



2001/2002 MSPPSA SERIES

DENSITOMETERS & IMAGE ANALYSIS

AN ANALYSIS OF
MARKET SIZE & GROWTH
MARKET SHARE
PURCHASE PLANS &
SUPPLIER ASSESSMENT FOR
THE EUROPEAN LIFE SCIENCE RESEARCH
MARKET

A Multi-Client Report

by
PhorTech International
San Carlos, California

February 9, 2001

Copyright 2001 by PhorTech International, 238 Crestview Drive, San Carlos CA 94070. All rights reserved. No material contained in this report may be reproduced in whole or in part without the written permission of the publisher. This report is not intended to be, and should not be construed as a recommendation for the purchase or sale of any securities mentioned herein. The information has been derived from statistical and other sources which we deem reliable but their completeness cannot be guaranteed. Opinions expressed herein are based upon our interpretation of available information and are subject to change.

TABLE OF CONTENTS

I. BACKGROUND.....	9
A. Survey Objectives	10
B. Survey Methodology.....	14
II. DEMOGRAPHIC SEGMENTATION.....	17
#0. Geographic Segmentation of Respondents.....	18
#21. Segmentation by Organizational Type.....	20
#20. Segmentation by Scientific Discipline.....	27
#9. Samples Types Analyzed by Image Analysis	29
#10. Typical Sample Dimensions	32
#11. Percentage of Image Analysis Using Radioisotopes.....	34
#12. Current Usage of Isotopic Labels	36
#13. Current Usage of Non-Isotopic Labels.....	38
#17. Stated Purpose for Using Image Analysis	40
III. MARKET SIZE & GROWTH	43
#1. Current Use of Image Analysis, Market Size	44
#2. Densitometer/Image Analyzer Installed Base Audit.....	46
#2+. Sharing of Instruments Among Users	51
IV. MARKET SHARE	61
#2++. Analysis of Installed Base of Imaging Instruments.....	62
V. PURCHASE PLANS.....	83
#5. Densitometer/Image Analyzer Sales Projections	84
VI. CURRENT & FUTURE METHODOLOGY	87
#14. Interest in Imaging with Multiple Labels	88
#15. Current and Future Imaging Capabilities.....	89
#16. Current and Future Image Resolution	92
#18. Computer System Currently in Use.....	94
#8. Most Important Issues for CCD-based Imaging System ..	96
VII. SUPPLIER ASSESSMENT	99
#3. Reasons Given for Image Analyzer Brand Selection	100
#4. Image Analyzer Customer Satisfaction Rates.....	115
#4+. Reasons for Satisfaction/Dissatisfaction with Analyzer	119
#19. Image Analyzer Customer Satisfaction with Distributors ..	131
#6. Ranked Image Analyzer Manufacturers' Performance	137
VIII. FUTURE EXPECTATIONS.....	145
#7. Desired Improvements in Image Analyzers	146

