

CHAPTER ONE: INTRODUCTION	1
STUDY GOALS AND OBJECTIVES.....	1
REASONS FOR DOING THE STUDY	1
INTENDED AUDIENCE.....	2
SCOPE OF REPORT	2
METHODOLOGY	2
INFORMATION SOURCES.....	3
ANALYST CREDENTIALS.....	3
RELATED BCC REPORTS	3
BCC ONLINE SERVICES.....	4
DISCLAIMER	4
 CHAPTER TWO: SUMMARY	 5
SUMMARY.....	5
<i>SUMMARY TABLE GLOBAL VALUE OF NANOBIO TECHNOLOGY MARKET, BY END USER, THROUGH 2015 (\$ MILLIONS)</i>	6
<i>SUMMARY FIGURE GLOBAL VALUE OF NANOBIO TECHNOLOGY MARKET, BY END USER, 2009- 2015 (\$ MILLIONS)</i>	6
SUMMARY (CONTINUED)	7
 CHAPTER THREE: OVERVIEW	 8
INTRODUCTION	8
<i>TABLE 1 SCOPE OF THIS REPORT</i>	8
MARKET POTENTIAL OF NANOBIO TECHNOLOGY	9
<i>TABLE 2 GLOBAL VALUE OF NANOBIO TECHNOLOGY MARKET, BY APPLICATION, THROUGH 2015 (\$ MILLIONS)</i>	9
NANOBIO TECHNOLOGY GROWTH DRIVING FORCES	10
<i>TABLE 3 NANOBIO TECHNOLOGY MARKET GROWTH DRIVING FORCES</i>	10
NANOBIO TECHNOLOGY MATERIALS PLATFORMS.....	11
<i>TABLE 4 GLOBAL VALUE OF NANOBIO TECHNOLOGY MARKET, BY PLATFORM, THROUGH 2015 (\$ MILLIONS)</i>	11
NANOBIO TECHNOLOGY PRODUCT LIFE CYCLE STATUS	12
<i>TABLE 5 LIFE CYCLE STATUS OF NANOMATERIALS</i>	12
NANOBIO TECHNOLOGY INDUSTRY.....	12
<i>TABLE 6 NANOBIO TECHNOLOGY INDUSTRY</i>	13
NANOBIO TECHNOLOGY INDUSTRY (CONTINUED).....	14
 CHAPTER FOUR: NANOBIO TECHNOLOGIES	 15
NANOBIO TECHNOLOGY.....	15
<i>TABLE 7 FEATURES OF NANOTECHNOLOGIES</i>	15
HISTORY OF NANOTECHNOLOGY	15
<i>TABLE 8 HISTORICAL TIMELINE OF NANOTECHNOLOGY, 1931- 2007</i>	16
NANOTECHNOLOGY VALUE CHAIN	17

<i>TABLE 9 VALUE CHAIN FOR NANOTECHNOLOGIES.....</i>	<i>18</i>
BIO-NANOMATERIALS	18
OVERVIEW	18
<i>TABLE 10 NANOBIOTECHNOLOGY MATERIALS.....</i>	<i>18</i>
APPLICATIONS STATUS.....	19
<i>TABLE 11 NANOMATERIALS APPLICATIONS STATUS.....</i>	<i>19</i>
LIFE CYCLE STATUS	20
<i>TABLE 12 NANOMATERIALS LIFE CYCLE STATUS.....</i>	<i>21</i>
NANOPARTICLES	21
NANOPARTICLES (CONTINUED).....	22
<i>TABLE 13 NANOPARTICLES IN IMAGING APPLICATIONS.....</i>	<i>23</i>
QUANTUM DOTS	24
<i>TABLE 14 COMPARISON OF QUANTUM DOTS, FLUORESCENT</i>	
<i>DYES AND FLUORESCENT PROTEINS.....</i>	<i>25</i>
<i>FIGURE 1 QUANTUM DOT SPECTRA.....</i>	<i>25</i>
<i>FIGURE 2 FLUORESCENT DYE SPECTRA.....</i>	<i>26</i>
LIPOSOMES	27
<i>TABLE 15 LIPOSOME TYPES.....</i>	<i>28</i>
DENDRIMERS.....	28
NANOPORES.....	29
