
The 2004 *Spectroscopy* Survey of Salaries and Employment Issues

A Look at Spectroscopists' Incomes and Attitudes About Their Jobs

Mike MacRae

In case you hadn't noticed, the nation is in the midst of a presidential election year. Regardless of who's leading in the polls when you read this, which side of the political spectrum you're on, or whether or not you even vote, there's no escaping the current national discussion of hot-button economic issues such as taxes, the federal deficit, and unemployment. In a nation that, for whatever reason, has lost a few million jobs during the past few years, a lot of folks are paying attention to the candidates' plans for economic recovery.

In just a few months, you'll get your chance to vote for the candidate who will take the nation's economy to where you want it to be. In the meantime, the data presented below might help you get your own economic indicators pointing in the right direction.

As a spectroscopist, you have a rather specialized skill set. But in other respects, you're just like anyone else and, thus, probably wish you were earning a bit more money than you are right now. Do you deserve a raise? Are you overpaid? We can't tell you that, but this article — *Spectroscopy's* annual salary and employment survey — can give you a better idea of how you stack up against others with similar skills and backgrounds.

Most people who work around spectrometers have had to invest considerably in their careers. As always, most of the people who answered our survey (60% this year) have graduate degrees. For most, it takes a lot of time, effort, and money to get into graduate school in the first place. From there, it's a long and winding road of lab work, seminars, departmental politics, exams, and all-nighters that further tests the gumption of would-be scientists. Can all this effort result in a satisfying career with a decent income? According to our surveys over the years, the answer is yes — if you really love what you do and are prepared to roll with the changes this dynamic profession can dish out throughout the course of a career. *Spectroscopy's* salary survey is a small sampling of the opinions and experiences of your fellow readers. The methodology is described in the accompanying sidebar. Although our sample is small, our response rate is consistently



strong, at least by marketing standards (15% this year). The cumulative results during the past six years show a small but steady uptick in the average annual salaries of spectroscopists. Other data have been relatively consistent from year to year, with only minor shifts in the level of job satisfaction, the motivation for making a job change, and so forth. This year is no exception and as ever, despite the nation's fractious

political dialog, spectroscopists generally are contented with their place in the economic matrix.

Salaries Continue Their Gradual Climb

The average annual salary of all respondents this year was \$72,140, up slightly better than 4% from 2003's average salary of \$69,180. As Table I illustrates, the rate of increase in the past several salary surveys (1–5) has fluctuated between 1.2% and 8.2%. By those standards, spectroscopists posted a solid gain during last year.

On either end of the 2004 salary spectrum, 2.1% of respondents said they were earning less than \$25,000 per year while another 2.1% said they were raking in more than \$150,000. The largest single group of earners, 8.7%, reported an average annual salary of between \$75,000 and \$80,000.

By field of work. Average incomes for spectroscopists vary widely based upon whether they work in private industry, for the government, or in academia. This year's survey produced some dynamic shifts in the fortunes of these respective groups.

Although this year's numbers reflected a significant leap in the average annual salary for industrial spectroscopists — \$77,420, up from \$71,770 last year — the opposite was true for government and academic scientists. The 2004 average salary for academic spectroscopists fell for the second consecutive year, down to \$59,850 from last year's \$62,130. Government employees also lost ground, falling from \$68,430 in 2003 to an average 2004 salary of \$66,610 (see Figure 1).

By geographic region. It's no surprise that geographic location plays a role in the size of one's paycheck. Higher average salaries along both U.S. coasts serve as bookends for a more modestly paid middle section. However, this year's results revealed some interesting fluctuations in the relative fortunes of various regions. They also showed that higher salaries do not necessarily mean more stability in today's changing job market.

Spectroscopists in the Pacific and Pacific Northwest posted a nearly 8%

salary hike over last year, and the region again topped the survey as home to the nation's highest-paying spectroscopy jobs. This year, the average annual salary was \$78,670, up from 2003's average of \$72,450.

The Northeast/Middle Atlantic region and the Midwest/Great Lakes states both held on to their respective rankings as second- and third-highest regions for average salaries.

