July 17, 2011

2Q12 Genomics Survey

Future for NGS Remains Bright

HEALTHCARE/LIFE SCIENCE TOOLS & DIAGNOSTICS

SUMMARY

Our proprietary genomics survey polled opinions from 49 academic researchers from 26 leading US institutions. Not unexpectedly, our respondents are bracing for NIH funding cuts in the coming year. However, despite the expectation for a contracting NIH budget, the majority of our participants are looking to increase their sequencing expenditures. Our survey implies considerable potential in the whole human genome (WHG) sequencing market as the scientists expressed growing interest in the experiment. The outlook is bleak for microarray, as researchers expect to devote fewer resources to the technology. Overall, the data support our expectations for continued growth in the NGS (Next Generation Sequencing) market. We believe GNOM, as an NGS pure play, provides investors the best access in our universe to future trends in the NGS market. We remain extremely cautious on AFFX considering the company's extreme leverage to the contracting microarray market.

KEY POINTS

- **NGS poised for sustained growth.** The vast majority of respondents (89%) use NGS technology and dedicate on average 17% of their budget for these experiments. Looking forward, 82% predict their usage to increase with whole genome sequencing being the most common future experiment. We view this as positive for LIFE, ILMN and GNOM.

- **Positive trends for outsourced sequencing.** Most respondents (90%) have heard of outsourcing solutions, spread equally amongst GNOM, ILMN and BGI. In total, 57% responded that they would consider using the technology with cost the limiting factor. Our survey suggests the $2,000 genome may be the tipping point for widespread adoption. We continue to believe GNOM presents the best value proposition for scientists.

- **Microarray faces further contraction.** The majority of our participants expect to decrease microarray utilization. The top two drivers for the decline are preference for NGS technologies (59%) and the inability to secure new funding for microarray experiments (19%). We believe this represents a fundamental headwind for AFFX and a reason for increased caution on ILMN.

- **Low-throughput market too early to assess.** Core labs remain the location of choice for NGS with ILMN retaining the dominant market share (73%). Our survey indicates low-throughput NGS has not yet found its way to this market. However, early adopters seem to favor the available Ion Torrent PGM.

- **NIH contraction expected.** Looking forward, 62% of our respondents expect the NIH budget to decrease while 22% expect no change in FY2012. This represents an obvious headwind for Life Science Tools companies; however, we believe leverage to higher growth sub-markets like NGS will help mitigate funding declines.

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Oppenheimer Genomics Survey: 2Q11

Our 2Q11 genomics survey examined the state of the Next Generation Sequencing (NGS), outsourced sequencing and microarray markets and expectations for the future. Our proprietary survey queried 49 academic researchers with particular focus in genetics/genomics, high-throughput statistical or computational biology at leading US institutions. These professors were identified as initial adopters of sequencing technologies/platforms in an academic setting and key entry points for more widespread acceptance and usage of NGS, outsourced sequencing or microarray technology. The survey also looked for guidance on the state of the NIH budget spending looking forward.

Overall, the outlook for the genetics/genomics market is encouraging with most users focusing heavily on experiments using the new technologies. Respondents indicated an increased directionality toward whole human genome sequencing with cost reductions being the key driver for more widespread adoption. Currently, most sequencing seems to be done in either core or collaborators labs where ILMN's sequencing platforms (HiSeq 2000/1000 and Genome Analyzer (GA) IIx) maintain a strong market presence. Infiltration of lower throughput sequencers such as the Ion Torrent Personal Genome Machines (PGM) and MiSeq is not widespread in this group, an unsurprising development considering the sample size and the proximity to launch for the Ion Torrent. Most of our respondents seem to prefer using a core or genomics facility to paying for an independent capital expenditure. Awareness of outsourced sequencing solutions such as Complete Genomics, Illumina Genome Network and BGI was surprisingly high, with many indicating an interest in future utilization.

Expectedly, the outlook for the NIH budget was negative, with most respondents predicting a budget cut in the near future. Microarray seems to be at greatest risk, as the majority of respondents indicated a likely decrease in their microarray usage as sequencing technology continues to encroach on the space.

With all of these data points analyzed together, we remain positive on GNOM, cautionary on ILMN and continue to see downside to AFFX. As for PACB and LIFE, most data is still preliminary and we wait for future updates on the rollout of their respective products.

Survey Background

Over 300 professors from 43 leading academic/translational universities and research centers throughout the United States were targeted as key opinion leaders in the genomics market. These universities represent about 35% of the total $25B budget earmarked for external NIH grants and about 38% of the approximately 50,000 NIH grants awarded each year. The survey collected data from 49 of these professors hailing from 26 of the institutions. This group represents a much smaller, but focused part of the genetics/genomics demographic with ~$28M in funding from 67 NIH awards. Responding professors had an average of 8.5 members per laboratory.

Exhibit 1. List of participating professors' universities

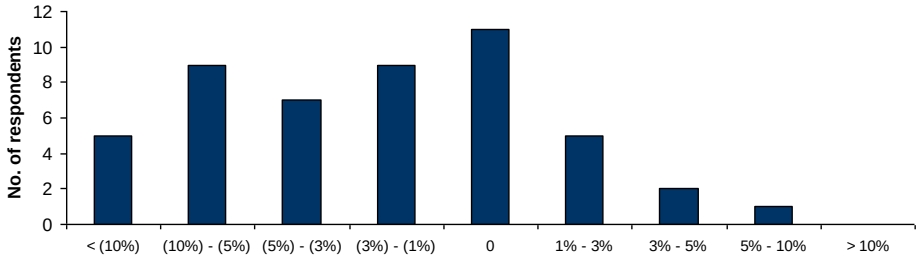
Albert Einstein College of Medicine (AECOM)
Baylor College of Medicine (BCM)
Boston University (BU)
Brigham and Women's Hospital
Cedars-Sinai Medical Center
Cold Spring Harbor Laboratory (CSHL)
Columbia University
Duke University
Johns Hopkins University
Princeton University
Massachusetts General Hospital (MGH)
Massachusetts Institute of Technology (MIT)
Mount Sinai School of Medicine (MSSM)
New York University (NYU)
Translational Genomics Research Institute (TGen)
University of California, Berkeley (Cal)
University of California, Los Angeles (UCLA)
University of California, San Diego (UCSD)
University of California, San Francisco (UCSF)
University of Colorado, Boulder
University of Miami, Miller School of Medicine
University of North Carolina (UNC)
University of Texas, Southwestern Medical Center (UTSW)
University of Wisconsin, Madison
University of Washington
Washington University (Wash U.)

