

# Global Economic Upturn in 2003 Bodes Well for Spectroscopy Market

**Lawrence S. Schmid**

Strategic Directions International  
Los Angeles, CA

The laboratory analytical and life science instrument industry performed well during a period in which whole sectors of the global economy sputtered. Buoyed by the dynamic expansion of life science-related procurements, the industry weathered the storm of bad news in semiconductors, telecommunications, metals production and fabrication, and chemicals production. Still, 2002 was not the year the industry had hoped it would be. According to *Instrument Business Outlook (IBO)*, a publication of Strategic Directions International (SDI, Los Angeles, CA), the total worldwide market of instrumentation and related aftermarket and service revenues reached the \$24 billion mark, growing about 8.2% from the 2001 level. However, this growth was a full percentage point lower than predicted at the beginning of 2002. Clearly, the economic malaise in the United States, Europe, and other parts of the world was a retarding factor in meeting growth projections. SDI's projection for 2003 is for only a slightly improved 8.4% growth for the overall market.

Emblematic of a somewhat disappointing year, there were a number of industry announcements chronicling a series of downsizing and restructuring moves by major suppliers. Agilent Life Science/Chemical Analysis (Palo Alto, CA), PerkinElmer (Norwalk, CT), and Thermo Electron (Waltham, MA) cut staff, dropped unprofitable product lines, and closed facilities in March 2002. Later in the year, additional cuts were unveiled by the likes of Applied Biosystems (Foster City, CA), Bruker Daltonics (Billerica, MA), and Tecan (Männedorf, Switzerland). Major reorganizations at Waters (Milford, MA) and PerkinElmer were also announced. Some of this discouraging news involved traditional analytical product areas, but it also related to life sciences, the savior of the industry for the past several years. A pause in pharmaceutical spending, biotechnology profitability woes, and a glut of expensive systems recently installed were causes of industry concern. Early signs, however, suggest this interruption was an anomaly.

SDI categorizes the spectroscopy market into three distinct sectors: molecular, atomic, and mass spectrometry. The applications of the techniques included in each sector and their prospects differ significantly, even within each sector. The overall worldwide spectroscopy area accounted for almost \$5.3 billion in revenues for 2002, or

**Table I. Spectroscopy product growth prospects for 2003.**

Fastest-growing		Slowest-growing	
Quadrupole time-of-flight	15–20%	Sector mass spectrometry	–3 to –1%
Fourier transform–ion cyclotron resonance	15–20%	Atomic absorption	0–1.1%
High-resolution liquid chromatography–mass spectrometry	12–15%	Fluorescence	2–3%
Nuclear magnetic resonance	8–10%	Arc/spark inductively coupled plasma	3–4%
Raman	8–10%		

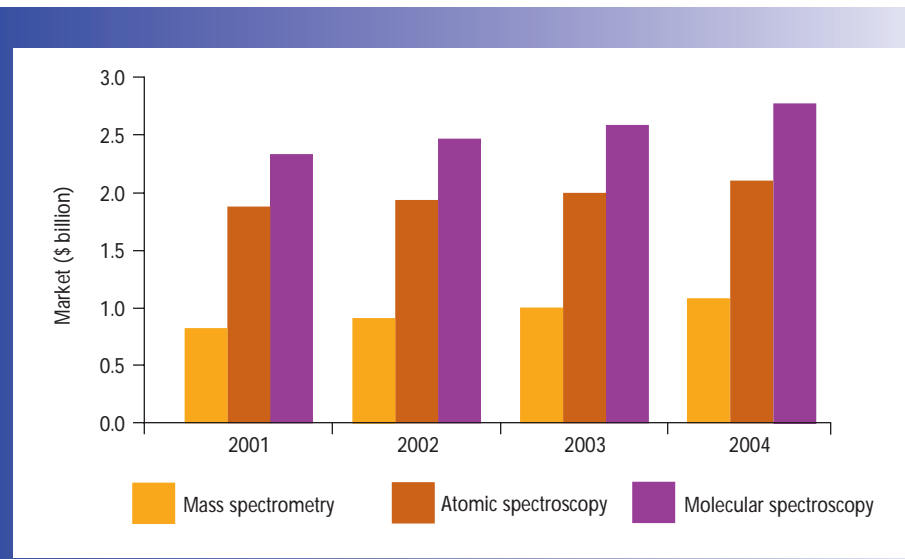
about 22% of the total laboratory analytical and life science instrument market. The overall spectroscopy market is estimated to have grown slightly more than 5.5% in 2002, a modest improvement over 2001 growth. It is estimated that the market will expand 6.0% in 2003.

