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Organization and Strategy at Millennium (A)

As Deborah Dunsire, M.D. returned home from her January 2005 interviews at Millennium Pharmaceuticals (Millennium), she ran through her assessment of the challenges she would face at the Cambridge, Massachusetts-based biopharmaceutical firm. As a potential successor to founding CEO Mark Levin, Dunsire's first priority was to bring Millennium to profitability. To succeed, she knew that she would need to rapidly establish a productive relationship with Millennium's management team. Among other things, the team would need to reevaluate the number of disease classes Millennium could feasibly tackle and to determine how the firm should allocate its limited resources across the value chain activities of early-stage discovery research, later-stage drug development and final product commercialization. Dunsire would present her initial plans for Millennium to the board on Monday morning. Sitting in her living room, she pulled out a legal pad and began to jot down her thoughts.

A Brief Background of the Pharmaceutical Industry

While the use of herbs and other remedies to treat ailments dates back to ancient times, the modern pharmaceutical industry can be traced back to the nineteenth century. For example, while searching for a malaria drug in 1856, William Henry Perkins synthesized the first synthetic dye, heralding a new era of chemical-based drug development. Subsequently, Louis Pasteur helped move germ theory and vaccination technology forward, Bayer AG released a popular Aspirin product and Paul Ehrlich developed the first antibiotic to treat disease. During the first half of the twentieth century, many chemical firms branched into the growing pharmaceutical industry and governments implemented increasingly stricter industry regulations.¹

The 1953 discovery of the molecular structure of DNA (the double helix) by Francis Crick and James Watson foreshadowed a paradigm shift in the pharmaceutical industry that would offer potential to unlock value in the early-stage discovery steps of the value chain (see **Exhibit 1**). In the early 1970s, Herbert Boyer and Stanley Cohen used this knowledge about DNA to develop new genetic engineering techniques to help launch the biotechnology industry. Genentech developed the first biotechnology drug, Humulin, a genetically engineered insulin, which was launched by Eli Lilly in 1983.² Despite the industry's promising start, the science was even more complex than first envisioned, and by 1988, the U.S. government had approved only nine biotechnology drugs.³

Professor Julie Wulf and Research Associate Scott Waggoner prepared this case. Certain details have been disguised. HBS cases are developed solely as the basis for class discussion. Cases are not intended to serve as endorsements, sources of primary data, or illustrations of effective or ineffective management.

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During the 1990s, a new wave of biotechnology firms emerged as the fields of biology and technology evolved and scientists made significant progress in mapping the DNA of the human genome. While pharmaceutical firms had traditionally focused on finding chemical compounds to treat the symptoms of disease, the new biotechnology firms used biology to identify biological targets responsible for diseases and develop molecules to prevent or cure these diseases. Up to that point, the pharmaceutical industry had only analyzed about 500 drug targets and experts predicted that biotechnology could help identify another 30,000-40,000 new drug targets while increasing efficiency in the drug development process and shortening the cost and time to develop drugs.⁴

The 1990s was also a period when the traditional chemical-based pharmaceutical industry had to address moving blockbuster drugs off patent, increasing competition from the emerging generic drug industry and falling productivity in the increasingly expensive and time consuming R&D processes.⁵ Tufts University estimated that the cost of an average marketable drug had spiraled to \$800 million and that the time between initial development research and marketing had grown to 10-15 years.⁶ Experts estimated that only one in 10,000 molecules in discovery became a marketable drug and only three of ten marketed drugs generated revenues that exceeded their R&D costs.⁷ In response to these dynamics, pharmaceutical firms scrambled to form research partnerships with the most promising biotechnology firms, such as Millennium.

The Founding and Evolution of Millennium

In 1993, Levin founded Millennium Pharmaceuticals in Cambridge, MA with a group of top-tier researchers. Levin, a biomedical engineer whose principle experience was outside academia, ran Genentech's process engineering in the 1980s, co-founded Cell Genesys in California and was a partner at the Mayfield Fund, a California-based venture capital firm, where he founded nearly a dozen businesses.

Levin's founding team included Daniel Cohen, M.D., Ph.D. (a professor at the University of Paris and co-founder of France's Centre d'Etude du Polymorphisme Humain⁸) and Eric Lander, Ph.D. (founder of the Whitehead Institute/Massachusetts Institute of Technology Center for Genome Research⁹), who were key players in competing projects to first map the human genome. Additionally, Jeffrey Friedman, M.D. was performing obesity research at Rockefeller University and Raju Kucheralapati, Ph.D. was a professor at the Albert Einstein College of Medicine.

To launch Millennium's operations, Levin raised \$8.5 million in seed financing from venture capital firms Mayfield Fund, Greylock Limited Partnership, Venrock Associates and Kleiner, Perkins, Caufield & Buyers.¹⁰ In 1993, Levin became Millennium's interim CEO, an interim that lasted until summer 2005.

Phase I – "Build it and They Will Come" (1993 to late 1990s)

In the early 1990s, as the fields of genetics and information technology rapidly evolved, Levin envisioned combining these fields at Millennium to, "address diseases at their root causes, rather than simply identifying and treating their symptoms."¹¹

Levin hired top-tier university researchers and medical doctors, from places like neighboring Harvard and MIT, to merge their expertise in such areas as genetics, biology, chemistry, robotics and computer systems into a state of the art "technology platform." Millennium's technology platform essentially combined hard sciences with powerful computer systems and industrialized the drug discovery process with new tools such as proprietary Rapid Analysis of Differential Gene Expression (RADE) technology, large scale DNA sequencing and high-throughput expression cloning. Levin

believed that Millennium's technology platform would revolutionize the pharmaceutical industry by drastically improving the speed, effectiveness and cost of drug discovery. As one executive surmised, "Mark's vision was bold, audacious. He was the ultimate visionary."¹²

Millennium's technology platform helped the firm leapfrog most other biotechnology and pharmaceutical firms in early-stage drug target identification (finding biological molecules within the body that were linked to diseases). By 1995, Levin was leveraging the firm's vision and technology platform to broker strategic alliances with major pharmaceutical firms. In a typical alliance agreement, Millennium would carry out early-stage discovery research and the pharmaceutical partner would pay Millennium an upfront fee, make milestone payments when a pre-specified research milestone was achieved and take responsibility for potential downstream drug development and commercialization.