Source: Oppenheimer Genomics Survey

NIH Budget

When asked what the general expectation for the year-over-year change to next year's (FY2012) overall NIH budget will be, most respondents were fairly pessimistic with an average decrease expected to be around 3%. Although responses ranged, 30 were downward trending, 11 unchanged and 8 upward trending. Notably, 9 of the respondents are members of NIH study sections (the groups who decide which grants should vs. should not get funded).

Exhibit 2. NIH budget expectations for FY2012



Source: Oppenheimer Genomics Survey

Obviously, NIH budget cuts would impact all companies with leverage to this funding source; however, we continue to believe leverage to faster growth submarkets like NGS will more than make up for a broader budget contraction.

Exhibit 3. Estimated Leverage to US Research

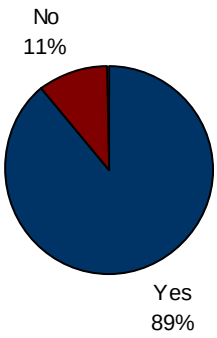
	2008	2009	2010
Agilent	3%	3%	3%
Affymetrix	45%	40%	39%
Becton Dickinson	7%	7%	7%
Beckman Coutler	12%	12%	12%
Life Technologies	40%	22%	22%
Thermo Fisher	15%	15%	16%
Qiagen	13%	13%	12%
Millipore	10%	10%	NM
Bio-Rad	3%	3%	3%
Illumina	39%	39%	39%
Perkin Elmer	10%	12%	9%
Sigma-Aldrich	9%	9%	10%
Weighted Average	**12%**	**12%**	**12%**

Source: Oppenheimer Estimates, Company Reports

NGS Usage

An overwhelming percentage of the respondents are users of NGS with only six scientists (11%) indicating no NGS usage, compared to the 49 people (89%) who do. We see this as an encouraging sign for continued adoption and utilization of NGS throughout the academic community.

Exhibit 4. Do you use NGS?



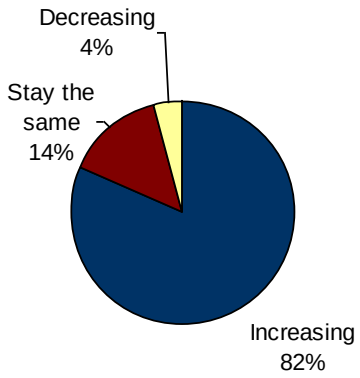
Source: Oppenheimer Genomics Survey

NGS Budgets

Of the people who responded affirmatively to NGS usage, we then asked what percentage of their general budget they dedicated to sequencing. Responses varied, but 36 of the 49 (73%) participants dedicate 5-20% of their funds to sequencing experiments. Average for the entire group, which includes heavy adopters, was 17%. We view this positively and see it as supporting our assumptions for NGS market growth. We currently forecast NGS market revenue of $1.1B and $1.4B, in 2011 and 2012, respectively.

We were even more encouraged by the scientists' outlook for the coming 12 months. When asked about sequencing budgeting in the near future, 40 of 49 respondents (82%) thought their sequencing spending would increase with time. We believe that this is an affirmation of the quality of the technological innovations and the importance they are playing in shaping research.

Exhibit 5. Percentage of budget dedicated to sequencing in the near future

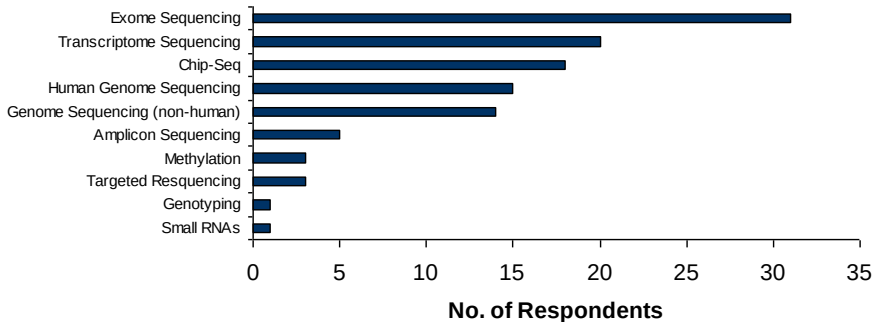


Source: Oppenheimer Genomics Survey

Current & Future Sequencing Experiments

When asked what types of experiments our 49 respondents used NGS for, the most common answers were exome sequencing and transcriptome sequencing (RNA-Seq). This is not surprising given the relative complexity of these experiments. Both exome (coding regions of the genome) and transcriptome (all expressed transcripts) sequencing are generally less resource-intensive, especially with respect to analytics. Traditionally, gene expression studies have remained popular, especially for nascent investigational studies hashing out mechanistic interactions of one protein with its neighbors further driving the usage of transcriptome sequencing. Farther down the line are more sensitive and complicated experiments like whole genome sequencing (both human and other species) and methylation analysis.