Molecular spectroscopy techniques account for about 46% of the spectroscopy market, although many different techniques are represented. Atomic spectroscopy is the second-largest sector at almost 37%, while mass spectrometry (MS) represents just 17% of spectroscopy revenues. It should be noted, however, that general-purpose liquid chromatography–mass spectrometry (LC-MS) and gas chromatography–mass spectrometry (GC-MS), major MS techniques, are not included here as they are considered to be part of the chromatography market. Revenues of these hyphenated techniques would increase the MS figures by two-thirds.

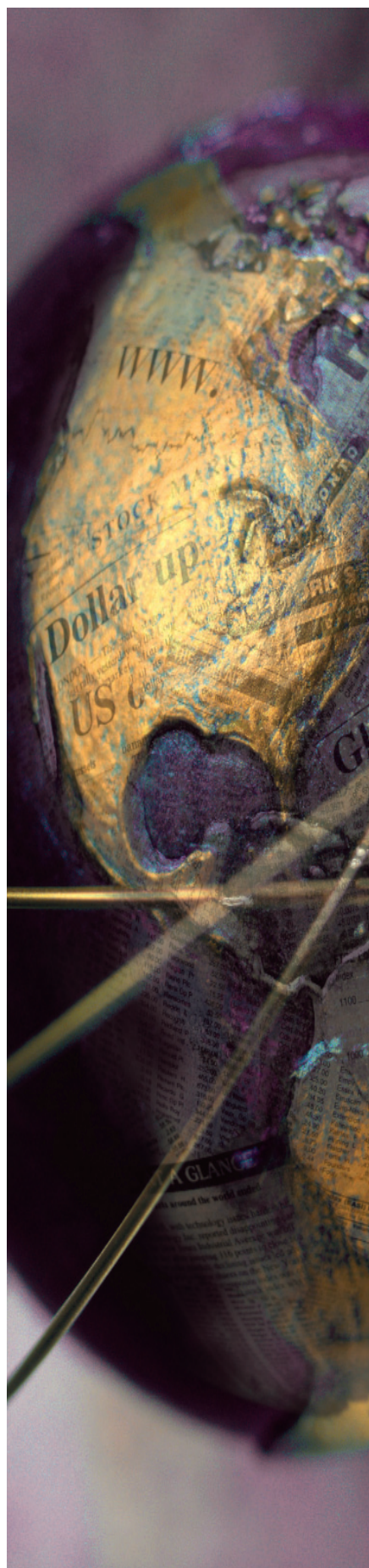
## MOLECULAR SPECTROSCOPY

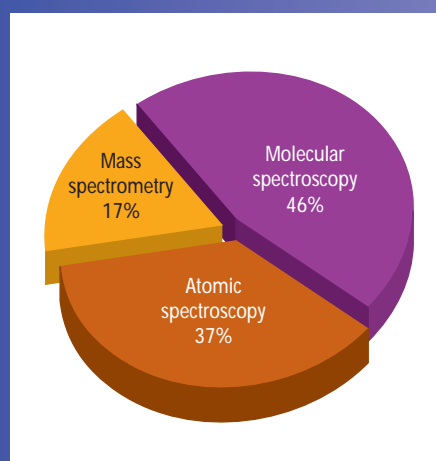
The market for molecular spectroscopy approached \$2.5 billion in 2002. And although not all portions of the market performed equally well, the diversity of molecular spectroscopy contributed to an overall consistent growth of about 5% in 2002, which should continue into 2003. No single technique dominates this market, but three techniques each account for more than 20% of the overall molecular spectroscopy market.

The primary demand for molecular spectroscopy comes from strong, growing life science industries, including the pharmaceutical, biotechnology, organic chemicals, and academic industries, which are also the primary contributors to growth of the market. Molecular spectroscopy techniques have an enormous range of applications, but also experience lower demand in other industries, many of which are currently depressed.