Millennium maximized the value of its technology platform by segregating the pharmaceuticals market by disease area (such as diabetes, inflammation and oncology) and entering into simultaneous and parallel partnerships with many firms, narrowly defining the scope of each alliance. For example, Millennium's first alliance was a \$70 million dollar deal with Hoffmann-LaRoche to search only for obesity and diabetes drug targets over a period of five years. Millennium retained a wide variety of rights, including ownership of any discoveries outside the scope of the agreement and future drug co-commercialization.

Millennium's ability to negotiate research alliances became a key driver of its competitive advantage. By September 1998, Millennium had formed over a dozen alliances and had just entered into the largest discovery alliance in the history of biotechnology. Millennium's \$465 million agreement with Bayer included a \$100 million equity investment by Bayer in the firm. Over the subsequent five years, Millennium would collect \$365 million for providing 225 drug targets to Bayer in the therapeutic areas of hematology, liver fibrosis, oncology, osteoporosis, pain and viral infections.¹³

Millennium was so successful at forging alliances, that it eventually collected some \$2 billion from its partners. These funds helped Millennium to build a world-class research platform with over 1,000 scientists performing cutting-edge work in some of the most challenging therapeutic areas including: asthma, autoimmune system, cardiovascular, central nervous system, inflammation, oncology and obesity (see **Exhibit 2**).

With respect to alliance opportunities, Levin commented, "When people walked in (offering) \$25 or \$50 million up front and \$300 or \$400 million, not guaranteed, but likely to be received in the future, we took them on. . . . It's hard to tell when to stop when you have that kind of demand. On the other hand, however, they did bring in a tremendous amount of cash, and what that allowed us to do was to build our own (downstream) pipeline, which cost well over a billion dollars."¹⁴ Anna Protopapas, SVP of Corporate Development, observed that over time some disadvantages of the alliances began to manifest themselves. For example, partnership agreements required Millennium to make major capital commitments and prevented Millennium from doing its own research in areas covered by the agreements to avoid any conflicts of interest. Moreover, any potential revenues had to be shared with Millennium's project partners.¹⁵

Phase II – Envisioning a Fully Integrated Biopharmaceutical Firm (late 1990s to early 2000s)

By the late 1990s, Levin saw that Millennium's competitive advantage in discovery was rapidly disappearing as information, technology and tools became more widely diffused in the market and partners learned from Millennium. International teams of government and privately sponsored

scientists were completing a preliminary mapping of the human genome, moving biological information, once held by a limited number of biotechnology firms, to the public domain. Levin recalled that, "It became increasingly clear that in the medium-term, the human genome would be sequenced and would either be public or with no value. So looking forward three, four or five years, if you weren't downstream, you would be history."¹⁶ Consequently, Levin began to steer Millennium away from early-stage discovery alliances (upstream) and towards drug development and commercialization (downstream) (see **Exhibit 3** summarizing the evolution of Millennium's business).

To achieve the broad scope of Levin's new strategy, Millennium pursued a series of acquisitions. According to Marsha Fanucci, CFO, "As Millennium needed to generate revenues via alternative paths, we felt organic growth would be too time consuming and difficult, so we concentrated on M&A"¹⁷ (see **Exhibit 4** showing selected acquisitions). Millennium's first significant move downstream from drug discovery research to drug development was the 1997 acquisition of Cambridge, MA-based ChemGenics Pharmaceuticals for approximately \$90 million in stock. ChemGenics provided high-throughput screening capabilities for developing drug targets into lead compounds. The deal also included alliances with Pfizer covering antifungal treatments and American Home Products (AHP) covering bacterial diseases.¹⁸

In October 1999, Levin announced the acquisition of Cambridge, MA-based LeukoSite for \$750 million in stock. LeukoSite provided Millennium with downstream development expertise in areas such as chemistry, clinical trials and regulatory affairs. It also contributed an oncology and inflammation product pipeline, with six drug candidates in clinical development and over a dozen drug candidates in pre-clinical development, including one candidate that Millennium would eventually market as VELCADE[®] (bortezomib) for Injection.¹⁹ Millennium appointed Christopher Mirabelli, the former CEO of LeukoSite, as President of Pharmaceutical Research and Development although he resigned in April 2000.

In many ways, 2000 was a highly successful year for Millennium. Levin expanded Millennium's strategy to include "personalized medicine," which he envisioned would leverage Millennium's technology platform to customize medicines to the genetic profiles of each and every patient. In Levin's view, personalized medicine held the promise of improving the effectiveness of drug treatment while limiting side effects. The firm also acquired U.K.-based Cambridge Discovery Chemistry (CDC) for \$50 million in cash. CDC bolstered Millennium's downstream drug development skills in medicinal and computational chemistry, adding nearly 100 chemists who would help to bridge the gap between early stage discovery research efforts and marketable drugs. Millennium signed a \$450 million alliance agreement with Aventis and was progressing towards a \$250 million alliance with Abbott, which was signed the following year.