After losing some ground in last year's survey, the Northeast/Mid-Atlantic states reported a healthy gain from \$71,380 in 2003 to \$74,770 this year. Salaries in the Midwest region grew at a similar rate, to \$71,480 in this year's survey, compared to a \$68,570 average last year. The South was another big gainer in 2004. Salaries in these states also grew by about 8% over last year to \$69,790 — enough to leapfrog over the Western-Central region, which fell from \$68,240 last year to \$66,760 in 2004 (see Figure 2).

Nationally, nearly 90% of respondents were working full-time and only 3.7% said they currently were unemployed. But despite earning high salaries on average, spectroscopists in the West seem to be feeling the effects of the prolonged economic downturn slightly more intensely than their counterparts elsewhere in the country. Spectroscopy

| Year | Average Salary (\$) |
|------|---------------------|
| 1999 | 59,110 |
| 2000 | 63,940 |
| 2001 | 64,690 |
| 2002 | 67,900 |
| 2003 | 69,180 |
| 2004 | 72,140 |

unemployment rates are much higher in the West than elsewhere, affecting 9.4% of respondents in the Pacific/Pacific Northwest states and 5.4% in the Western-Central region. The region with the next highest jobless rate was the Northeast/Middle Atlantic at 3%, followed by the South with 2.8% and the Midwest/Great Lakes region with 2%.

Spectroscopists in Western states also said they were less satisfied with their current positions than their counterparts in the rest of the nation. Respondents in the Pacific states posted a 13.3% rate of dissatisfaction. They were joined in disgruntlement by 8.3% of their colleagues in the Western-Central region. Although that dissatisfaction rate is more on a par with those found in the Midwest (8.9%) and South (8.6%), it helps to reinforce a perception that there might be unique problems in the Western half of the United States related to the ups and downs of its core industries, most notably the semiconductor business. We will more fully explore the subject of job satisfaction later in this article.

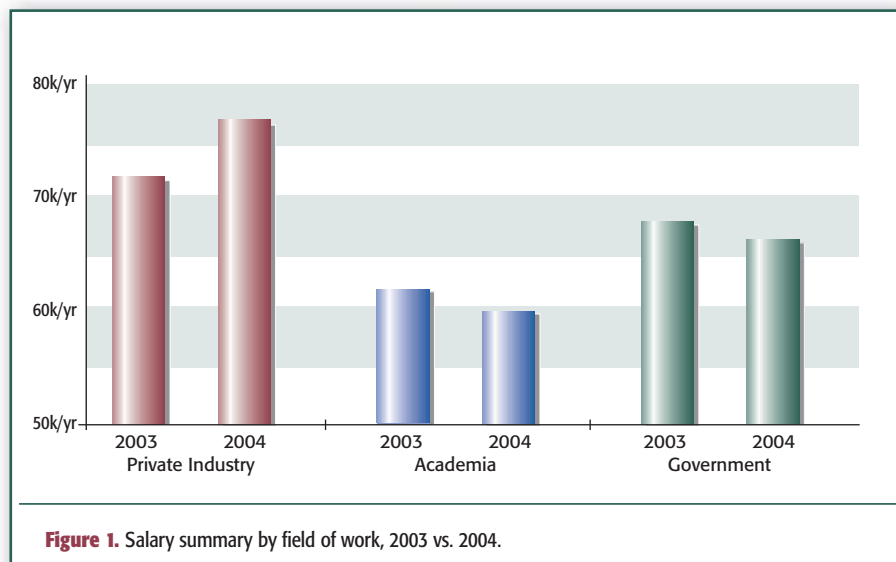


Figure 1. Salary summary by field of work, 2003 vs. 2004.

By Gender. As in the past, our survey response pool included far more males than females in 2004 — 79.1% men and 20.9% women, to be exact. This gender ratio essentially was consistent across all areas of employment: industry, academia, and the government. On average, the men currently are earning \$75,350 per year while the women are earning \$58,680. Last year, men earned \$72,690, and women earned \$58,900.