IX. THE QUESTIONNAIRE.....153

LIST OF TABLES & GRAPHS

I. BACKGROUND.....	9
Survey Objectives	10
Survey Methodology	14
Survey Response Rates.....	14
II. DEMOGRAPHIC SEGMENTATION.....	17
Geographic Segmentations for Names Used in Survey.....	18
Respondents' Geographic Location, All Respondents	19
Distribution by Type of Organization, All Respondents	20
European Respondents' Location, by Type of Organization	21
U.S. Respondents' Location, by Type of Organization	25
Distribution by Scientific Discipline, All Respondents.....	27
Sample Types Currently Analyzed by Image Analysis	29
Verbatim Descriptions of 'Other' Image Analysis Sample Types.....	30
Typical Sample Dimensions, All Respondents	32
Percent of Image Analysis Work Utilizing Radioisotopes.....	34
Isotopic Labels Currently in Use, All Respondents.....	36
Verbatim Descriptions of 'Other' Isotopic Labels	37
Nonisotopic Labels Currently in Use, All Respondents.....	38
Verbatim Descriptions of 'Other' Nonisotopic Labels	39
Reasons for Using Image Analysis, All Respondents.....	40
Verbatim Description of 'Other' Reasons for Using Image Analysis.....	41
III. MARKET SIZE & GROWTH	43
Est of Eur Life Scientists Using Image Analysis, 2000 Global Lab Study ...	45
Number of Doctoral-Level Researchers, Laser & Other Types of Dens.....	46
Mean, Median & Mode # of Researchers per Laser Densitometer.....	47
Mean, Median & Mode # of Researchers per Dens, Other Types.....	47
Mean, Median & Mode # of Researchers per Flatbed Scanner.....	47
Number of Doctoral-Level Researchers, Flatbed Scanners.....	47
Mean, Median & Mode # of Researchers per CCD Camera	47
Number of Doctoral-Level Researchers, CCD Cameras.....	48
Number of Doctoral-Level Researchers, Specialized Imaging Systems.....	48
Mean, Median & Mode # of Researchers per Storage Phosphor System....	49
Mean, Median & Mode # of Researchers per Multi-Mode Detectn Sys....	49
Mean, Median & Mode # of Researchers per Fluorescent Detection Sys....	49
Number of Doctoral-Level Researchers, Microscopy Systems & Software..	49
Mean, Median & Mode Sharing for Each Category, All vs. Europeans.....	50
Average Number of Instruments per Respondent, Audit.....	51
Number of Instruments in Audit, by Instrument Class, Europeans Only...	52
\$ Spent on Instruments in Audit, by Instrument Class, Europeans Only ...	53
Total Installed Base for Eur Image Analysis Systems, by Instrument Cat ...	53
Installed Base Unit Market Share, by Instrument Class, Europeans Only ..	54
Installed Base \$ Market Share, by Instrument Class, Europeans Only.....	54

Unit Placements by Year in Europe, CCD Cameras	55
Unit Placements by Year in Europe, Flatbed Scanners	56
Annual European CCD Camera & Flatbed Scanner Sales Estimates.....	56
Unit Placements by Year in Europe, Laser & Other Densitometers	57
Annual European Laser & Other Densitometers Sales Estimates	57
Unit Placements by Year in Europe, Specialized Image Analysis Systems ...	58
Annual Eur Storage Phosphor & Fluorescent Imager Sales Estimates.....	59
Annual Eur Multi-Mode Imager Sales Estimates	59
Annual European Sales Estimate for 2000, All Image Analysis Systems.....	59
Image Analyzer Sales by Year in Europe, by Class of Image Analysis Sys....	60
IV. MARKET SHARE	61
Mean Number of Instruments & Dollar Spend per Eur Resp, Audit	62
Unit Market Shares, Instruments in Audit, European Researchers	63
Dollar Market Shares, Instruments in Audit, European Researchers	63
Storage Phosphor Imaging Systems	64
Mean Spend per Storage Phosphor System, Audit	64
Mean Number of Units & Dollar Spend per Eur Resp, Audit	64
Unit Market Shares, Storage Phosphor Systems, European Researchers	65
Dollar Market Shares, Storage Phosphor Systems, European Researchers...	65
Most Frequently Mentioned Storage Phosphor Image Analyzers.....	66
CCD Cameras	66
Mean Number of Units & Dollar Spend per Eur Resp, Audit	66
Mean Spend per CCD Camera, Audit.....	66
Unit Market Shares, CCD Cameras, European Researchers.....	67
Dollar Market Shares, CCD Cameras, European Researchers	67
CCD Camera Manufacturers in the 'Other' Category	68
Most Frequently Mentioned CCD Cameras.....	69
Multi-Mode Detection Image Analyzers	69
Mean Spend per Multi-Mode Detection Analyzer, Audit	69
Mean Number of Units & Dollar Spend per Eur Resp, Audit	69
Unit Market Shares, Multi-Mode Detection Systems, Eur Researchers	70
Dollar Market Shares, Multi-Mode Detection Systems, Eur Researchers ...	70
Most Frequently Mentioned Image Analyzers with Multi-Mode Detectn ..	71
Fluorescent Imaging Systems	71
Mean Spend per Fluorescent Imaging System, Audit	71
Mean Number of Units & Dollar Spend per Eur Resp, Audit	71
Unit Market Shares, Fluorescent Imaging Systems, Eur Researchers	71
Dollar Market Shares, Fluorescent Imaging Systems, Eur Researchers.....	72
Fluorescent Detection Image Analyzer Manufacturers in the 'Other' Cat...	72
Microscopy	73
Mean Spend per Microscopy System, Audit	73
Unit Market Shares, Microscopy Systems, Eur Researchers.....	73
Dollar Market Shares, Microscopy Systems, Eur Researchers	74