Millennium's vision and rapid evolution made it the "Darling of Wall Street" as investors drove the company's stock price up more than ten-fold, pushing Millennium's market capitalization to \$18 billion by November 2000. By way of comparison, major established pharmaceutical firms such as Schering-Plough and Pharmacia were valued in the \$70 billion range at that time. In 2000, revenues for the three firms were \$196 million, \$10 billion and \$18 billion, respectively. In any case, strong investor demand that year permitted Millennium to raise over \$1 billion cash in the public markets and to use its highly valued stock as currency to acquire other businesses. To some, it seemed as if Millennium had no resource constraints. Fanucci commented, "Visionary leaders are not necessarily disciplined. It would be too constraining."²⁰

In 2001, Millennium announced the \$3 billion acquisition of COR Therapeutics (COR), a San Francisco-based biopharmaceutical firm with approximately 300 employees and over \$50 million in annual profits. COR owned INTEGRILIN[®] (eptifibatide) Injection, a successfully marketed

cardiovascular drug for acute coronary syndromes, which it had successfully co-promoted with Schering-Plough since 1998. Millennium's management stated that a key attraction of COR was its cardiovascular sales and marketing team, with over 100 people covering hospitals across the U.S. COR also had research teams and a product pipeline in both oncology and cardiovascular diseases. By acquiring COR, Millennium became a fully integrated pharmaceutical firm "overnight," with proven capabilities in the discovery research, development and commercial arenas.

Phase III – Refocus (early to mid 2000s)

Unfortunately, the tide turned quickly at Millennium. As Levin began to realize just how challenging it was to build expertise in a broad variety of therapeutic areas while expanding the value chain downstream towards commercialization, Millennium's stock price dove towards pre-bubble levels (see **Exhibit 5**). In response, Levin started to concentrate Millennium's resources in disease areas where he felt the firm had a competitive advantage. In 2001, Millennium wound down most of its discovery efforts in infectious diseases and the central nervous system. While this initiative helped focus the firm and reduce cash burn, Fanucci worried that, "Millennium had several good products in development and risked closing down a potential blockbuster prematurely."²¹

In 2002, Millennium's management team worked on assimilating COR's San Francisco-based oncology and cardiovascular R&D platform. Levin reflected, "I think that the COR acquisition was a mixed success. . . . COR was a great company, with a great team and a strong commercial organization. COR also brought \$50 to \$75 million to the bottom line, which was key to helping us reach profitability. The major issues for us were that Integrilin was in a fairly competitive market and at that point we probably weren't as focused as we should have been and maybe shouldn't have gone into cardiovascular."²²

Following the acquisition, Millennium appointed Charles Homcy, COR's former Executive Vice President of Research and Development, to President of R&D. Homcy soon transitioned to Senior Advisor of R&D and left the firm in November, 2003, although Millennium subsequently appointed him to its Board of Directors.

Millennium spent \$511 million in R&D and booked a net loss of \$590 million in 2002 (see **Exhibit 6** for summary financials). While Millennium still had approximately \$1 billion in net cash at year-end, Levin commented, "You can't lose three or four hundred million dollars a year for very long."²³ Partnership revenues were falling, due to the shift in business model from an R&D services organization to a fully-integrated company focused on its own pipeline, and raising significant amounts of additional outside capital was unlikely following the 2001 burst of the technology bubble and subsequently weak capital markets.

In summer 2003, Levin launched a major restructuring effort which included reducing Millennium's headcount from 2,300 to 1,700 and rationalizing the firm's geographic footprint to its Cambridge roots by winding down U.K. and San Francisco operations. This round of restructuring was focused on reducing early-stage discovery research expenditures and terminating metabolic research efforts. Until this restructuring, research was well over 50% of total R&D spend, significantly higher than the industry average of 25% to 35%.²⁴ However, Millennium largely maintained the budget and staff in its downstream activities of non-clinical development sciences (animal testing) and medical sciences (human testing) (see **Exhibit 7** showing selected operating metrics). Millennium devoted additional resources to its commercial organization, helping to bolster Integrilin sales and prepare for the 2003 commercial launch of Velcade, a drug candidate acquired in the 1999 LeukoSite deal. Millennium booked \$191 million in restructuring charges and a net loss of \$484 million in 2003.

Culture, Organization and Incentives at Millennium

Culture

By most accounts, Millennium was an exciting and intense place to work. Millennium's team rallied around Levin's evolving vision of biotechnology and enjoyed working on tough problems at the forefront of science. Levin commented, "Early on we focused on building a culture where great people could do great things and making sure it was a really open environment."²⁵ Lander added, "The reason spectacular scientists come to Millennium is that spectacular scientists work at Millennium. Mark saw that from the beginning."²⁶

Levin also spent a significant amount of time thinking about the firm's vision, "Articulating a broad vision, though, is only a first step—you need to map out a course to get there. The way I do it is to give our people a specific vision or theme for each year. In fact, this is probably one of the reasons why we've managed to stay entrepreneurial. If you have a new vision every 12 months, you become, in effect, a new company every 12 months."²⁷ Levin even printed and distributed T-shirts emblazoned with each year's vision, such as, Nothing's Impossible (1994), Prime the Pipeline with Products (1998) and Focused Execution (2001).²⁸

Levin maintained Millennium's creative culture and evolutionary vision through informal organizational processes. According to Levin, "(Maintaining Millennium's entrepreneurial culture) is our number one challenge, and we spend a tremendous amount of time on it. It was easy to be entrepreneurial years ago, when we had just 30 people in the company; everybody could sit around one table. Of course, it's impossible to perfectly duplicate the intensity and passion of a start-up, but you have to act like you can."²⁹ In many ways, Levin succeeded in maintaining Millennium's entrepreneurial culture, even when the firm's team topped 1,000 people. Millennium's employees continued to be passionate about Levin's vision of improving the world and continued to work long hours and weekends under stressful conditions to meet aggressive goals. One employee observed, "People would do anything for Mark."³⁰

Organization

Millennium's organizational structure and processes had always been more informal than those of larger companies. According to Dunsire, "Millennium was organized around its people."³¹ Employees had a sense of Millennium's organization but relied on informal committees and ad-hoc systems throughout the firm to help guide the business and coordinate operations. The Executive Committee, for example, included Levin and the Heads of Commercial^a, R&D, Finance, Legal and Human Resources, and was responsible for high level issues such as corporate strategy and resource allocation (see **Exhibit 8** showing Millennium's management team).