TECHNICAL FEASIBILITY OF NANOPORE SEQUENCING	30
NANOCRYSTALS.....	31
<i>TABLE 16 ADVANTAGES OF NANOCRYSTAL DRUG TECHNOLOGY.....</i>	<i>32</i>
POLYMER STRUCTURES	33
INTEGRATED NANOSTRUCTURES.....	33
INTEGRATED NANOSTRUCTURES (CONTINUED)	34
INTEGRATED NANOSTRUCTURES (CONTINUED)	35
CHAPTER FIVE: :NANOBIOTECHNOLOGY APPLICATIONS	36
INTRODUCTION	36
<i>TABLE 17 NANOBIOTECHNOLOGY MATERIALS/APPLICATIONS</i>	
<i>MATRIX.....</i>	<i>36</i>
DRUG DELIVERY APPLICATIONS.....	37
<i>TABLE 18 BENEFITS OF IMPROVED DRUG DELIVERY.....</i>	<i>37</i>
<i>TABLE 19 KEY NANOMATERIALS IN DRUG DELIVERY</i>	<i>38</i>
<i>TABLE 20 NUMBER OF COMMERCIAL DRUGS USING</i>	
<i>NANOTECHNOLOGY, BY INDICATION, SEPTEMBER 2010.....</i>	<i>38</i>
<i>TABLE 21 MARKETED NANO-BASED DRUGS, 2010</i>	<i>39</i>
<i>TABLE 21 (CONTINUED).....</i>	<i>40</i>
<i>TABLE 22 STATUS OF AMPHOTERICIN B</i>	<i>41</i>
TARGETED DELIVERY.....	42
<i>TABLE 23 TARGETED VERSUS NONTARGETED DRUG DELIVERY</i>	<i>43</i>
SIRNA DRUG DELIVERY	43
<i>FIGURE 3 RNAI SYSTEMIC DELIVERY APPROACHES.....</i>	<i>44</i>
BIOLOGIC IMAGING APPLICATIONS	45

<i>TABLE 24 KEY BIOLOGIC IMAGING NANO-REAGENT TYPES</i>	46
WHY NANOPARTICLES ARE IMPORTANT FOR IMAGING.....	47
SUMMARY OF NANOPARTICLE IMAGING APPLICATIONS	48
<i>TABLE 25 NANOPARTICLES IN IMAGING APPLICATIONS</i>	49
<i>In Vivo</i> Imaging	49
<i>TABLE 26 NANOPARTICLE IN VIVO DIAGNOSTICS PIPELINE</i>	50
<i>TABLE 26 (CONTINUED)</i>	51
<i>In Vitro</i> Imaging	52
<i>TABLE 27 NANOSPHERE IN VITRO DIAGNOSTICS REAGENTS</i>	
<i>PIPELINE</i>	52
Genomics, Proteomics and Cell Biology Imaging.....	53
EMERGING APPLICATIONS OF IMAGING REAGENTS	53
<i>FIGURE 4 THREE COMPONENTS OF ADVANCED IMAGING</i>	
<i>REAGENT TECHNOLOGY</i>	54
ADVANCED IMAGING NANO-REAGENTS	55
<i>TABLE 28 EMERGING BIOLOGIC NANO-IMAGING REAGENT</i>	
<i>FUNCTIONS</i>	55
Dual Modality Reagents.....	55
Multifunctional Reagents.....	56
Multiplexed Reagents.....	57
SEQUENCING APPLICATIONS.....	57
<i>TABLE 29 SEQUENCING KEY NANOMATERIALS</i>	58
<i>TABLE 30 USE OF NANOMATERIALS, BY SEQUENCING</i>	
<i>PLATFORM</i>	58
SEQUENCING APPLICATIONS (CONTINUED)	59
<i>FIGURE 5 \$1,000 GENOME PROGRAM AWARDS, BY TECHNOLOGY,</i>	
<i>2007-2009</i>	60
RESEARCH TOOLS APPLICATIONS	61
MICROBICIDE APPLICATIONS	61
<i>TABLE 31 APPLICATIONS OF NANOMATERIALS IN MICROBICIDES</i>	62