Laser Densitometers	74
Mean Spend per Laser Densitometer, Audit	74
Unit Market Shares, Laser Densitometers, Eur Researchers.....	75
Dollar Market Shares, Laser Densitometers, Eur Researchers	75
Most Frequently Mentioned Laser Densitometers	76
Other Densitometers	76
Unit Market Shares, Other Densitometers, Eur Researchers	76
Dollar Market Shares, Other Densitometers, Eur Researchers.....	77
Most Frequently Mentioned Other Types of Densitometers.....	77
Flatbed Scanners.....	77
Mean Spend per Flatbed Scanner, Audit.....	78
Mean Number of Units & Dollar Spend per Eur Resp, Audit	78
Unit Market Shares, Flatbed Scanners, Eur Researchers.....	78
Dollar Market Shares, Flatbed Scanners, Eur Researchers	79
Flatbed Scanner Manufacturers in the 'Other' Category	79
Most Frequently Mentioned Flatbed Scanners.....	80
Image Analysis Software	80
Mean Spend per Software Program, Audit.....	80
Unit Market Shares, Image Analysis Software, Eur Researchers.....	81
Dollar Market Shares, Image Analysis Software, Eur Researchers	81
Image Analysis Software Manufacturers in the 'Other' Category.....	82
Product Mix for Leading Manufacturers.....	82
Major Image Analyzer Manufacturer Installed Base Sales, by Category	82
V. PURCHASE PLANS.....	83
Purchase Plan Profiles for Image Analyzers, Within Next 12 Months	84
2001 European Sales Projections for New Image Analyzers	85
VI. CURRENT & FUTURE METHODOLOGY	87
Interest in Using Multiple Labels, to Image Individual Samples.....	88
Various Imaging Capabilities, Currently Accessible to Respondents.....	89
Accessibility to Imaging Capabilities, Current vs. Anticipated.....	90
Percent Growth for Various Imaging Capabilities Over the Next 2 Years ..	91
Imaging Capabilities of No Current or Future Need	91
Resolution of Images Currently Achieved	92
Resolution of Images Current & Anticipated Within the Next 2 Years	93
Level of Resolution Achieved Over the Next 2 Years.....	93
Computer Systems Currently Used with Image Analyzers.....	94
Computer System in Use by Resps from Various Types of Organizations..	95
Most Important Issues, Developing a CCD-Based Imaging System	96
Other Issues Important When Developing a CCD-Based Imaging Sys	97
VII. SUPPLIER ASSESSMENT	99
Most Recently Purchased Type of Analyzer, European Researchers.....	101
Last Purchased Analyzer Manufacturer, Installed Base Audit, Eur Resps....	101