In the very early years, few committee meetings required preapproved agendas or extensive preparation by anyone. Rather they were viewed as non-conflictive discussion forums to generate ideas and to make decisions. This approach evolved, in part, over time. For example, Levin began to professionalize executive meetings as Millennium prepared to launch Velcade commercially and to restructure its business. Fanucci observed, "A lot of people resisted or resented the change in culture. Everyone still felt entitled to have a voice but people didn't want to be held accountable."³² Consequently, clear roles, responsibilities and governance structures of individuals and teams did not fully mature. Millennium's 2005 firm-wide employee surveys reflected a high level of employee

^a The Head of Commercial position was vacant in early-2005.

satisfaction but hinted at some frustration. One executive observed, "Millennium had a consensus-driven culture, so was slow to make decisions and was continually revisiting issues."³³

Resource allocation in R&D For example, in 2001 Millennium launched Project 241, an early stage development partnership with a local biotechnology firm. For financial reasons, Millennium's management decided to stop the program before it went into clinical trials. Somehow Project 241 survived, and by 2005 it was one of the latest stage molecules in Millennium's pipeline and one of only a few to show early signs of clinical benefit in patients. Regardless, an increasing number of individuals throughout Millennium's R&D organization, and several committees across its R&D and G&A functions, concluded that the probability of Project 241 being successful was low due to the molecule's projected side effects relative to its level of efficacy. Given the molecule's falling probability of success and the relatively small addressable patient population, its financial outlook became increasingly negative. Furthermore, some believed that Project 241 was distracting Millennium's R&D organization from more productive opportunities. So when the molecule reached Phase II clinical trials, management established "go/no-go" criteria. The criteria stipulated that if the drug did not drop levels of the relevant biomarker efficacy by 50% in a set number of patients, then the clinical trials should be terminated. Unfortunately, after the trials were completed, it became clear that Project 241 did not meet these criteria.

Millennium's Portfolio Review Committee (PRC), whose membership included the senior level R&D team, reviewed Project 241's Phase II clinical data, commercial feasibility and financial projections and concluded that the project should be terminated. The PRC discussed its conclusion with the Executive team, which requested a formalized presentation. In the meantime, individual members of the Project 241 team who were champions of the molecule, initiated parallel discussions with individual Executive Team members to lobby for the continuation of the project. Continuation of Project 241 would require significant additional investment by Millennium. Despite the PRC's recommendation, Project 241 continued.

Incentives

Millennium's human resources practices were focused on fostering a creative, entrepreneurial environment in which employees were encouraged to extend themselves in terms of work load and content. Executives emphasized social gatherings and creating forums for the exchange of ideas, always with the goal of making work feel like fun. Few human resources policies existed and fewer were applied consistently across groups. Management discussed processes but often abandoned them to accommodate individuals.

Millennium had a relatively informal employee review process for many years. However, employees were not consistently required to prepare formal goals at the beginning of each year, making it impractical to hold them accountable at year-end. Because annual goals were not documented consistently, compensation was not necessarily tied to performance. As a result, compensation was generally doled out relatively equally to employees across a level, creating a narrow dispersion. A Human Resources executive added, "It was tough to rank top-tier, valedictorian-type talent, so most employees received good reviews."

In general, Millennium's employees were compensated well which kept them from complaining about limited pay differentiation. However, for some, it created a lot of frustration because "compensation awards were more the result of relationships within the firm rather than achievements."³⁴ Over time, a lack of recognition tended to de-motivate the firm's best performers and a lack of accountability failed to motivate the underperformers to improve. Millennium's executives recognized this central tendency problem and developed more organized goal setting and

performance management systems. However, they implemented no mechanisms to hold managers accountable for using these systems.

Historically, Millennium compensated its employees principally with a cash base salary plus a significant number of stock options (see **Exhibit 9** showing selected employee stock options activity). This was a popular combination for emerging biotechnology and information technology firms, as it helped businesses with limited resources conserve cash and provided employees with significant potential upside through options. Millennium's management believed that its stock option program also helped to align the goals of the firm's shareholders, the firm and its employees. As the technology bubble rose in the late 1990s, Millennium's employees became increasingly wealthy and reset their compensation expectations upwards.

Things changed following the burst of the technology bubble in 2001, and the subsequent fall in Millennium's stock price. The value of previously granted employee stock options (and related stock obtained through option redemptions) fell significantly, negatively impacting both employee wealth and morale. This fall also dampened employee enthusiasm for future option grants, according to employee surveys.

So Levin migrated Millennium towards the compensation model used in the more mature pharmaceutical industry, eventually offering employees a cash salary and a cash bonus, while scaling back the firm's stock option programs. By 2005, Millennium was also considering adding a restricted stock program. At that time many U.S. firms were also modifying their compensation packages in response to changes in accounting and reporting requirements.

Although compensation was important, firm-wide surveys indicated that Millennium's team was also driven by a variety of other intangible factors, such as the ability to help patients, to work with smart people and to have a voice in the firm. Employees also enjoyed the firm's innovative and entrepreneurial culture. For one commercial manager, "Millennium was small enough to have vibrancy and to make an impact personally, but large enough to have resources, specialists and depth of knowledge." According to Joe Bolen, Head of Oncology Biology at the time, "Quality of science and top science reputation mattered more to employees than compensation." (see **Exhibit 10** showing 2005 employee satisfaction survey)

Leadership

As Millennium migrated towards downstream drug development and commercialization, Levin came to the conclusion that the firm needed a different kind of leader, "someone who was passionate about making a difference for patients, had big pharma experience but was excited about leading an entrepreneurial team, and had tremendous commercial success."³⁵ In early 2005, Levin met with Dunsire, a medical doctor by training who spent some of her early career practicing medicine but found her niche in drug commercialization, launching nearly a dozen products during her career. At the time, she managed Novartis International's \$2 billion North American Oncology Business Unit. He subsequently reflected, "It was a perfect match."³⁶

Situation in the 2004 Timeframe

Despite restructuring, Millennium still spent \$430 million in R&D and booked a \$252 million loss in 2004, bringing net cash reserves well below \$600 million. The company had narrowed its development efforts to cardiovascular, inflammation and oncology and was focused on transforming its early-stage contract research business into a vertically integrated biopharmaceutical firm.