 CHAPTER SIX: NANOBIO TECHNOLOGY INDUSTRY STRUCTURE	 63
INDUSTRY OVERVIEW	63
<i>TABLE 32 NANOBIO TECHNOLOGY MATERIALS/APPLICATIONS</i>	
<i>MATRIX</i>	63
DRUG DELIVERY INDUSTRY	64
<i>TABLE 33 DRUG DELIVERY INDUSTRY POSITION, BY</i>	
<i>NANOMATERIAL</i>	65
<i>TABLE 34 DRUG DELIVERY COMPETITOR POSITION</i>	66
<i>TABLE 34 (CONTINUED)</i>	67
<i>TABLE 34 (CONTINUED)</i>	68
<i>TABLE 34 (CONTINUED)</i>	69
<i>TABLE 35 COMPANIES SPECIALIZING IN DRUG DELIVERY OF</i>	
<i>BIOMOLECULES</i>	69
NANOPORE SEQUENCING INDUSTRY	70

<i>TABLE 36 SEQUENCING INSTRUMENT COMPETITORS, BY TECHNOLOGY</i>	70
<i>TABLE 36 (CONTINUED)</i>	71
QUANTUM DOTS INDUSTRY.....	72
<i>TABLE 37 QUANTUM DOTS KEY COMPETITORS</i>	72
ACQUISITIONS AND STRATEGIC ALLIANCES	73
<i>TABLE 38 NANOBIO TECHNOLOGY INDUSTRY ACQUISITIONS, 2007-2010</i>	74
<i>TABLE 39 NANOBIO TECHNOLOGY INDUSTRY STRATEGIC ALLIANCES, 2007-2010</i>	75
<i>TABLE 39 (CONTINUED)</i>	76
ACQUISITIONS AND STRATEGIC ... (CONTINUED).....	77
ACQUISITIONS AND STRATEGIC ... (CONTINUED).....	78
CHAPTER SEVEN: NANOBIO TECHNOLOGY MARKETS	79
MARKET GROWTH DRIVING FORCES	79
<i>TABLE 40 NANOBIO TECHNOLOGY MARKET GROWTH DRIVING FORCES</i>	79
<i>TABLE 41 NANOBIO TECHNOLOGY PEER-REVIEWED PUBLICATIONS, 1990-2009</i>	80
NANOBIO TECHNOLOGY MARKET SUMMARY	81
NANOPRODUCTS MARKETS BY PLATFORM	81
<i>TABLE 42 GLOBAL VALUE OF NANOBIO TECHNOLOGY MARKET, BY PLATFORM, THROUGH 2015 (\$ MILLIONS)</i>	81
NANOPRODUCTS MARKETS BY APPLICATION	82
<i>TABLE 43 GLOBAL VALUE OF NANOBIO TECHNOLOGY MARKET, BY APPLICATION, THROUGH 2015 (\$ MILLIONS)</i>	83
<i>TABLE 44 GLOBAL VALUE OF RESEARCH TOOLS MARKET, BY APPLICATION, THROUGH 2015 (\$ MILLIONS)</i>	83
<i>TABLE 45 GLOBAL VALUE OF RESEARCH TOOLS MARKET, BY NANOPLATFORM, THROUGH 2015 (\$ MILLIONS)</i>	84
DNA SEQUENCING MARKET	85
<i>TABLE 46 GLOBAL VALUE OF NANOBIO TECHNOLOGY SEQUENCING MARKET, THROUGH 2015 (\$ MILLIONS)</i>	85
<i>TABLE 47 GLOBAL VALUE OF SANGER AND NEXT-GENERATION NANO-ENABLED SAMPLE PREPARATION MARKET, BY SEQUENCING GENERATION, THROUGH 2015 (\$ MILLIONS)</i>	86
<i>TABLE 48 GLOBAL VALUE OF THE NANO-ENABLED NANOPORE SEQUENCING MARKET, BY PRODUCT TYPE, THROUGH 2015 (\$ MILLIONS)</i>	86
<i>TABLE 49 GLOBAL VALUE OF THE NANO-ENABLED SEQUENCING MARKET, BY NANOPLATFORM, THROUGH 2015 (\$ MILLIONS)</i>	87
DIAGNOSTICS MARKET	88