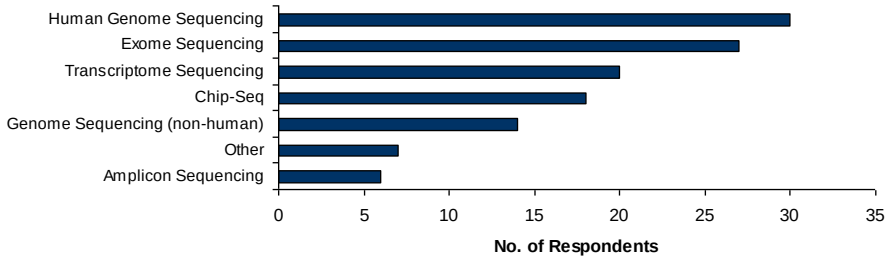
Exhibit 6. NGS experimentation profiling



Source: Oppenheimer Genomics Survey (Note – responses throughout parts of the survey sometimes add to greater then 49, as respondents were allowed to vote for multiple categories, representative of normal laboratory behavior)

We then continued our line of question and asked how our respondents believed their uses and needs would change with time. Aligning nicely with our initial hypothesis, the No. 1 interest in the future was whole human genome sequencing. We believe this shift will occur with further declines in cost coupled with continued technological improvements. Not surprisingly, interest remains in exome sequencing and transcriptome sequencing considering the relative experimental ease.

Exhibit 7. NGS experimentation profiling for the future

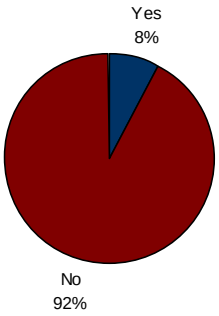


Source: Oppenheimer Genomics Survey

Machine Ownership & Location

Perhaps indicative of the incipient nature of NGS technology platforms, when asked, most participants (92%) responded that they did not own their own machine. This comes as no surprise in relation to the more expensive ILMN (HiSeq and GA), Roche (454) and LIFE (SOLiD) machine lines. The lower purchasing interest in the Ion Torrent and MiSeq is not unexpected considering how early in the product cycle we are. Of the seven responses for people who did own machines, there were three ILMN HiSeq 2000, two ILMN GAII/IIx/IIe, one LIFE Ion Torrent and one LIFE SOLiD 5500/XL.

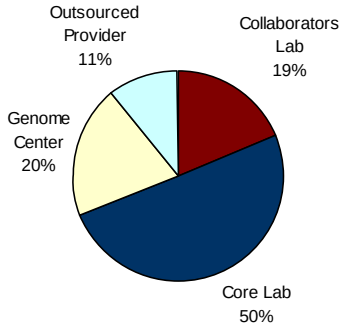
Exhibit 8. Personal machine ownership



Source: Oppenheimer Genomics Survey

We questioned further, asking where our respondents were doing their sequencing. The most common place was their universities core lab (50%) followed by a genome center (20%), a collaborators lab (19%) or an outsourced provider (11%). This makes sense as the higher throughput offerings that have dominated the market now, such as ILMN's HiSeq 2000, are expensive (~$695k) and therefore require large capital commitments; something typically more appropriate for a university's budget as compared to a laboratory's budget.

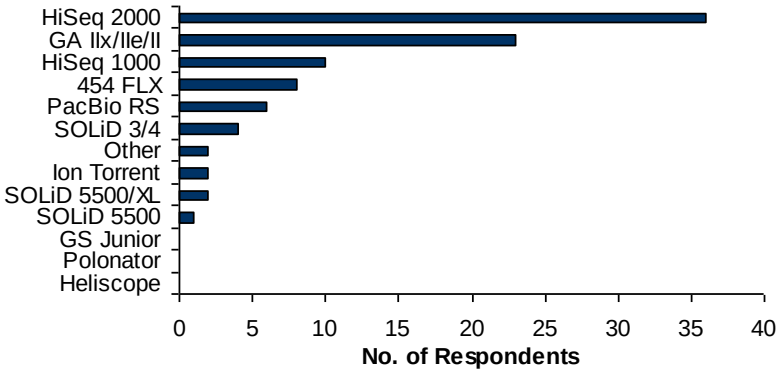
Exhibit 9. Area where NGS is performed



Source: Oppenheimer Genomics Survey

In the core labs, expectedly, ILMN seems to have the strongest presence with the HiSeq 2000, HiSeq 1000 and the GAII/IIx/IIe accounting for 73% of total placements, with the rest of the placements ranging amongst multiple platforms.

Exhibit 10. System/s used when sequencing

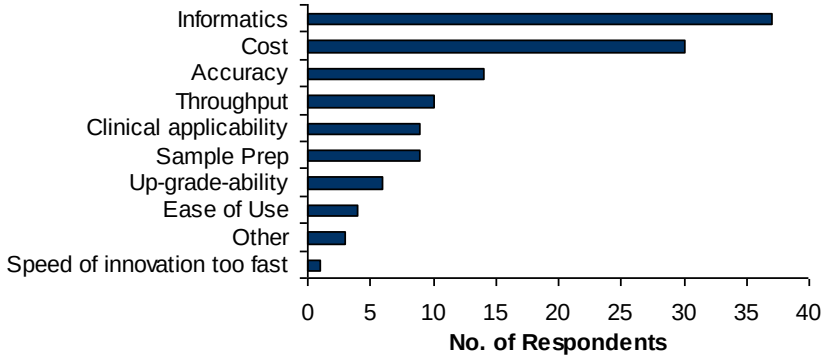


Source: Oppenheimer Genomics Survey

NGS Hurdles

We were also curious what the researchers believed were the limiting factors to this compelling technology. It came as no surprise that the highest rated hurdles are informatics, followed shortly by high costs. As the speed of technology continues to evolve at a ferocious pace, it has been difficult for people to handle the data overload, both in terms of analysis as well as physical storage limitations. Informatics limitations coupled with high costs, both for machine purchases and consumables, have remained consistent problems. However, these two issues are both active areas of innovation and research, and something we are optimistic will continue to improve.