Millennium also was commercializing two products, Velcade and Integrilin. Key functional leadership challenges needed resolution to make the vision a reality.

Commercial Efforts

As blockbuster research partnerships became a thing of the past, Millennium became increasingly dependent on revenues from its commercialized products. For Millennium, a critical cultural change was to move from a pure science mindset to one where commercial functions had similar respect and voice. Fortunately, the firm's oncology drug, Velcade, was proving to be one of the most effective treatments in its space and was less expensive than its leading competitor. Millennium's managers also believed that Velcade had significant potential for growth through label expansion into new treatment areas. Protopapas observed, "While we launched Velcade successfully. . . the reality was that the sales of Velcade in the U.S. were lagging behind our growth expectations. . . . Part of it was a biotech company, primarily science-based, really trying to become a commercial company. And we launched Velcade in the U.S. with (just) 65 sales reps."³⁷ Velcade revenues more than doubled to \$143 million in 2004, but flattened during the latter part of 2004 and beginning of 2005. Millennium's management was also concerned about Integrilin revenues, which grew by just 12%, to \$206 million, in 2004.

Management turnover One executive traced some of Millennium's underperforming Velcade and Integrilin sales to commercial management turnover. Millennium hired Paul Hemelin to head Commercial Operations in December 2000 and he left shortly thereafter. In 2002, Millennium appointed Vaughn Kailian (the former CEO and president of COR) as Vice Chairperson of the Board of Directors and Head of Commercial Operations, although he resigned his commercial role in 2003. Millennium CFO Kenneth Bate moved over to run Millennium's commercial operations in July 2003. Bate resigned in January 2005, and Levin covered the vacant position.

One executive reflected, "While there were several factors for the turnover in the commercial group, Millennium's legacy and commitment to science was a key factor. Millennium's management believed that markets were won through good science and clinical data so products based on good data would sell themselves. This philosophy left little room for a marketer to express his or her opinions on competing in the marketplace through education and promotion."³⁸

Challenge of commercializing two products In the interim, two commercial managers who came over from the COR acquisition ran Millennium's team of U.S. marketing representatives. Most of the representatives had backgrounds in the cardiovascular market but were responsible for marketing both Integrilin (cardiovascular) and Velcade (oncology). Millennium outsourced international marketing to partner firms Schering Plough and Johnson & Johnson, respectively. In contrast to Millennium's stagnant domestic Velcade sales, Johnson & Johnson was producing robust overseas revenue growth. Kyle Kovalanka, Vice President of Investor Relations, highlighted some of the challenges facing Millennium's U.S. sales force:

Millennium's commercial team was relatively small. Leveraging our limited capacity and capabilities across the two products was a challenge. For example, the physician groups were specialists in their respective areas and did not necessarily even work in the same locations. The Velcade sales team detailed to oncologists with a vast majority working from their own private practices or in out-patient units of hospitals. The Integrilin team detailed to cardiologists and purchasing groups in hospitals with critical care facilities for percutaneous infusions.

Both therapeutic areas required keen understanding of the clinical trial results of their respective products and those of their competitors. It was unrealistic to require a sales

representative to master the material of both products. Complicating these differences was that both products faced intense competition and required significant investment to remain competitive. It was difficult to imagine diluting the focus of a commercial rep by leveraging him or her to work on both products.³⁹

Discovery Research and Development

As Millennium continued moving away from pure discovery research and towards downstream activities, there was a high probability that Robert Tepper, M.D., Head of R&D, might leave to join a business focused on his specialty, early-stage research. So Dunsire faced a potential R&D leadership vacuum. Additionally, since the current level of R&D expenditure at Millennium was so high, Dunsire knew that she needed to quickly get her arms around the firm's R&D operations and determine which projects to continue funding and which projects to cut. Given Dunsire's limited experience in R&D, one of her options to fill the Head of R&D role was to hire an experienced leader from outside the firm, bringing in a new set of skills and ideas.

Alternatively, Dunsire could promote one of Millennium's top R&D managers, each of whom she considered to be fully capable of running the firm's R&D group. Joe Bolen, Ph.D. (SVP Research) joined Millennium from Hoechst Marion's oncology group in 1999 and by 2005 was in charge of Millennium's early-stage research and drug discovery efforts. Nancy Simonian, M.D. (SVP Development) covered the later-stage activities of clinical testing, medical benefit/risk assessments, and regulatory affairs; Simonian joined Millennium from Biogen's clinical research team in 2001. Peter Smith, Ph.D. (SVP Nonclinical Development Sciences) bridged the discovery efforts of Bolen's group through lead compound selection and the later-stage clinical work of Simonian's group by helping to launch clinical trials; Smith joined from Pharmacia in 1999. However, both of these options (external hire or internal promotion) introduced several complications. As one executive observed, "Filling Tepper's role either through an internal promotion or external appointment risked disenfranchising at least two of Millennium's top scientists."⁴⁰

Dunsire could also "flatten" the organization by eliminating the Head of R&D position and have the three SVPs of R&D report directly to her. This approach would allow Dunsire to strengthen supervision over resource allocation in R&D and prevent such problems as those associated with Project 241. But flattening and increasing her span of control (i.e. the number of direct reports) would require a significant time commitment on her part and risked distracting her from leadership responsibilities, particularly in the commercial and financial arenas.

Investor Relations

Millennium's stock price peaked at \$85.60 on November 7, 2000, giving the firm a market capitalization of \$18 billion just before the technology bubble burst. Following the market crash, Levin tried to appease investors by announcing that Millennium would turn profitable in 2004. In 2003, Levin withdrew his earlier financial guidance and projected that Millennium would turn profitable in 2006; investors reacted unfavorably. By December 31, 2003, Millennium's stock price had fallen by 78% to \$18.65, reflecting challenges in the capital markets, the biotechnology industry and at Millennium.

