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The Biotechnology Revolution

By Michael D. Becker

Few individuals would dispute technology's profound impact on society. Semiconductor chips, software, personal computers and the internet have dramatically increased efficiency in almost every sector of our economy. Manufacturing, engineering, retailing and communication processes that used to take days are now done in seconds.

Investors and entrepreneurs with an ability to recognize and participate in important paradigm shifts, such as the Industrial Revolution during the 19th century or the Technology Revolution during the 20th century, have been rewarded handsomely. For example, the AMEX Computer Tech Index has an average annual compounded return of 26.58% from 1990 through 1998. In other words, a $1,000 investment in this index at the beginning of the decade would have grown to $8,342 by the end of 1998.

In stark comparison to the impressive returns witnessed in the technology industry over the last decade, participation in the biotechnology sector has not been equally satisfying. Anyone who purchased the AMEX Biotech Index at the end of 1991 would have a negative average annual compounded return of -2.86% through the end of 1998.

As we approach the new millennium, however, it appears that biotechnology's fortunes may be changing. Contrary to previous "doom and gloom" analyst commentary, the sector has shown dramatic fundamental improvement in recent years. For example, the number of products in late-stage clinical trials, new product approvals, profitable biotech companies and industry mergers & acquisitions are all at record levels. Combine these positive attributes with decoding the human genome, improving capital markets, a more accommodating FDA and a novel blending of technology, chemistry and biology and you have all the necessary ingredients for what I see as another paradigm shift: The Biotechnology Revolution.

Strong performance

The NASDAQ Biotech Index is on track to record its second consecutive year of greater than +40% returns. The rally that began during the fourth quarter of 1998 has propelled the major biotechnology indices out of a three-year trading range and into record territory during 1999. For the year ending November 30, 1999, the NASDAQ and AMEX Biotech Indices are up 54.80% and 55.62% respectively. In contrast to a rather hostile capital market environment that favored financing any company ending in "dot-com", rather than those working to cure or treat disease, this recent performance is even more impressive.

In light of several years of strong returns, "Will this trend continue?" is the question on the minds of many industry pundits. Considering the improved fundamentals and the fact that many investors who purchased stocks in these biotechnology composites during the early 1990's are just starting to get their initial investment back, the answer could be a resounding "yes".

The rally broadens

During the fourth quarter of 1998, the NASDAQ and AMEX Biotech Indices rose 37% and 33% respectively. Large capitalization companies such as Amgen (AMGN), Biogen (BGEN) and Immunex (IMNX) led the performance, which accounted for a majority of the returns that year. In 1999, however, you won't find any of these leaders in the top ten percentage gainers for the year. In fact, out of nearly 200 companies in the NASDAQ Biotech Index, none of the industry's bellwethers are even in the top 30.

Many of 1999's best performers are emerging biotechnology companies that exhibited success in late-stage clinical trials. For example, Amylin Pharmaceuticals (AMLN) is up an astounding 1600% for the year after announcing positive phase III results from their lead diabetes drug called Symlin. Imclone Systems (IMCL) is up 308% for the year as their lead therapeutic for head and neck cancer entered Phase III trials. Lastly, QLT Phototherapeutics (QLTI) is up 292% this year after the company’s therapy for the treatment of wet age-related macular degeneration (AMD) was recommended for approval by an FDA subcommittee.

More than 20% of the 200 companies in the NASDAQ Biotech Index have doubled so far in 1999 and 8% have more than tripled. In addition to positive clinical progress, merger & acquisition speculation helped provide an additional catalyst for many late-stage companies as big pharmaceutical companies searched for ways to fill gaps in their product pipelines.

Segmenting the industry according to market capitalization helps further illustrate the broadening biotechnology rally. In early 1999, over one-third of the companies in the NASDAQ Biotech Index had a market capitalization below $50 million. At the end of the third quarter, the number of companies in this segment dropped to fewer than 10%. More importantly, the percentage of companies with a market capitalization above $250 million reached 45% at the end of the third quarter compared to 30% at the beginning of the year.

Commanding a larger market capitalization is vital for biotechnology companies to attract additional investment dollars. The large inflow of capital into mutual funds, combined with impressive returns witnessed in the equity markets over the past several years, has caused institutional investors to seek larger and, therefore, more liquid positions in their investments. Due to an increased number of companies achieving market values above $250 million, the environment for financing, institutional investment and research coverage should remain favorable.

A widespread revolution

Just as the Industrial and Technology Revolution impacted almost every facet of our lives, the effects of the Biotechnology Revolution will be far reaching. Even in its nascent stages, this new paradigm is positively affecting the environment, agriculture, criminal investigations and most importantly - the quality of human life.