The gender gap in earnings is influenced by numerous factors, some more easily measured than others. For example, advanced degrees are a major determining factor in annual income. In our survey, males held 89.5% of all the Ph.D.s, 67.9% of the master's degrees, and 74.7% of the bachelor's degrees. Males, on average, seemed somewhat more likely to pursue a graduate degree, with 46.6% holding one or more Ph.D. and 17.4% holding a master's. Slightly more than 20% of women said they'd earned a Ph.D., while 31% had earned a master's. About 32% of the men and 41% of the women said the highest degree they held was a bachelor's.

Another obvious factor behind salary is years on the job. In terms of raw averages, males averaged 21.75 years of experience while females averaged 14.43. Our results showed far greater gender balance among rookies, but a large drop-off in women's earnings among the ranks of senior employees. Among workers with less than 10 years of experience, 60% were male and 40%

| Satisfaction Level | Males | Females |
|--------------------|-------|---------|
| Very Satisfied | 28.8% | 10.5% |
| Satisfied | 41.5% | 49.1% |
| Somewhat Satisfied | 21.2% | 31.6% |
| Dissatisfied | 8.5% | 8.8% |

were female. Among spectroscopists with 10–20 years of experience, 74.7% were male and the percentage of females fell to 25.3%. At 30 or more years on the job, only 6.3% of our respondents were females.

From year to year, this survey compares the relative proportion of men to women in key areas of employment. These breakouts normally are consistent throughout the years. In the largest employment category, private industry, 79.9% of respondents were male and 20.1% were female. The spectroscopy workforce in both academia and the government was 78% male and 22% female. The main point of interest is that the number of female employees in government seemed to be regaining ground lost in 2003, when the number posted a dramatic slide from 31.4% in 2002 to 17.9% last year.

Although these statistics show that men and women face different experiences in the workplace, both genders seem comparably satisfied with their professional situations. Of those who said they were “very satisfied” or “satisfied” with their current position, 81.4% were male and 18.6% were female. Of

those who said they were “somewhat satisfied,” 71.4% were male and 28.6% were female. And, of those who were “dissatisfied,” 78.3% male and 21.7% were female. Satisfaction level by gender is broken out in Table II.

Age, Experience, and Education

They say there's no substitute for experience. Although the survey data showed that average earnings begin to plateau around the 20-year mark, the connections between length of experience and earning potential are clear.

The average age of our respondents was 47 years (and three months) old. The median age for men was just under 49 and the median age for women was 40 and a half. The largest concentration of respondents, 21%, fell into the 50–55 year age bracket. By contrast, only 4.5% said they were younger than 30, while 14% said they were more than 60.

The average length of career experience for all respondents was 20.3 years. Newcomers with less than 10 years' experience made up 19.2% of the responses and were earning an average of \$49,000 per year. Spectroscopists with from 10 to 20 years of experience, repre-