'Other Manufs of the Most Recent Purchased Sys, Freq of Mentns 102
Verbatim Comments for Image Analyzer Selection Sorted by Brand..... 103
Most Recently Purchased Type of Analyzer, Non-European Researchers ... 111
Last Purchased Analyzer Manufacturer, Audit, Non-Eur Resps..... 111
Verbatim Comments for Analyzer Selection Sorted by Brand, Non-Eur 112
Reasons for Selecting Brand of System, European Researchers 114
Level of Satisfaction with Most Recently Purchased Image Analyzer 115
Customer Satisfaction Rates for Major Brands of Image Analyzers..... 116
Satisfaction Rates and 65% Confidence Levels for Major Manufacturers ... 117
Customer Satisfaction Rates for Categories of Image Analyzers..... 117
Reasons for Satisfaction with Most Recently Purchased Brand & Model ... 119
Reasons for Dissatisfaction with Most Recently Purchased Model 124
Reasons for Dissatisfaction with Most Recently Purch Brand & Model 125
Image Analyzer Manufacturers' Estimated Loss/Gain, Freq of Mentions ... 130
Respondents' Opinion of Distributors, European vs. Non-European..... 131
Satisfactory Distributors of Image Analyzers 132
Reasons for Being Pleased with a Local Distributor, European Rschrs 133
Reasons for Being Pleased with a Local Distributor, U.S. Rschrs 135
Reasons for Disapproval of a Local Distributor, European Rschrs..... 135
Reasons for Disapproval of a Local Distributor, U.S. Rschrs..... 136
Image Analyzer Manufacturers' Ranking: Easiest to Use 137
Image Analyzer Manufacturers' Ranking: Highest Versatility..... 138
Image Analyzer Manufacturers' Ranking: Most Reliable Quality 139
Image Analyzer Manufacturers' Ranking: Greatest Innovator 139
Image Analyzer Manufacturers' Ranking: Best Value for Money..... 140
Image Analyzer Manufacturers' Ranking: Fastest Results 141
Image Analyzer Manufacturers' Ranking: Best Field Service 141
Image Analyzer Manufacturers' Ranking: Most Committed 142

VIII. FUTURE EXPECTATIONS..... 145

Suggested Improvements in Densitometers/Image Analyzers 146
Suggested Improvements/Image Analysis, Most Freq Mentioned Themes . 151

IX. QUESTIONNAIRE..... 153

I. BACKGROUND

A. SURVEY OBJECTIVES

The purpose of this survey was to provide the management of our client companies with an analysis of the current European market for densitometer and image analysis systems (including the installed base of laser densitometers, flatbed scanners, CCD video cameras, storage phosphor detectors, fluorescent, and multi-mode detectors) and of the attitudes and expectations of a cross-section of researchers who utilize image analysis in their work.

The surveying was blind, with no reference made to any clients for the survey. To encourage respondents to express themselves freely, the survey was anonymous, and made frequent use of open-ended questions.

Several demographic screens were used to characterize respondents, including scientific discipline and type of organization. In addition, we present characteristics of respondent's current usage consisting of the type of samples currently analyzed, the typical dimensions of these samples, the isotopic and non-isotopic labels currently used and the reasons given for using image analysis.

Early on the in survey, respondents were asked whether or not they currently used or had access to a densitometer or image analysis system. Those respondents not currently using this were directed to back out of the survey as they were not qualified to respond. Those researchers who answered positively were directed to a detailed audit question. In particular, users were asked to itemize all laser densitometers, flatbed scanners, CCD cameras, storage phosphor, fluorescent, or multi-mode detectors they owned or operated, providing the brand, model, date acquired, and approximate cost for each unit. We also asked respondents to indicate the number of doctoral-level researchers using each instrument.

Respondents were questioned regarding their reasoning behind choosing their last image analysis unit and whether they would choose the same analyzer again. In particular, researchers were asked to specify whether they would choose the same brand and model of instrument, the same brand but a different model or a different brand and model of analyzer, and to explain the reason for this decision. All respondents were also asked a question regarding the likelihood of future densitometer/image analysis instrumentation purchases. They were then asked to detail desired improvements in densitometers or image analyzers and to select the highest-rated manufacturer in eight key areas. In particular, respondents were asked to choose the top-ranked manufacturer amongst eight leading densitometer/image analyzer manufacturers (or a ninth 'other' choice) in the following areas: ease of use, versatility, reliable quality, innovation, value for money, fast results, field service, and level of commitment to the field. They were also queried as to the

most important issues involved in putting together a CCD-based imaging system from a list of nine options. These were automation, cost, host platform, integrated hardware/software, networkability, programmability, resolution or speed. Respondents were also invited to provide a short description of another issue not included on the list.