Exhibit 11. Limiting factors to NGS uptake

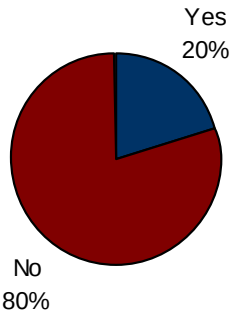


Source: Oppenheimer Genomics Survey

New Machine Purchase

When asked whether our participants were interested in purchasing a new machine, a large majority (80%) answered no. We believe this to be more indicative of the age of the new technologies, rather than a prognostic for the future. It will take time for this market to develop as the Ion Torrent launched this year and the MiSeq is still in beta testing with an initial launch expected in 3Q11. Of the ten respondents who said they would be purchasing a new machine, seven responded that they were interested or already had purchased one of the lower cost NGS machines (Ion Torrent or MiSeq). Six of these replies were for the Ion Torrent, two for the MiSeq and one was unsure. When asked what was driving their purchase, topping the list was throughput, followed by cost and clinical applicability of results. Additionally, two of the participants expressed interest in the HiSeq 2000 and one expressed interest in the PacBio RS on top of the smaller machine purchase. Explanations were multifold, ranging from clinical applicability to validation experiments and sample overflow for sequencing powerhouses. Although we want to stress how preliminary we consider these results to be, we are encouraged by the early interest in the Ion Torrent PGM and continue to believe it will drive tremendous upside for LIFE.

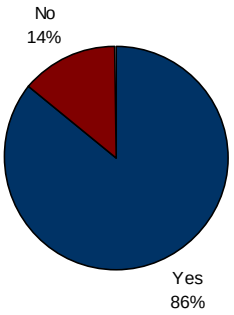
Exhibit 12. New machine purchases



Source: Oppenheimer Genomics Survey

We then took a step back and asked all the people who expressed no interest in a new machine purchase or who responded no to buying a lower cost NGS system if they had heard of the lower cost systems like the MiSeq, Ion Torrent or GS Junior. Based on the responses, it seems these systems' market presence is well known with 36 respondents (86%) affirming that they knew of the lower throughput machines.

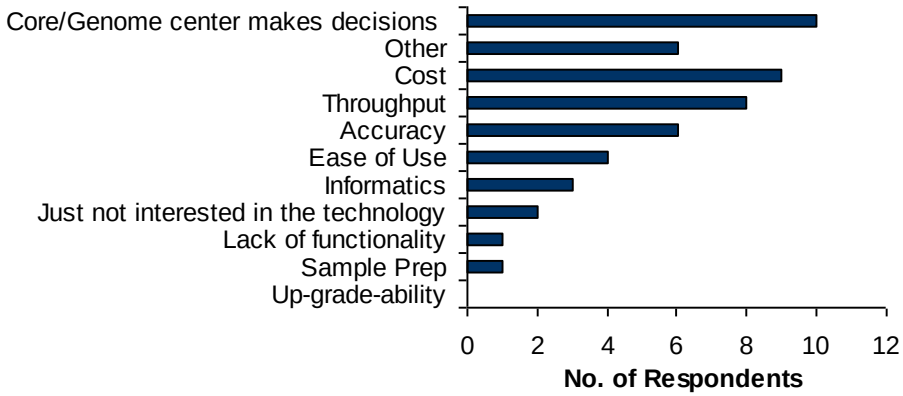
Exhibit 13. Knowledge of Lower Throughput NGS (PGM, MiSeq)



Source: Oppenheimer Genomics Survey

Of the respondents who had heard of the machines (36 participants) and were not interested in purchasing one, responses varied. The most common response was that the universities' core lab makes these decisions, but responses ranged, as shown in Exhibit 14.

Exhibit 14. Reasons for lack of interest in a lower cost NGS platform



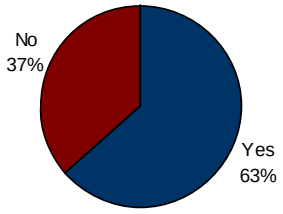
Source: Oppenheimer Genomics Survey

Of the remaining six participants who had not heard of the lower cost NGS platforms, after a brief description of the cost and capabilities of these machines, two (33%) of the respondents indicated interest in learning more.

Human Genome Sequencing & Outsourcing Services

Continuing on what we learned earlier in Exhibits 6 and Exhibit 7, we asked survey respondents whether they planned to do whole human genome sequencing. Thirty-one of 49 (63%) respondents indicated yes. Of the 18 (37%) no responses, the most common explanation given for lack of interest was that they did not work in human systems.

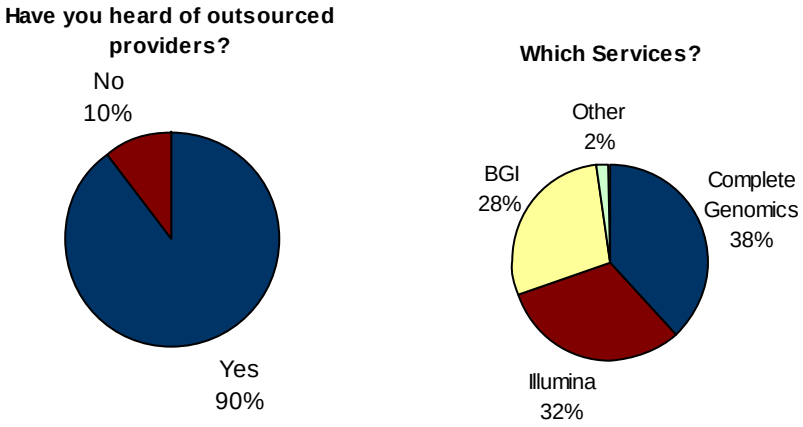
Exhibit 15. Usage of whole human genome sequencing



Source: Oppenheimer Genomics Survey

Next, respondents were asked if they had heard of outsourced whole genome sequencing services like Complete Genomics, the Illumina Genome Network and BGI. To date, it appears that word has spread, with 44 of 49 (90%) indicating that they knew of at least one of these services. Distribution of the services seems to be fairly well spread out, with Complete Genomics narrowly edging out its competitors.

