has these critical job performance factors. Don't simply accept the candidate's word. Plan to ask them to describe situations in which they demonstrated these factors. Some managers ask candidates to demonstrate the skill, solve a problem, or write or create something. For example, a young chemist of my acquaintance was interviewing for a sales position. He given a product bulletin to read and then participated in a mock sales call on a customer.

Schedule the candidate to interview with others such as future peers, managers from other departments with whom they will work, and your own supervisor. After the interview, make sure all of interviewers share their impressions of the candidate with you.

PREPARING FOR THE INTERVIEW

It's in the hiring manager's best interest to help candidates prepare for the interview. This helps assure that their most relevant skills and experience are identified and assessed. Don't make the interview more difficult for you and the candidate by limiting the information you provide beforehand. It's in both your interests to discuss the job opening non-confidentially in advance with the candidate. Follow the advice of professional recruiter Nick Corcodilos, author of "Ask The Headhunter" (Penguin/Plume, 1997), who suggests, "Treat the interview as an open-book test and give the candidate the book before the test."

Also describe the challenges and problems and challenges your team, your company, and your industry face. Observe how well candidates use the information you provide and grade them accordingly.

DURING THE INTERVIEW

Employment interviews provide the employer with the opportunity to get beyond the facts listed in a candidate's résumé and gain some idea of the candidate's compatibility as a coworker. Important attributes such as interpersonal and teamwork skills, oral communication skills, and the ability to think quickly "on one's feet" can be assessed in interviews. How candidates respond to questions such as how they would behave in situations likely to occur in the workplace can help you assess how candidates would "fit" in your work group or team.

Avoid the temptation to dominate the interview conversation. However, do describe the methods you employ in R&D project management. Discuss how your group, department, or team works together with other groups within your company and with customers and suppliers. This will help candidates determine if the workplace culture is compatible with their own ways of doing things.

Coordinate your questions with those of other interviewers. This will allow them to ask some of the same questions you did but in their own words. Additional interviewers also can explore an aspect of the candidate's qualifications that you did not have time to explore. The other interviewers will learn things you don't and be able contribute to deciding if the job candidate would be a productive, congenial coworker. To accomplish this, the interviewers should meet or at least inform the others of issues they plan to discuss with the candidate.

WRAP-UP

Lou Adler recommends that managers conduct an after-the-fact audit to validate the hiring decision. This audit could be used to determine how the best hiring decisions were made and stop doing things that caused the worst ones. This audit should be carried out long enough after the employment interview to enable the hire to establish a track record of performance at the company. This author's sense is that the hire's first annual performance review would be a good time to conduct this assessment.

Better employment decisions can both enhance managers' contributions to their company and their own career advancement.

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

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