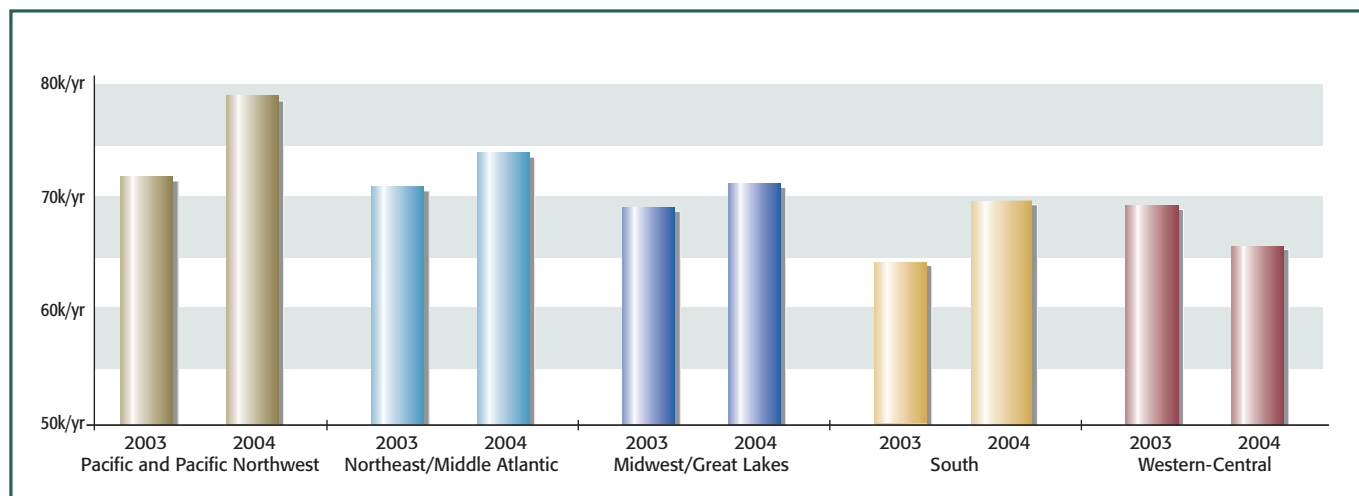


Figure 2. Salary summary by geographic region 2003 vs. 2004.

Methodology

The 2004 *Spectroscopy* Salary and Employment Survey was mailed to 2000 randomly selected *Spectroscopy* subscribers. The surveys were mailed on December 10, 2003. Of those, five were undeliverable and 294 were completed and returned, for a response rate of 15%. Certain percentages add up to more than 100% because respondents were allowed to provide multiple answers; some totals are more or less than 100% due to rounding. All phases of the study were conducted or supervised by The Wayman Group (Cedarhurst, NY), an independent research firm. To encourage participation, *Spectroscopy* offered to donate \$1 to the recipient's choice of the following three charitable organizations: the American Cancer Society, the American Heart Association, and the AIDS Foundation.



senting 27.9% of respondents, were making \$70,960. Those with from 20 to 30 years on the job, the largest segment at 35.4%, were making \$79,710. Finally, the 17.6% of respondents reporting more than 30 years' experience were making an average of \$82,910 a year.

As befits a profession steeped in the physical sciences, the highest salaries went again this year to spectroscopists who invested in graduate education. The average salary for all Ph.D. holders (who made up 38% of this year's response pool) was \$83,690, up from last year's \$81,900 average. This year, 26% of Ph.D. holders reported making more than \$100,000 per year, while the highest paid Ph.D.s in this year's survey said they were making about \$155,000.

Not all Ph.D.s are raking in the big bucks, though. The survey revealed 4.5% of Ph.D.s pulling in modest average annual incomes of less than \$35,000.

Spectroscopists with master's degrees (21.4% of those surveyed) earned an average of \$69,680 this year, up from \$67,280 in 2003. Our 100K Club included 14.5% of this year's MS holders, while 6.4% earned below \$35,000.

Those with bachelor's degrees (34.7% of the response pool) earned an average salary of \$62,130. Even BS holders were represented among the survey's highest earners, with 5% reporting salaries above the \$100,000 threshold. But, as one might expect, 15% said they were making less than \$35,000 in 2004. Spectroscopists with bachelor's degrees continue to see the largest annual jumps in

average salary. Last year, they averaged \$58,410 per year and in 2002, they made \$55,590.

Supplemental Compensation

Our survey distinguished between base pay, as reported thus far, and incentive or bonus compensation. Only about 39% of our respondents say they are eligible for these extra earnings, but bonuses are an important factor in job satisfaction for spectroscopists. For employers, offering these extras is key in recruiting and retaining the cream of the crop.

When it comes to participation in a bonus plan, graduate degree holders were not necessarily at an advantage — 42% of BS-level spectroscopists expect a bonus this year, compared to 39.7% of the MS-level scientists and 36% of Ph.D. holders. Academia and the government definitely are not the places to look for work if a bonus plan is important to you. Only 9.3% of government employees and 10.2% of academics were eligible for supplemental income. In private industry, however, 55.6% of those surveyed were expecting some form of extra earnings this year. These payments sometimes can be sizable. More than 12% of industrial spectroscopists said they'd be getting on the order of \$15,000 or more. The average bonus for all respondents was \$5850. Just under 55% of those earning a bonus will be getting less than \$5000; 22.5% will earn between \$5000 and \$10,000; and 22.5% were in the top range of \$10,000 to \$15,000 or more this year.