In January 2004, Millennium issued 2004 projected sales guidance for Integrilin in the range of \$320 million to \$350 million; an equity research analyst from JP Morgan Chase summarized that Millennium's, "2004 guidance was modestly disappointing."⁴¹ In April, a SG Cowen equity research analyst noted, "Both Velcade and Integrilin falling short of our estimates."⁴² In July, Millennium withdrew its 2004 revenue guidance for Integrilin noting that sales would fall short of previous company guidance.

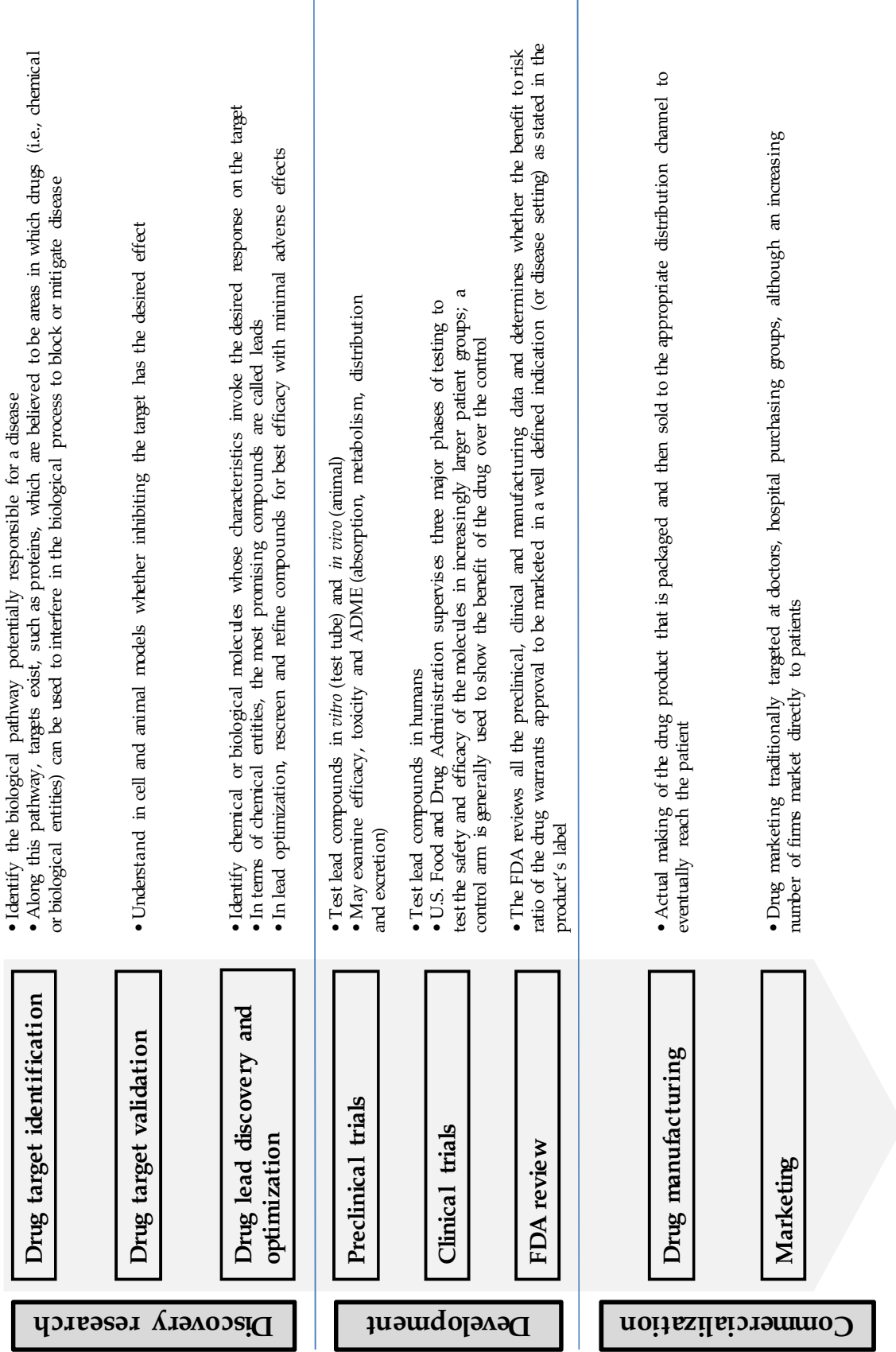
In September, Millennium promised to provide revised Integrilin sales guidance for the calendar year during the company's October earnings call with investors; it was unable to given the unreliability of the sales data it received from Schering-Plough. According to Kovalanka, "Investors became less interested in Millennium's grand vision and more interested in profitability, pushing Millennium's stock price further downward. The situation was further complicated because no one could see how profitability would be achieved in 2006 given the historic losses and lack of a clear path on how we would achieve it."⁴³

By January 31, 2005, Millennium's stock was trading at \$9.21 per share, about one-tenth of its all-time high. Millennium's relations with the investor community further deteriorated when Fidelity Investments, one of Millennium's largest long-term investors, lowered its stake in the company from 14.3% to 7.6% in early 2005.⁴⁴

Looking Forward

Dunsire returned to her legal pad and summoned her thoughts. A flurry of questions came to mind: Was it possible to professionalize Millennium's organization while maintaining its entrepreneurial vision and culture? How could she move Millennium from its R&D roots to a more commercially-focused platform? With respect to resource allocation between Millennium's commercial and R&D platforms, how could she optimize current commercial opportunities without jeopardizing future product development? How should she address the potentially vacant senior management positions in the R&D and commercial organizations and, in order to fill these positions, should she hire externally or promote from within? Externally, what should she do to regain credibility with the investment community? Which of these challenges were the most urgent and how should she prioritize among them?