DIAGNOSTICS MARKET SUMMARY.....	88

<i>TABLE 50 GLOBAL VALUE OF THE NANO-ENABLED DIAGNOSTICS MARKET, BY APPLICATION, THROUGH 2015 (\$ MILLIONS)</i>	88
<i>TABLE 51 GLOBAL VALUE OF THE NANO-ENABLED DIAGNOSTICS MARKET, BY MODALITY, THROUGH 2015 (\$ MILLIONS)</i>	89
Diagnostics Market Summary (Continued).....	90
<i>TABLE 52 GLOBAL VALUE OF THE NANO-ENABLED DIAGNOSTICS MARKET, BY NANO-PLATFORM, THROUGH 2015 (\$ MILLIONS)</i>	91
MRI MARKET	91
<i>TABLE 53 GLOBAL VALUE OF THE NANO-ENABLED MRI DIAGNOSTICS MARKET, BY NANO-PLATFORM, THROUGH 2015 (\$ MILLIONS)</i>	92
IN VITRO DIAGNOSTICS MARKETS	93
<i>TABLE 54 GLOBAL VALUE OF THE NANO-ENABLED IN VITRO DIAGNOSTICS MARKET, BY ASSAY TYPE, THROUGH 2015 (\$ MILLIONS)</i>	93
<i>TABLE 55 GLOBAL VALUE OF THE NANO-ENABLED IN VITRO DIAGNOSTICS MARKET, BY NANO-PLATFORM, THROUGH 2015 (\$ MILLIONS)</i>	94
IN VITRO DIAGNOSTICS NANOPARTICLES MARKETS	95
<i>TABLE 56 GLOBAL VALUE OF NANOPARTICLE IN VITRO DIAGNOSTICS, BY NANO-PLATFORM, THROUGH 2015 (\$ MILLIONS)</i>	95
<i>TABLE 57 GLOBAL VALUE OF GOLD NANOPARTICLE IN VITRO DIAGNOSTICS, BY APPLICATION, THROUGH 2015 (\$ MILLIONS)</i>	96
MICROBICIDES MARKET.....	96
<i>TABLE 58 GLOBAL VALUE OF THE NANO-ENABLED MICROBICIDES MARKET, BY APPLICATION, THROUGH 2015 (\$ MILLIONS)</i>	96
<i>FIGURE 6 BRANDED CONDOM MANUFACTURER WORLDWIDE MARKET SHARES, 2010 (%)</i>	97
<i>FIGURE 6 (CONTINUED)</i>	98
<i>TABLE 59 GLOBAL VALUE OF NANO-ENABLED MICROBICIDES MARKET, BY PLATFORM, THROUGH 2015 (\$ MILLIONS)</i>	98
DRUG DELIVERY MARKET.....	99
<i>TABLE 60 GLOBAL VALUE OF DRUG DELIVERY NANOPRODUCTS MARKET, BY INDICATION, THROUGH 2015 (\$ MILLIONS)</i>	100
<i>TABLE 61 GLOBAL VALUE OF THE NANO-ENABLED DRUG DELIVERY MARKET, BY TECHNOLOGY PLATFORM, THROUGH 2015 (\$ MILLIONS)</i>	101
<i>TABLE 62 GLOBAL VALUE OF THE NANO-ENABLED CANCER DRUG DELIVERY MARKET, BY TECHNOLOGY PLATFORM, THROUGH 2015 (\$ MILLIONS)</i>	102

TABLE 63 GLOBAL VALUE OF NANO-ENABLED CNS DRUG DELIVERY MARKET, BY TECHNOLOGY PLATFORM, THROUGH 2015 (\$ MILLIONS).....	103
TABLE 64 GLOBAL VALUE OF NANO-ENABLED ANTI-INFECTIVE DRUG DELIVERY MARKET, BY TECHNOLOGY PLATFORM, THROUGH 2015 (\$ MILLIONS).....	104
TABLE 65 GLOBAL VALUE OF NANO-ENABLED LIPID DISORDER DRUG DELIVERY MARKET, BY TECHNOLOGY PLATFORM, THROUGH 2015 (\$ MILLIONS).....	105