Satisfaction

As suggested earlier, most spectroscopists who answered our survey indicated that they were, on the whole, satisfied with their current position. There was a slight increase in the number who said they were dissatisfied, and a slight decrease on the opposite extreme, with fewer readers claiming to be "very satisfied." However, by and large, employers can take heart that their laboratories tend to be populated by contented spectroscopists. This year, 24.1% said they were "very satisfied," compared to last year's rate of 28.5%. Another 44.8% said they were "satisfied," just slightly higher than last year's 43.8% finding. The more cautious readers who said they were "somewhat satisfied" made up 23.1% of this year's poll, compared with 21.5% last year. And, finally, 8% told us they were outright "dissatisfied" this year, up somewhat from last year's 6.3% result.

Is there a correlation between salary and satisfaction? Probably. Those with the highest levels of satisfaction posted an average annual salary of \$75,490. Among those who said they were only somewhat satisfied, the average income drops to \$66,360. Dissatisfied spectroscopists were earning, on average, \$64,200.

What are the factors behind dissatisfaction? Our survey can only suggest possible clues. Here is a composite profile of the typical dissatisfied spectroscopist — maybe you know him. He's a 47-and-a-half-year-old male with a BS in chemistry who has worked for about 20 years in a QA/QC lab in the Midwest. He's fed up with his job because the pay

is lousy, the work environment stinks, and the work no longer is challenging. He's somewhat concerned about job security in the era of corporate downsizing and outsourcing, and he'd entertain the notion of relocating for more security. But mainly he's just looking for a bigger paycheck and the chance to do something more stimulating than polishing glassware.

What's it like on the opposite extreme? Our composite of a typical "very satisfied" spectroscopist actually has a lot in common with the disgruntled worker above. He too is male, 47 years old, and living in the Midwest/Great Lakes region. This veteran of 21 years in private industry, however, holds a Ph.D. and has attained a senior research position on his company's applied R&D team. He is strongly committed to remaining in his current position, but if he ever did decide to move on, it would be to tackle a greater intellectual

challenge or to take advantage of greater opportunities for advancement.

How Do Spectroscopists Stack Up?

It's worthwhile to measure how spectroscopists are faring relative to scientists working in other professional categories. These samples from other recent surveys shed some light on this question.

Chemists and materials scientists.

The U.S. Department of Labor (DOL) reports that chemists and materials scientists held about 92,000 jobs in 2000, half of which were in manufacturing firms. DOL projects employment growth for chemists to be in step with the average rate for all occupations through 2010, with drug manufacturing, R&D and testing firms driving the demand. The government expects chemical and drug companies to continue their traditional investment in in-house R&D efforts, but that outsourcing

this work to independent firms will help maintain growth in demand for chemists with higher degrees. Apart from jobs in the chemical, pharmaceutical, and biotechnology sectors, however, DOL is forecasting a decline in employment growth for chemists. These companies will further downsize their in-house capabilities with little, if any, new hiring beyond replacement of retirees.

DOL's 2000 figures report a median annual salary for chemists of \$50,080. The agency includes all chemical specialties in this calculation — analytical, organic, inorganic, physical, and so forth. The lowest 10% of this group earned less than \$29,620 and the highest 10% earned more than \$88,030. The median salaries in the three top industrial sectors were: federal government, \$65,950; pharmaceuticals, \$50,820; research and testing services, \$41,820.

Life scientists. A survey with a far

Changes in the Pharmaceutical Industry Bring Headaches, Opportunities for Spectroscopists

"Where are the good jobs?" asks Emil W. Ciurczak. "With major pharmaceutical companies laying off thousands, it's not in industry anymore." Ciurczak — a contributing editor to *Spectroscopy* with more than 30 years' experience in industry, academia, and consulting — has seen the highs and lows of the spectroscopy job market from multiple viewpoints. As newly severed industrial spectroscopists and recent graduates hit the job market, Ciurczak sees a surge in the number of new consultants on the scene, with plenty of competition for a slice of the pharmaceutical industry's growing outsourcing budget.