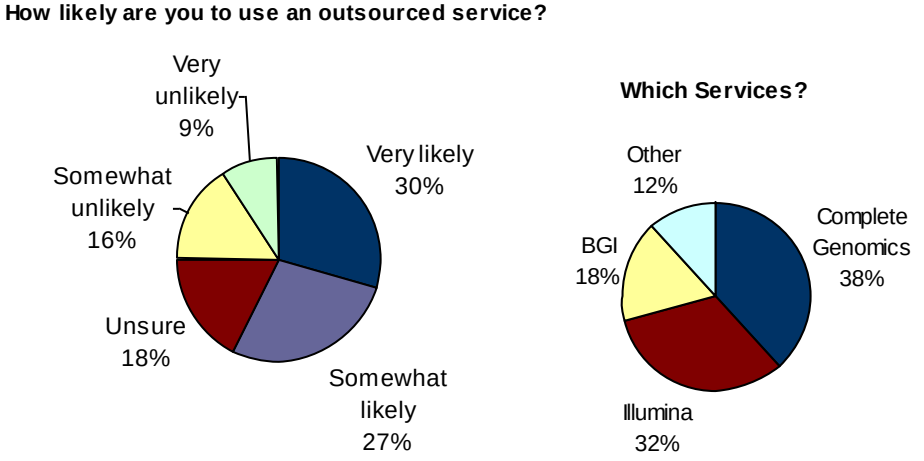
Exhibit 16. Knowledge of outsourced whole genome sequencing services and market distribution amongst competitors



Source: Oppenheimer Genomics Survey

Respondents were then asked how likely they were to use an outsourced provider and which of the providers they were likely to use. Only 25 of 44 (57%) respondents indicated that they are considering the usage of an outsourced sequencing provider with the distribution amongst companies very similar to what was stated above. The main reason people were uninterested in a service provider is that they would rather use their university's core facility (13 of 29 respondents or 45%) or the costs were too high (six of 29 or 21%). Cost decrease (11 of 39 or 28%) was the No. 1 reason people would consider changing their mind, followed by good informatics solutions (6 of 39 or 15%).

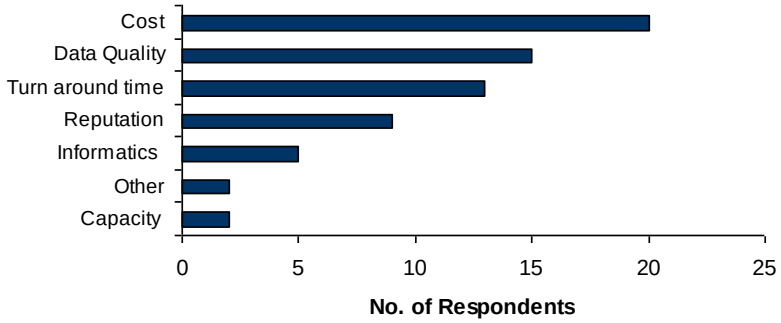
Exhibit 17. Likelihood of using an outsourced whole genome sequencing services and the provider of choice



Source: Oppenheimer Genomics Survey

The No. 1 factor driving this decision was cost followed by data quality and turnaround time. For these reasons, we believe that with time and improvements in cost, data quality and reputation, more and more researchers will view these new outsourced sequencing providers as viable options for their experimental needs.

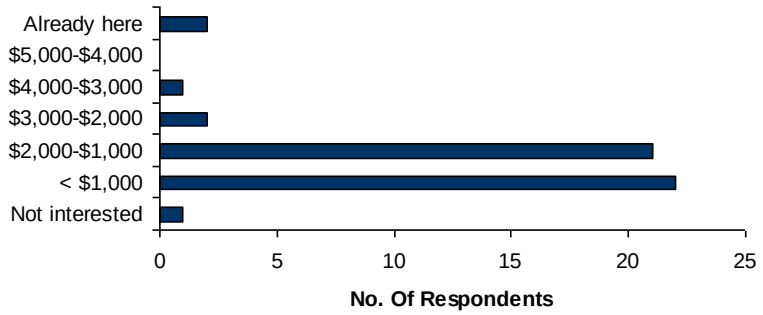
Exhibit 18. Defining characteristics of an outsourced sequencing provider



Source: Oppenheimer Genomics Survey

With cost being such a clear concern throughout much of this survey, we next asked what would be the cost per genome where price no longer becomes a concern and the focus shifts onto scientific issues like data analysis and experimental design. Respondents were quite clear in their responses with 43 of 49 (88%) pointing to under $2,000 as the sweet spot. As we think services like Complete Genomics will be able to attain such marks in the near future (one to two years), we are encouraged by these results.

Exhibit 19. Cost/genome where researchers do whole genome sequencing without reservations

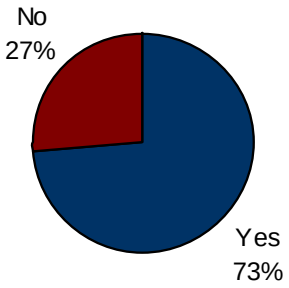


Source: Oppenheimer Genomics Survey

Microarray

Last but not least, we asked respondents whether or not they use microarray technology, and 33 of 49 (73%) responded positively. Of the respondents who do not use microarray, the most common answer (six of 15 or 40%) said they use sequencing instead. Following the sentiment shift toward NGS was general disinterest in microarray and an inability to get grants funded for microarray studies. A downturn in microarray funding could exacerbate contraction in the microarray market.

Exhibit 20. Microarray usage

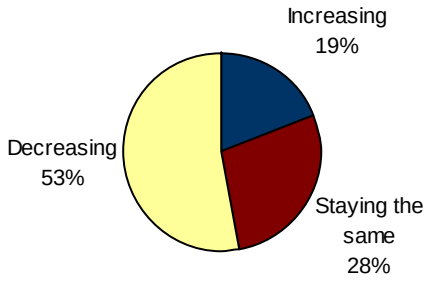


Source: Oppenheimer Genomics Survey

Of the respondents who do use microarray, the percentage of their research budget dedicated to microarray varied between 5% and 20% with an average of 14%.

Of the 36 users who use microarray, trends in the past were remarkably constant with 56% of users not changing their microarray experimental usage, 22% having increased from the past and 22% having decreased. Reasons for changes were diverse, ranging from scientists preferring sequencing technologies to a desire to try the new microarray chips being released. Of greater interest is the outlook moving forward. When asked how the respondents perceive their microarray usage moving forward, 19 of 36 (53%) felt their usage would decrease, ten of 36 (28%) felt it would stay the same and only seven of 36 (19%) felt it would increase.