The next series of questions queried various current and future aspects of their current image analysis work. Respondents were asked to indicate whether they have any interest in imaging individual samples with multiple labels. From a list of eight imaging capabilities (digital imaging, digital control, hard copy output, B/W video, color video, image processing analysis, motion analysis or automated functions), respondents were asked to indicate which are currently available to them and which they plan to add within the next two year. Current and near future capabilities regarding the resolution of the image were also examined. Finally, researchers were asked to specify which computer system they use with their image analyzer and how they use the images captured by the system, for qualitative evaluation, quantitative measurement, presentation or teaching, publication, documentation or archiving or an other usage. Lastly, respondents were asked to identify distributors they were pleased with, and conversely displeased with and to provide an explanation for their response.

Major objectives of the survey were to estimate the present size of this market and to determine the present market share for major instrument categories and for leading companies, based upon the installed base of units, to measure the market's historic growth rate, based upon the identified installed base, to identify the leading manufacturers in terms of units placed and estimated dollar sales volume. In addition, characteristics of current and anticipated future image analysis work would be defined and profiles of respondents most likely to purchase new instrumentation in the near term would be carefully examined.

The audit should permit the evaluation of our clients' present market positions, identify marketing strengths and weaknesses, and suggest strategies to develop or improve sustainable competitive advantage.

This report is the first 2001/2002 study in a growing series of market research analyses that began in 1993. We plan to continue the series, adding titles and alternating between U.S. and international markets, depending upon our clients' suggestions and support.

Topics in the U.S. series to be published in 2001/2002 include:

Electrophoretic Instrumentation & Reagents
Molecular Biology Reagent Systems, Vol. 2

This series also includes the following reports covering international markets:

Densitometers & Image Analysis in Europe
DNA Sequencing in the Far East.

The 2000/2001 series covered the following three reports:

U.S. DNA Amplification
U.S. Molecular Biology Reagent Systems, Vol. 1
Molecular Biology Reagent Systems, Vol. 1 in the Far East.

In the 1999/2000 series, we have released three reports examining the following markets. These are:

Microplate Equipment in Europe
DNA Sequencing in the U.S.
Monoclonal Antibodies in the U.S.

The following nine titles have been released in the series for 1998/1999:

Cell & Tissue Culture in the U.S.
Cytokines & Growth Factors in the U.S.
DNA Amplification in the Far East
DNA Sequencing in Europe
Electrophoretic Gel Media in Europe
HPLC in the Life Sciences in the U.S.
Molecular Biology Reagent Systems, Vol. 1
Molecular Biology Reagent Systems, Vol. 2 in the Far East
Protein Expression Systems in the U.S.

The following titles have been released in the U.S. series for 1997/8:

DNA Sequencing
Molecular Biology Reagent Systems, Vol. 1
Molecular Biology Reagent Systems, Vol. 2
Molecular Diagnostics.

Clients are reminded that additional copies of any of these reports that have been purchased in the past are available at a modest cost. Please contact us for further details. Those wishing to know publication dates for any of these reports, or wanting to read summaries of the 72+ reports in this series are invited to visit our Web site at: www.phortech.com.

B. SURVEY METHODOLOGY

Two sources of names were used for this survey. First, e-mail invitations to take part in the survey were sent to a selected cross-section of life science researchers from our panel of over 7,000 life science researchers worldwide. After selection for appropriate areas of interest, invitations were sent to a random selection of 1,368 members of the panel who have been in contact with us in the last year. The second source consisted of a cross-section of 2,973 Nature subscribers taken randomly from a list of 5,374 names. Customized e-mail invitations to the web site survey were sent to the PhorTech panel on September 27th. Invitations to the second source of Nature subscribers were sent between October 13th through the 23rd.

Each participant received an e-mail invitation including the web address of the survey and a unique validation code.

To improve response rates, respondents were able to select from a choice of five prizes for completing the survey. These were a laser pointer, a AAA mini Maglite flashlight, a 12 ounce box of Jelly Belly gourmet jelly beans, a \$5 gift card good towards any purchase at Barnes & Noble or a custom designed tee-shirt.