TABLE 66 GLOBAL VALUE OF NANO-ENABLED “OTHER” DRUG DELIVERY MARKET, BY TECHNOLOGY PLATFORM, THROUGH 2015 (\$ MILLIONS).....	106
NANOBIOTECHNOLOGY MARKETS BY GEOGRAPHY	106
TABLE 67 GLOBAL VALUE OF NANOBIOTECHNOLOGY MARKET, BY GEOGRAPHY, THROUGH 2015 (\$ MILLIONS).....	107
CHAPTER EIGHT: NANOBIOTECHNOLOGY PATENT STATUS	108
NANOBIOTECHNOLOGY PATENTS BY GEOGRAPHY	108
FIGURE 7 NUMBER OF NANOBIOTECHNOLOGY PATENTS BY GEOGRAPHY, 2000 TO SEPTEMBER 2010.....	108
FIGURE 7 (CONTINUED)	109
DRUG DELIVERY PATENTS	109
FIGURE 8 NUMBER OF DRUG DELIVERY NANOBIOTECHNOLOGY PATENTS BY NANOMATERIAL PLATFORM, 2000 TO SEPTEMBER 2010	110
FIGURE 9 NUMBER OF DRUG DELIVERY NANOBIOTECHNOLOGY PATENTS BY GEOGRAPHY, 2000 TO SEPTEMBER 2010 (%).....	111
FIGURE 10 NUMBER OF LIPOSOMAL DRUG DELIVERY PATENTS BY GEOGRAPHY, 2000 TO 2010	112
FIGURE 10 (CONTINUED)	113
FIGURE 11 NUMBER OF NANOPARTICLE DRUG DELIVERY PATENTS BY GEOGRAPHY, 2000 TO SEPTEMBER 2010	113
FIGURE 11 (CONTINUED)	114
CHAPTER NINE: COMPANY PROFILES	115
ABBOTT GMBH & CO. KG.....	115
ABRAXIS BIOSCIENCE	115
ACCESS PHARMACEUTICALS, INC.	116
ACUSPHERE, INC.	117
TABLE 68 ACUSPHERE PRODUCT PIPELINE	117
TABLE 69 ACUSPHERE PATENT ESTATE.....	118
ACRYMED, INC.	118
AION DIAGNOSTICS	119
ALNIS BIOSCIENCES INC.....	120
AMAG PHARMACEUTICALS, INC.....	120

<i>TABLE 70 AMAG MOLECULAR IMAGING REAGENTS PIPELINE</i>	121
<i>TABLE 71 AMAG MRI IMAGING REAGENTS MARKETING</i>	
<i>ALLIANCES</i>	122
AGILENT TECHNOLOGIES, INC.	122
AGILENT TECHNOLOGIES, INC.(CONTINUED).....	123
ALLERGAN, INC.....	124
ALLTRACEL PHARMACEUTICALS, PLC	124
ALPHA RX, INC.	125
ANSON NANO-BIOTECHNOLOGY CO. LTD.	125
APHIOS CORPORATION	125
AQUANOVA AG	126
ARMAGEN TECHNOLOGIES, INC.....	126
ARTIFICIAL CELL TECHNOLOGIES, INC.	126
AZAYA THERAPEUTICS	127
BASE4 INNOVATION LTD.	127
BAXTER INTERNATIONAL INC.	128
BBI INTERNATIONAL.....	128
BILCARE LIMITED	129
BIND BIOSCIENCES, INC.....	129
BIOALLIANCE PHARMA.....	130
BIOCON	131
BIODELIVERY SCIENCES INTERNATIONAL, INC.	131
BIO-GATE AG.....	132
BIONANOMATRIX, INC.....	132
BIOPHAN TECHNOLOGIES, INC.	133
BIOSANTÉ PHARMACEUTICALS INC.....	133
BIO-SYNECTICS, INC.	134
CALANDO PHARMACEUTICAL.....	134
CAMURUS AB	135
CAPSULATION PHARMA AG	136
CELSION CORPORATION.....	136
<i>TABLE 72 CELSION LIPOSOMAL PLATFORM STATUS</i>	137
CENTOCOR ORTHO BIOTECH INC.	137
CERAMISPHERE PTY LTD	138