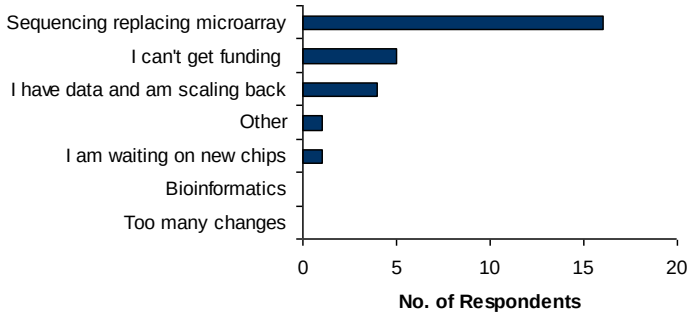
Exhibit 21. Microarray usage moving forward



Source: Oppenheimer Genomics Survey

This shift away from microarray is something we expect to continue. Of the 19 responders who mention their microarray usage would decrease, 59% mentioned that they believe sequencing is replacing microarray and another 19% mentioned that they were having trouble getting their microarray grants funded. We believe that trouble with a funding environment for this technology represents a fundamental hurdle for microarray moving forward. Of the respondents who mentioned their usage would increase, the most common explanation was excitement over bigger chips with more functionality. Based on these results we continue to see downside to AFFX, whose business remains heavily (~80%) tied to the microarray industry. Additionally, we are cautious on the potential impact to ILMN, which derives approximately 40% of revenue from microarray.

Exhibit 22. Reasons microarray usage will decrease with time



Source: Oppenheimer Genomics Survey

Conclusion

Our survey of 49 genetics/genomics professors from top US academic institutions has presented us with some interesting results. Outlook for the NIH budget in general is pessimistic. However, even with uncertain times, researchers expect to increase their usage of sequencing technologies, especially in regards to whole human genome sequencing. With time we expect outsourced technologies to become ever more accessible, affordable and useful for researchers. This upward trend is concomitant with a decreasing utilization rate for microarray technologies. Results of this survey have reaffirmed our belief that AFFX has a growing fundamental business headwind which could ultimately impact ILMN as well considering ILMN's leverage to microarray. In addition, we believe our survey speaks positively about the future for the outsourced whole human genome sequencing market, and we continue to believe the best way to play the market is GNOM.

Other companies mentioned in this report (prices a/o July 15, 2011):

Agilent (A, $47.08, Not Rated)

Becton Dickinosn (BDX, $87.09, Not Rated)

Beckman Coulter (BEC, $83.47, Not Rated)

Thermo Fisher Scientific (TMO, $63.22, Not Rated)

Qiagen (QGEN, $18.28, Not Rated)

Bio-Rad Laboratories (BIO, $118.37, Not Rated)

PerkinElmer (PKI, $26.19, Not Rated)

Sigma-Aldrich (SIAL, $73.22, Not Rated)

Roche Holdings (RHHBY, $41.90, Not Rated)

Price Target Calculation

Complete Genomics (GNOM): Our $18.50 target price assumes a WACC of 9.6% and a terminal growth rate of 2.5% on an estimated EBITDA of $111M in 2022.

Pacific Biosciences of California (PACB): Our $15 target price assumes a terminal growth rate of 3% on an estimated EBITDA of $103M in 2022.

Life (LIFE):: Our price target of $60 is driven by a discounted cash flow analysis using a weighted average cost of capital (WACC) of 11.7% and a terminal growth rate of 2% on estimated EBITDA of $3.4B in 2019.

Key Risks to Price Target

Complete Genomics: Key risks include the following: 1) Competition from high-throughput NGS installed base, 2) Uncertainty over research funding, 3) Technology obsolescence, 4) Competition from other service providers, 5) Clinical market may take time to develop, and 6) Financing risk.

Pacific Biosciences of California: Key risks include the following: 1) Competition from existing high-throughput systems, 2) New competition from lower cost NGS systems, 3) Research funding uncertainty, 4) Technical obsolescence, 5) Uncertain FDA pathway, and 5) Financing risk.

Life Technologies: Key risks include the following: 1) Worse than expected price pressure in key markets; 2) Decline in procedures on extended high unemployment; and 3) Cuts in European health care budgets.