By the close of the survey on November 28th, we had received 293 responses. After removing duplicate responses and non-users, there were a total of 277 valid responses which translates to an 6.4% response rate. This did not meet our expectations.

Apart from the prize, no inducements were employed. The questionnaires were anonymous, using a combination of tabular entry, check-offs, and open-ended probes. However, almost all respondents did identify themselves by filling in the prize entry form. This makes it possible for us to double-check the responses to any questions by emailing respondents, improving the overall confidence in the data. We did not observe any survey fatigue in this questionnaire, and felt that respondents spent considerable time explaining their positions on the open-ended questions.

Based upon 277 responses, the overall statistical results presented in this report are accurate to within ± 5.9 percentage points at the 95% confidence level. In our experience, 95% confidence levels are appropriate primarily for scientific experiments. Most business people making decisions are content to be right more often than they are wrong. In this case, a 65% confidence level, (in which you would be right twice as often as you would be wrong) is more appropriate. Conveniently, 65% confidence levels are nearly exactly one half the size of the 95% level, thus our 65% levels would be ± 2.9 % for all respondents.

According to the binomial distribution theory, these values are valid when the measured event has about a 50% probability. When the measured event is considerably more rare than this, the corresponding confidence intervals get smaller. On the other hand, these confidence intervals are valid for answers based upon the complete pool of respondents. When analyzing data for a group that includes only a small segment of respondents, the answers are less certain and confidence intervals are correspondingly larger.

In this report, we will calculate more exact individual confidence intervals when appropriate. In our comments, we will note whether given differences are significant at either the 65% or 95% level. To aid our clients in determining the appropriate confidence interval for various combinations of sample size and measurements, we have created the following table. Just read the closest percentage on the left and find the closest sample size column. The intersection will show the confidence interval for that combination. For example, a measured 35% value with a sample size of 200 has a 95% confidence interval of $\pm 6.6\%$.

95% Confidence Intervals for Various Percentages & Sample Sizes

Percent	n=10	n=20	n=50	n=100	n=200	n=500	n=1000
5%	$\pm 13.5\%$	$\pm 9.6\%$	$\pm 6.0\%$	$\pm 4.3\%$	$\pm 3.0\%$	$\pm 1.9\%$	$\pm 1.4\%$
10%	$\pm 18.6\%$	$\pm 13.1\%$	$\pm 8.3\%$	$\pm 5.9\%$	$\pm 4.2\%$	$\pm 2.6\%$	$\pm 1.9\%$
20%	$\pm 24.8\%$	$\pm 17.5\%$	$\pm 11.1\%$	$\pm 7.8\%$	$\pm 5.5\%$	$\pm 3.5\%$	$\pm 2.5\%$
35%	$\pm 29.6\%$	$\pm 20.9\%$	$\pm 13.2\%$	$\pm 9.3\%$	$\pm 6.6\%$	$\pm 4.2\%$	$\pm 3.0\%$
50%	$\pm 31.0\%$	$\pm 21.9\%$	$\pm 13.9\%$	$\pm 9.8\%$	$\pm 6.9\%$	$\pm 4.4\%$	$\pm 3.1\%$
65%	$\pm 29.6\%$	$\pm 20.9\%$	$\pm 13.2\%$	$\pm 9.3\%$	$\pm 6.6\%$	$\pm 4.2\%$	$\pm 3.0\%$
80%	$\pm 24.8\%$	$\pm 17.5\%$	$\pm 11.1\%$	$\pm 7.8\%$	$\pm 5.5\%$	$\pm 3.5\%$	$\pm 2.5\%$
90%	$\pm 18.6\%$	$\pm 13.1\%$	$\pm 8.3\%$	$\pm 5.9\%$	$\pm 4.2\%$	$\pm 2.6\%$	$\pm 1.9\%$
95%	$\pm 13.5\%$	$\pm 9.6\%$	$\pm 6.0\%$	$\pm 4.3\%$	$\pm 3.0\%$	$\pm 1.9\%$	$\pm 1.4\%$