In the environment, biotechnology applications are replacing or enhancing the cleanup of hazardous waste sites, oil spills and abandoned industrial sites. Biotechnology is also being used to prevent pollution by replacing chemicals in laundry detergents with enzymes that are friendlier to the environment.

Despite the controversy surrounding genetically modified organisms (GMO's), biotechnology is improving both the quantity and quality of food. Opponents of GMO's have rallied around innocent butterflies that may be equally susceptible to genetically engineered crops designed to be toxic only if eaten by other harmful insects, while being benign to humans or animals. This argument quickly loses its merit, however, when one considers how traditional chemical pesticides negatively impact many aspects of our environment. Biotechnology's ability to customize crops that can grow in any climate, resist harmful insects, require less water or yield products that simply taste better will ensure its role in the future of agriculture.

Just as no two individuals have the same fingerprints, every living thing (except identical twins) has a unique combination of genes. By comparing genetic material obtained from a crime scene with samples from a database of previous offenders, biotechnology can help criminal investigators rapidly identify a culprit. Eventually, law enforcers may even utilize hand held devices that quickly analyze hair, skin or bodily fluids while still at the crime scene.

Biotechnology, with its potential to cure, treat and diagnose disease will likely rival prior paradigm shifts in the economy. Someone you know with cancer, a heart condition, diabetes or other disease was likely already helped by biotechnology. Currently marketed products developed by this industry help dissolve blood clots that cause heart attacks and strokes, allow kidney dialysis patients to regain energy and improve their quality of life and provide growth hormones to children who lack them. In the future, drugs designed to starve cancerous tumors of the oxygen and nutrients they need in order to survive may provide new hope to those who suffer from many types of cancer.

Borrowing from past paradigms

Ironically, many components of the Technology Revolution may be fueling the Biotechnology Revolution. Novel approaches that combine semiconductor chips, software and the internet with advances in chemistry and biology are accelerating the rate of drug discovery and development.

For example, silicon chips are combined with genetic information to create “biochips”, which are capable of quickly identifying subtle mutations and patterns in DNA. Bioinformatics software is

helping scientists analyze the massive amounts of data that these biochips can produce. Some software even allows scientists to design and test new drug targets without them ever entering an animal or human being. Lastly, vast databases of genetic information can now be shared across different departments, cities and countries thanks to the internet.

Indeed, the similarities between the Technology and Biotechnology Revolutions are numerous. For example, just as computers and operating systems standardized the analysis and flow of information, biochips and enterprise solutions in the biotechnology industry promise to make data and information available via common interfaces. For instance, privately-held InforMax, Inc. is leading the development of bioinformatics software for accelerated drug discovery with over 10,000 researchers using their products worldwide. The company's Software Solution For Bio-Medicine (SSBM) is a new generation of molecular biology and genetics software utilizing the modern and most prominent computer science technologies - relational databases, client-server architecture and Java framework.

In 1971, Intel (INTC) introduced their first microprocessor chip called the 4004. Considered revolutionary at the time, it contained 2300 transistors and could perform only 60,000 operations per second. Two years later, Intel introduced another chip called the 8080, which contained 4500 transistors and could execute 200,000 instructions per second. Gordon Moore made the observation (now known as Moore's Law) that the number of transistors on a chip doubled roughly every two years. He was correct, 25 years later Intel's Pentium Pro microprocessor contained 5.5 million transistors.

The GeneChip® by Affymetrix (AFFX) is biotechnology's equivalent of Intel's first 4004 processor chip. Introduced commercially in 1996, the first GeneChip was capable of analyzing 100 genes on a single chip. By 1997, a single GeneChip could analyze up to 1500 genes. Next generation chips will monitor the expression of up to 40,000 genes. Using the history of the microprocessor as a guide, within the next few years it's possible that one chip will contain all 100,000 genes in the human genome.

Other companies, such as Nanogen (NGEN), are working to miniaturize entire laboratories onto computer chips. Fluid samples will move through channels etched in silicon, saving companies money by using smaller amounts of expensive chemicals and reagents. Results from experiments run on these new chips will be fed automatically into a computer for immediate analysis.

Summary

As the Biotechnology Revolution unfolds, we will continue to keep readers informed of new trends, emerging technologies and the investment opportunities they present. The magnitude of this revolution could be unlike any other before it. For those who understand the risks inherent in any emerging industry, and are financially equipped to withstand them, this will be an exciting and rewarding opportunity.