Important Disclosures and Certifications

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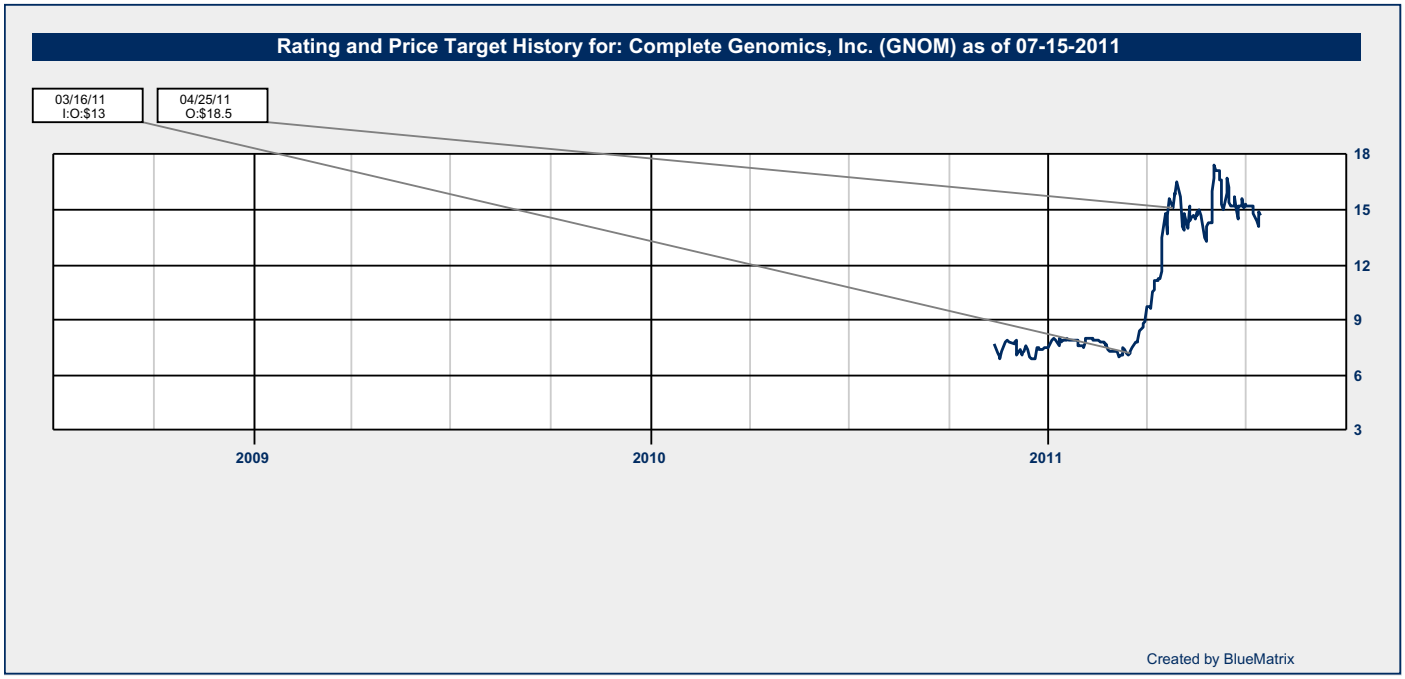
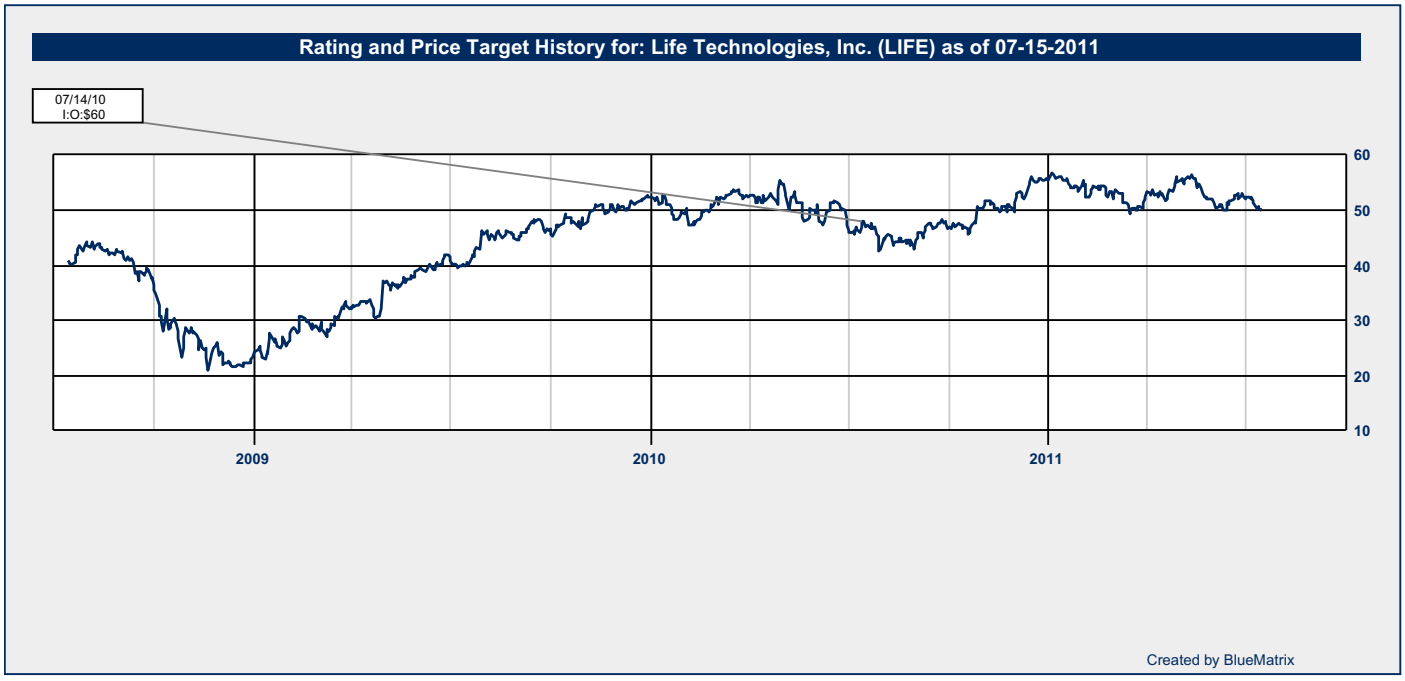
Stock Prices as of July 17, 2011

Complete Genomics, Inc. (GNOM - Nasdaq, 14.70, OUTPERFORM)
Life Technologies, Inc. (LIFE - Nasdaq, 50.19, OUTPERFORM)
Affymetrix Inc. (AFFX - Nasdaq, 6.45, PERFORM)
Illumina, Inc. (ILMN - Nasdaq, 72.82, PERFORM)
Pacific Biosciences of California (PACB - Nasdaq, 11.09, PERFORM)