Exhibit 1 The Biotechnology Value Chain



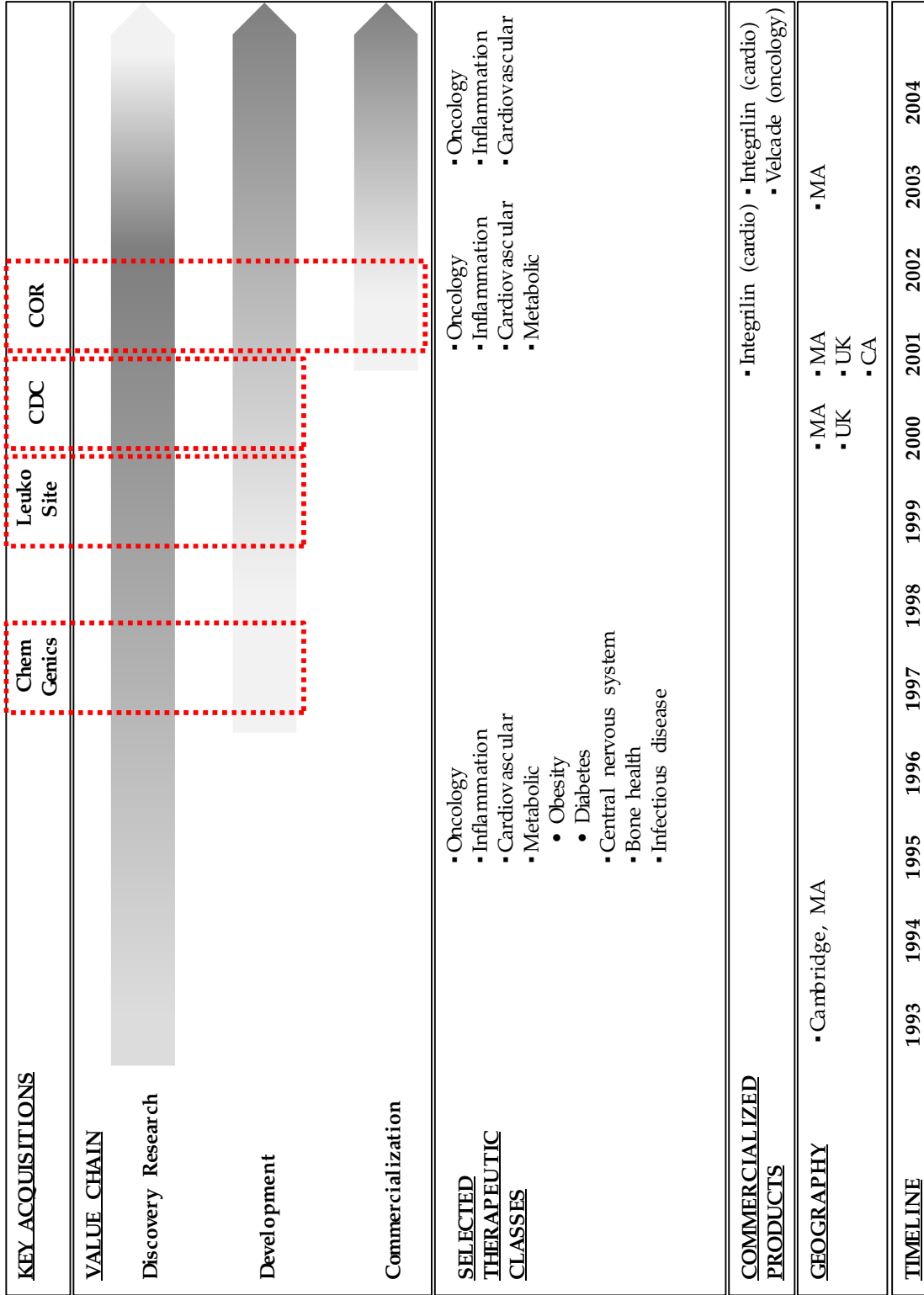
Source: Adapted from company management.

Exhibit 2 Selected Early-Stage Alliances – Total Potential Deal Value (in U.S.\$ millions)

Date	Alliance	Summary	Amount
1994	Hoffmann-LaRoche	<ul style="list-style-type: none"> • Disease focused discovery • Obesity, diabetes 	\$50
1995	Aventis	<ul style="list-style-type: none"> • Target specific discovery • Inflammatory respiratory diseases 	50
1995/ 1996	Eli Lilly	<ul style="list-style-type: none"> • Disease focused discovery and technology transfer • Cardiovascular, oncology 	70
1997	Monsanto	<ul style="list-style-type: none"> • Technology transfer • Agriculture 	218
1998	Bayer	<ul style="list-style-type: none"> • Disease focused discovery • Cardiovascular, oncology, pain, blood, viral infections 	465
2000	Aventis	<ul style="list-style-type: none"> • Drug joint-development and joint-commercialization • Inflammation 	450
2001	Abbott	<ul style="list-style-type: none"> • Drug joint-development and joint-commercialization • Metabolic 	250
2003	Johnson & Johnson (Ortho Biotech subsidiary)	<ul style="list-style-type: none"> • Velcade product joint-development and transfer of international commercialization to Ortho 	NA

Source: Adapted from casewriters interviews with company management and SEC filings, May – September, 2009.

Exhibit 3 Evolution of the Scope of Millennium Pharmaceuticals



Note: In 2004, Millennium's presence in cardiovascular was limited to the sale and marketing of Integrilin.