"This greater reliance on outsourcing and an influx of consultants in the 'new' pharmaceutical industry will create some headaches for experienced consulting spectroscopists," he said. "There are already too many consultants from other fields saying they can do pharma work. I hate to say it, but it's muddying the waters for some of those who have actual experience doing spectroscopy in the pharmaceutical industry."

Ciurczak said he is concerned that pharmaceutical companies are retaining firms that could possess expertise in regulatory issues such as cGMPs and 21 CFR Part 11, but do not have sufficient knowledge of the spectroscopic data with which they must interact. "And when they mess up," he said, "all spectroscopy consultants get painted with the same brush."

But others say the pharmaceutical industry still holds promise for spectroscopists, especially those whose skill set is in line with emerging growth opportunities. Gary E. Ritchie, a pharmaceutical spectroscopist with the United

States Pharmacopoeia (Rockville, MD), said FDA's Process Analytical Technology initiative is one such opportunity. This initiative is part of a major shift in the agency's approach toward analytical technology, he said, where the benefits of real-time process and product-quality measurements increasingly are factored into FDA's approval of pharmaceutical analytical methods. "Pharmaceutical companies will turn to spectroscopists to help them assess the utility of appropriate technologies — be it near-IR, Raman, UV/Vis, MS, or x-ray — for process capabilities," Ritchie said.



broader sampling pool than *Spectroscopy's* found that the median annual salary for bioscientists is \$65,000 per year. The report, *Compensation of Life Scientists in the United States of America — 2003*, was released in September 2003 by Abbott, Langer & Associates (Crete, IL). It was based upon 12,600 respondents working in 18 benchmark jobs. Fields of specialization with the highest median incomes — between \$87,500 and \$108,750 per year — were radiation; drug discovery, development, and delivery; veterinary science; and pharmacology. Specializations with the lowest median annual incomes — between \$50,000 and \$53,800 — were general biology, molecular biology, aquatic sciences, and wildlife biology. See www.abbott-langer.com/biosumm.html for more details.

Perspectives On a Changing Field

As this year's crop of newly minted Ph.D. spectroscopists prepare to collect their sheepskins this spring, what awaits them in the job market? We

asked a top academic spectroscopist for his take.

"I have seen the number of people contacting me from industry concerning openings for Ph.D. and MS students really dry up over the past three years," said Peter R. Griffiths, a professor of chemistry at the University of Idaho (Moscow, ID). "Some jobs are available, but they are few and far between at this time."

Griffiths, who for decades has been a leading figure in the vibrational spectroscopy community, said even his best graduate students must now look harder than ever for jobs — or be willing to forego higher starting salaries in exchange for benefits once taken for granted. "I had an outstanding postdoc in my group who applied for a position with a salary of less than \$32,000 just because it was permanent," Griffiths said. "He finished up getting a position with a pharmaceutical company paying about three times more than this, but it took him many months of applying."

Griffiths' view that the demand for

spectroscopists seems to be changing is supported in the accompanying sidebar. There, we present the perspectives of two other working spectroscopists who have built careers around the pharmaceutical industry. They describe a changing industry, offering both new opportunities and new challenges for pharmaceutical spectroscopists.

There are as many perspectives on the spectroscopy job market as there are spectroscopists. Although our modest survey measures only a small sample of them, the results provide one of the few metrics available to help spectroscopists better gauge their standing in today's changing workplace.

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Topics of Interest for 2004

Although *Spectroscopy* is looking for articles on any interesting technique or application, there are certain topics we expect to play a particularly prominent role this year. We invite researchers engaged in the fields listed below to consider *Spectroscopy* as a forum for their work:

- Pharmaceutical/Biomedical
- Drug Discovery
- Mass spectrometry
- Single-cell detection
- Instrument miniaturization
- Process Analysis
- Microspectroscopy/imaging
- Novel uses of chemometrics

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