**Figure 1.** Spectroscopy market by product segment.





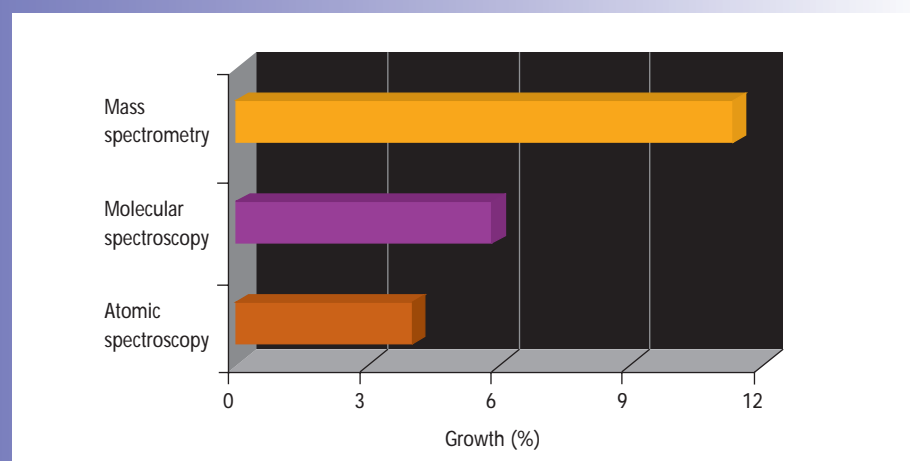
**Figure 2.** Percentage of 2002 revenues (\$5.3 billion) for each spectroscopy market sector.

Ultraviolet/visible (UV/Vis) spectrophotometers make up the largest portion of the molecular spectroscopy market, but also one of the slowest-growing segments. Visible-only and non-scanning units are actually experiencing declining sales. Faster and more powerful types of instruments, at marginally higher prices, are replacing these lower-performance instruments.

Nuclear magnetic resonance (NMR) spectrometers represent the most dynamic molecular spectroscopy technique, with estimated 2003 growth of almost 10%. The continual development of more powerful magnets, combined with improved probe designs, is stimulating NMR purchases. The NMR market may soon overtake UV/Vis as the largest segment of molecular spectroscopy. The overall Raman spectroscopy market continues to experience strong demand, with 2003 growth expected to be in the high single digits. Microscope-based dispersive systems, as well as Fourier transform (FT)-Raman add-on units for infrared (IR) systems, have found widespread use in the chemicals and pharmaceutical sectors. Benchtop dispersive systems using fiber-optic probes also have good prospects, although significant numbers of benchtop Raman systems are focused more on process applications than those in the laboratory. So growth in the lab is somewhat muted.

IR and near-infrared (NIR) instruments are now considered mature technologies and are likely to experience continued moderate growth, with FT-based instruments leading the way. Color-measurement instrument demand dropped off significantly in 2001 and 2002 because of end-user industry conditions, especially for textiles and printing. However, a rebound is expected in 2003 as global economic conditions improve.

The fluorescence market is continuing to exhibit relatively low growth due to shrinking demand for very simple instruments such as luminometers and filter fluorometers. Spectrofluorometers and multifunctional fluorometers offer more promise, but



**Figure 3.** Estimated growth in spectroscopy sectors for 2003.

demand for fluorescence detection continues to shift toward microplate readers.

#### ATOMIC SPECTROSCOPY

Atomic spectroscopy did better in 2002 than 2001, but it was still a difficult year for most suppliers. The semiconductor industry did not rebound in 2002 as many had hoped, and there is still no consensus on when in 2003 that turnaround will occur. The loss-making metals industry held down capital expenditures, especially in the United States and in Europe, but environmental testing labs saw some improvement in revenues and profits. However, because atomic spectroscopy is so oriented to industrial activity, the poor overall economic environment held it back.

The market for atomic spectroscopy is steadily improving, and growth rates are expected to increase during the next few years. In 2002, the overall growth rate for atomic spectroscopy was 3.5%, which should improve to 4.0% in 2003 and still further to 5.5% in 2004. These gains are due to a combination of factors, including new environmental regulations coupled with increased environmental spending, a hoped-for resurgent semiconductor industry, and greater acceptance of ultrapure water analyzers (total organic carbon analyzers) in pharmaceutical and other applications.

Individual techniques will display disparate growth rates. The greatest growth for 2003 is expected from x-ray techniques — x-ray diffraction (XRD) and x-ray fluorescence (XRF). Single-crystal XRD is the fastest-growing atomic spectroscopy technology, fueled by its use in cutting-edge proteomics research. The market for XRF is profiting from new portable and handheld energy-dispersive instruments. In the longer term, total-reflectance XRF will benefit from an upturn in the semiconductor industry.