CERULEAN PHARMA INC.....	138
CHEMICELL GMBH.....	139
CRITITECH, INC.	139
CSL BEHRING	140
CYTIMMUNE SCIENCES, INC.	140
DAMAGE PREVENTION CONCEPT	140
DENDRITECH, INC.....	141
ELAN CORPORATION PLC.....	141
ELECTRONIC BIO SCIENCES.....	142
ENDOCYTE	143

ENZON PHARMACEUTICALS.....	143
EPITARGET AS.....	144
EVIDENT TECHNOLOGIES.....	144
EXILICA LIMITED	145
FERROPHARM GMBH.....	145
FLAMEL TECHNOLOGIES	146
FRESNIUS KABI AG	146
GE HEALTHCARE UK LTD.....	147
GILEAD SCIENCES, INC.....	147
GRACEWAY PHARMACEUTICALS, LLC	148
HANA BIOSCIENCES, INC.	148
HUMAN GENOME SCIENCES	148
IMMUNOVACCINE	149
INDIANA NANOTECH LLC.....	149
INTERNATIONAL BUSINESS MACHINES CORP.	150
JOHNSON & JOHNSON, INC.	150
KEREOS, INC.....	151
<i>TABLE 73 KEREOS IMAGING REAGENTS PIPELINE.....</i>	<i>152</i>
<i>TABLE 74 KEREOS STRATEGIC ALLIANCES</i>	<i>153</i>
LABOPHARM INC.	153
LIFECARE INNOVATIONS PVT. LTD.	154
LIPLASOME PHARMA APS.....	154
LIPOXEN	155
LUNA NANOWORKS.....	156
MARINA BIOTECH.....	157
MINGYUAN MEDICARE DEVELOPMENT COMPANY LTD.....	157
MYMETICS S.A.	158
NABSYS, INC.	158
NANOBIO CHEMICALS INDIA PRIVATE LIMITED.....	159
NANOBLOTIX.....	159
NANOBIOSYM, INC.	160
NANOCARRIER CO., LTD.	160
NANOCO TECHNOLOGIES LTD.....	161
NANOCOPOEIA, INC.	162
NANOCYTE INC.	162
NANOPROBES, INC.....	163
NANOSPECTRA BIOSCIENCES, INC.....	164
NANOSPHERE, INC.....	164
NANOTOX.....	165
NANOVECTOR, INC.....	165
NATCO PHARMA LIMITED	165
NOVAVAX, INC.....	166
NOVOSOM AG.....	166
NOVOZYMES BIOPHARMA US INC.....	166

OCTOPLUS N.V.	167
OXFORD NANOPORE TECHNOLOGIES LTD.	167
OXFORD NANOPORE TECHNOLOGIES LTD. (CONTINUED)....	168
OXONICA INC.....	169
PACIRA PHARMACEUTICALS	169
PANACEA BIOTEC LTD.	170
PCI BIOTECH AS.....	170
SALVONA TECHNOLOGIES INC.	171
SCHERING-PLOUGH.....	171
SELAH TECHNOLOGIES, LLC.....	172
SELECTA BIOSCIENCES	172
SEQUENOM, INC.	173
SEQUENOM, INC. (CONTINUED).....	173
SEQUENOM, INC. (CONTINUED).....	174
SEQUENOM, INC. (CONTINUED).....	175
SIEMENS AG.....	176
SIGMA-TAU PHARMACEUTICALS, INC.....	176
SKYEPHARMA PLC	177
SMITH & NEPHEW PLC.....	178
SNOGG AS.....	178
SOPHERION THERAPEUTICS, LLC.....	178
STARPHARMA HOLDINGS LTD	179
<i>TABLE 75 STARPHARMA STRATEGIC ALLIANCES</i>	<i>180</i>
SUPRATEK PHARMA	181
TEKMIRA PHARMACEUTICALS	181
TEVA PHARMACEUTICALS	181
UNIDYM, INC.....	182
VIVE NANO INC.	182