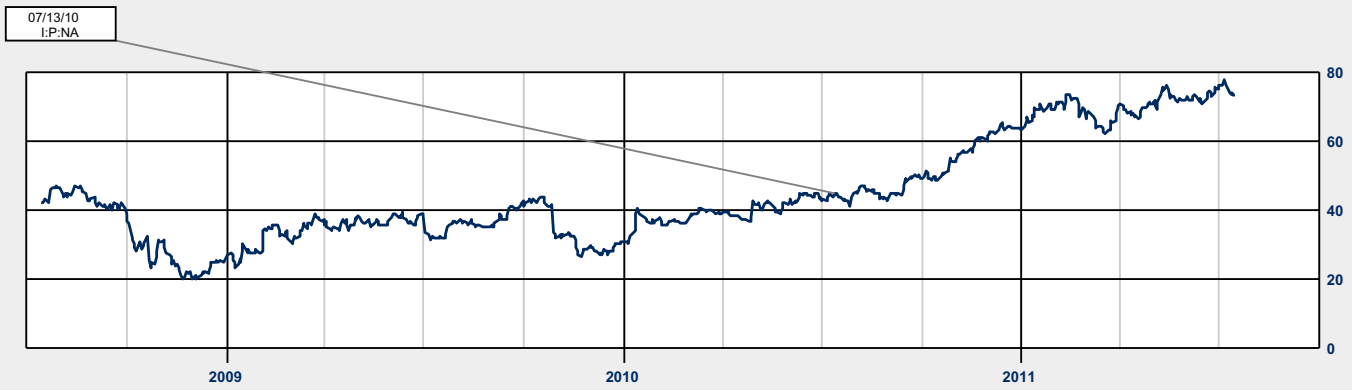

Rating and Price Target History for: Complete Genomics, Inc. (GNOM) as of 07-15-2011
03/16/11
I:O:$13
04/25/11
O:$18.5
18
15
12
9
6
3
2009
2010
2011
Created by BlueMatrix


Rating and Price Target History for: Life Technologies, Inc. (LIFE) as of 07-15-2011
07/14/10
I:O:$60
60
50
40
30
20
10
2009
2010
2011
Created by BlueMatrix

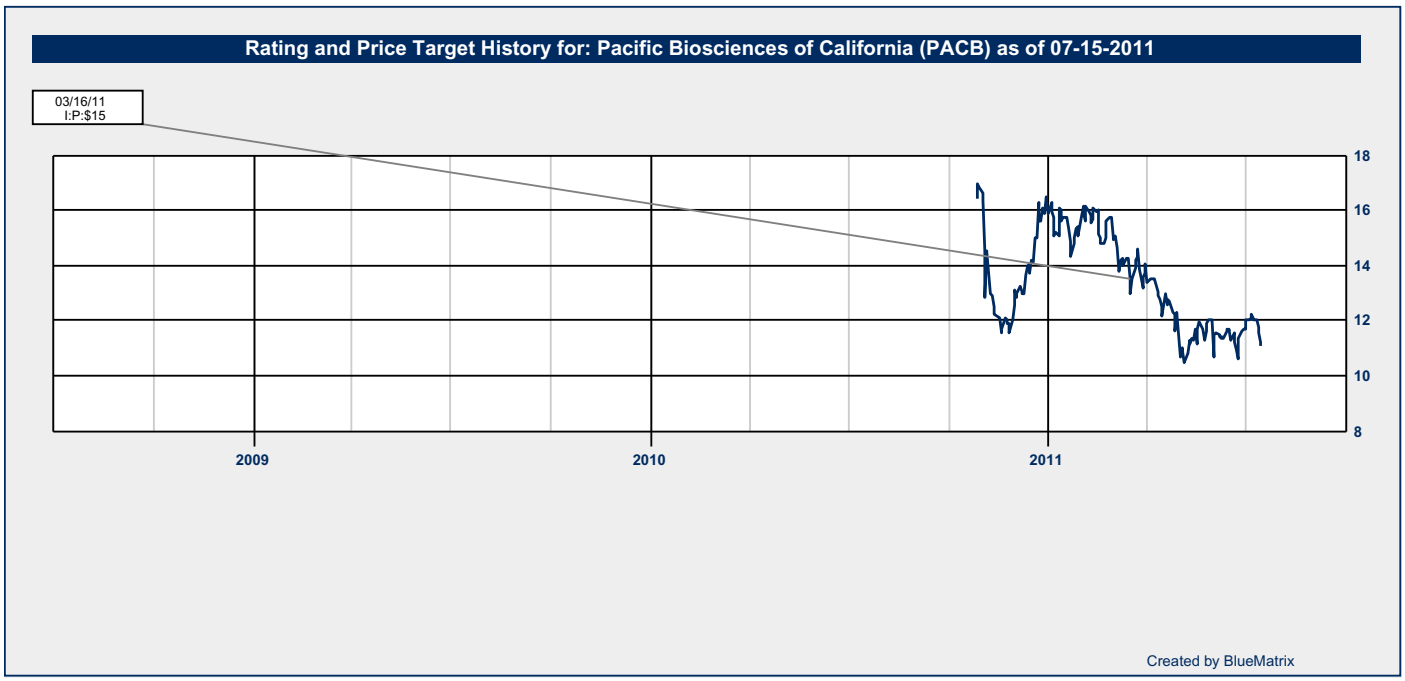
Rating and Price Target History for: Affymetrix Inc. (AFFX) as of 07-15-2011

Created by BlueMatrix

Rating and Price Target History for: Illumina, Inc. (ILMN) as of 07-15-2011



Created by BlueMatrix



All price targets displayed in the chart above are for a 12- to- 18-month period. Prior to March 30, 2004, Oppenheimer & Co. Inc. used 6-, 12-, 12- to 18-, and 12- to 24-month price targets and ranges. For more information about target price histories, please write to Oppenheimer & Co. Inc., 300 Madison Avenue, New York, NY 10017, Attention: Equity Research Department, Business Manager.

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Perform (P) - Stock expected to perform in line with the S&P 500 within the next 12-18 months.

Underperform (U) - Stock expected to underperform the S&P 500 within the next 12-18 months.

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Neutral - anticipates that the shares will trade at or near their current price and generally in line with the leading market averages due to a perceived absence of strong dynamics that would cause volatility either to the upside or downside, and/or will perform less well than higher rated companies within its peer group. Our readers should be aware that when a rating change occurs to Neutral from Buy, aggressive trading accounts might decide to liquidate their positions to employ the funds elsewhere.

Sell - anticipates that the shares will depreciate 10% or more in price within the next 12 months, due to fundamental weakness perceived in the company or for valuation reasons, or are expected to perform significantly worse than equities within the peer group.

Distribution of Ratings/IB Services Firmwide

			IB Serv/Past 12 Mos.	
Rating	Count	Percent	Count	Percent
OUTPERFORM [O]	323	55.20	142	43.96
PERFORM [P]	253	43.20	82	32.41
UNDERPERFORM [U]	9	1.50	1	11.11

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