Increasing semiconductor, pharmaceutical, and environmental applications will keep inductively coupled plasma (ICP)-MS and elemental analyzers growing at 5.5% and 4.5% respectively. ICP instruments will

not grow as fast as ICP-MS, but may have the most to gain from projected stringent regulations on arsenic in drinking water.

Arc/spark, which had a disastrous year in 2002 due to the contracting metal industry, will grow at 3.3% in 2003. Nevertheless, the market for arc/spark will not return to 2001 levels until 2004. The slowest growing technology is atomic absorption (AA), which will only grow at 1.1% for 2003. Because of the maturity of AA as a technique, the market is largely stable and focused on replacements and aftermarket purchases.

#### MASS SPECTROMETRY

Despite global economic pressures and the drawback in many companies' capital expenditures, demand for MS still saw nearly double-digit growth in 2002, thanks to its heavy use in the pharmaceutical and biotechnology industries. Although the market for MS is not expected to see a return of the dramatic growth of the late 1990s, when a number of revolutionary technologies were widely introduced to the market, it should see a significant rise in growth for 2003 to 11.3% from the sub-double-digit growth during the last two years. A number of companies in the pharmaceutical sector have been limiting capital expenditures recently, but that appears to be a temporary lull. Drug companies have paused their rapacious appetite for drug discovery to reevaluate research and development (R&D) philosophies based on successful new drug launches, or lack thereof.

Although quadrupole time-of-flight (Q-TOF)-MS experienced extremely strong growth from 1998 to 2001, recent growth has begun to cool. Near-term expectations are for growth rates that are more sustainable for what has now become a very significantly sized MS market. The majority of end-users who were inclined to adopt high-end Q-TOF technology have done so. Q-TOFs are now seeing more competition from less-expensive and simpler MS techniques, many of which have capabilities that have significantly increased in the past few years. In response to this trend, lower-cost

Q-TOF systems are now beginning to appear. In any case, Q-TOF technology should continue to exhibit the strongest growth of all MS techniques in 2003.

High-resolution LC-MS grew nearly 13% in 2002, and will not lag far behind Q-TOF growth in 2003. High-resolution LC-MS instruments have become essential tools for drug discovery. TOF-LC-MS will continue to be the strongest-growing type of high-resolution LC-MS. The market for matrix-assisted laser desorption/ionization time-of-flight (MALDI-TOF) is now relatively saturated, and suffers from competition with LC-TOF and Q-TOF techniques as well. MALDI-TOF should see growth in 2003 of about 7%, nearly the same as in 2002. FT-MS has seen significant improvements in technology, particularly in the power of the magnets used. FT-MS sales should expand close to 20% in 2003. However, demand for magnetic-sector MS is falling off. Large academic and governmental organizations will continue to upgrade their capabilities on a sporadic basis, but overall, these systems are being replaced by less-expensive, similarly performing MS techniques.

#### SPECTROSCOPY REMAINS AN INDISPENSABLE ANALYTICAL TECHNIQUE

The plethora of spectroscopy-based instruments in use in laboratories around the world represents an indispensable source of analytical capability that will continue to grow in use and application, albeit moderately. Except for the dynamic MS market, most spectroscopy segments are well established and experience infrequent technical enhancements. However, as we have seen in prior years, when innovative approaches are incorporated into these instruments, a spurt of growth immediately follows. This was true of AA, NIR, ICP-MS, and certainly NMR.

So it seems that mature spectroscopy instruments go that way because of a slowdown in supplier R&D, not reduced customer acceptance. Recent softness in the marketplace due to economic conditions has not helped, but hopefully as economic conditions improve, innovative product introductions will follow, and the spectroscopy market will accelerate. And along the way, we may see another entirely new type of instrument modality appear that will engender excitement in the field. Perhaps ultrasonic spectroscopy is just one such possibility.

**Lawrence S. Schmid** is president and chief executive officer of Strategic Directions International, a consulting and marketing intelligence firm. For more information on IBO or other instrumentation research, contact Strategic Directions International, 6242 Westchester Parkway, Suite 100, Los Angeles, CA 90045, (310) 641-4982, fax: (310) 641-8851, e-mail: IBO@strategic-directions.com. ■