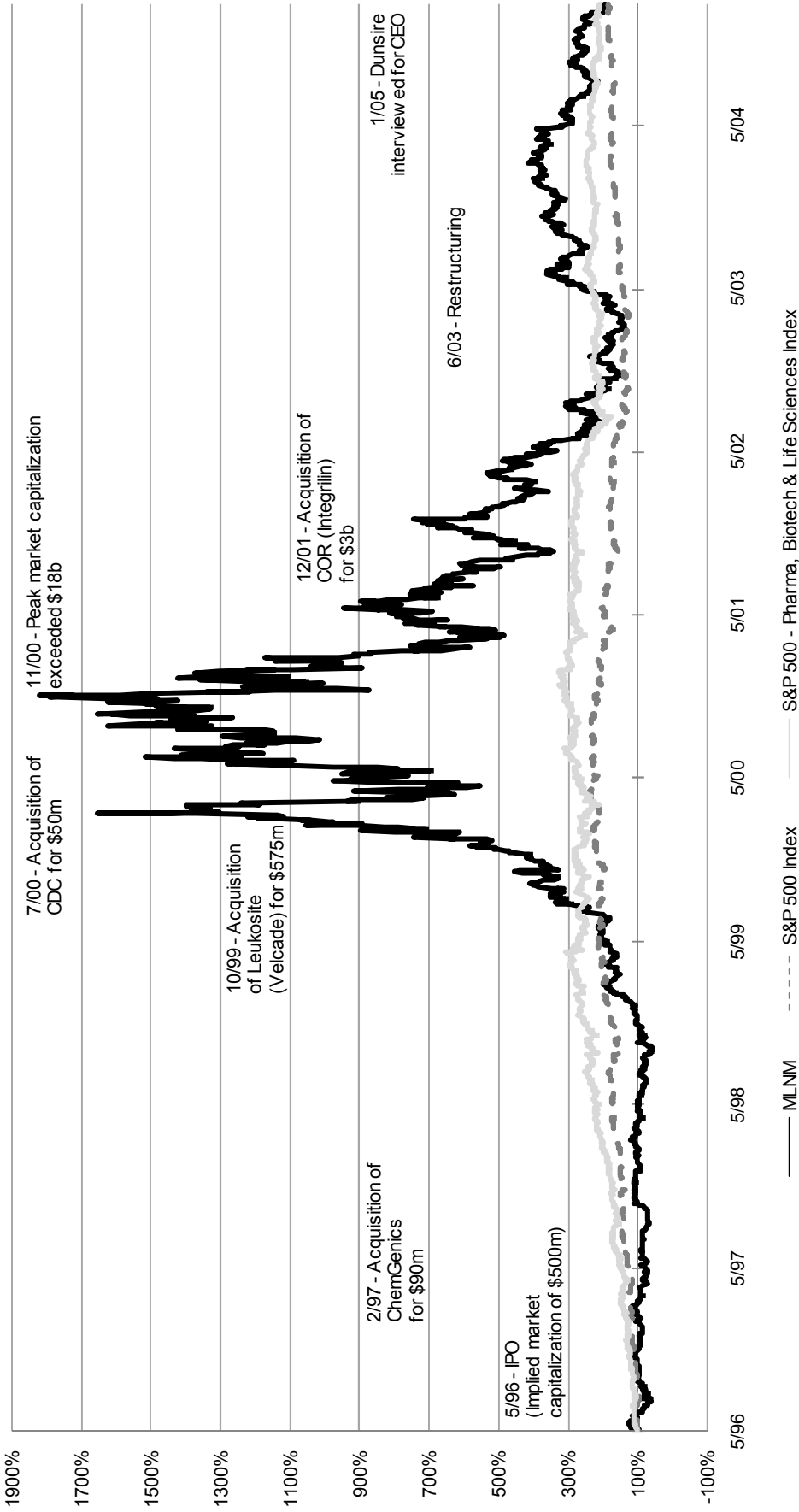
Source: Adapted from casewriters interviews with company management and SEC filings, May – August, 2009.

Exhibit 4 Selected Acquisitions (in U.S.\$ millions)

Date	Acquisitions	Summary	Amount
1997	ChemGenics Pharmaceuticals (Cambridge, MA)	<ul style="list-style-type: none"> • Millennium's first move downstream • Capabilities for identifying drug leads via high speed molecule screening • Acquired with Millennium stock 	\$100
1999	LeukoSite (Cambridge, MA)	<ul style="list-style-type: none"> • Bolstered downstream development skills and provided product pipeline • Velcade (oncology drug in development stages) and Campath (Campath 50-50 JV was sold in 2001) • Acquired with Millennium stock 	550
2000	Cambridge Discovery Chemistry (U.K.)	<ul style="list-style-type: none"> • Downstream skills in pharmaceutical chemistry for mass production of molecules • Acquired with cash 	50
2001	COR Therapeutics (San Francisco)	<ul style="list-style-type: none"> • Provided cardiovascular discovery, development and commercial capabilities • Integrilin (cardiovascular drug marketed since 1998) • Acquired with Millennium stock 	3,000

Source: Adapted from casewriters interviews with company management, Capital IQ and SEC filings, May – September, 2009.

Exhibit 5 Millennium Share Price Performance, from May 17, 1996 IPO to January 31, 2005 (measured relative to selected indices as of May 17, 1996)



Source: Stock and index values via Capital IQ, accessed February 2009. Relative performance estimated by casewriters. SEC filings May – September 2009.

Exhibit 6 Selected Millennium Financial Data, 1993-2004 (in U.S.\$ millions, except as noted)

For the year ending December 31,	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Revenues from strategic alliances	-	\$8	\$23	\$32	\$90	\$134	\$184	\$196	\$246	\$193	\$190	\$99
Velcade (oncology)	-	-	-	-	-	-	-	-	-	-	60	143
Integrilin (cardiovascular)	-	-	-	-	-	-	-	-	-	160	184	206
Total revenue	0	8	23	32	90	134	184	196	246	353	434	448
Cost of goods sold	-	-	-	-	-	-	-	-	-	47	61	70
Sales, general and administrative	2	3	3	8	17	24	33	49	83	169	179	197
Research & development	3	11	18	35	75	114	160	269	401	511	489	403
Amortization of goodwill and intangibles	-	-	-	-	2	3	4	55	65	35	39	34
Operating income	(4)	(6)	2	(11)	(4)	(8)	(13)	(177)	(302)	(409)	(334)	(255)
Restructuring charges	-	-	-	-	-	-	-	-	-	(3)	(191)	(38)
Acquired in-process R&D expense	-	-	-	-	(84)	-	(351)	-	-	(242)	-	-
Other income/(expense)	0	(0)	(0)	2	6	18	(16)	(178)	110	64	41	41
Net income	(\$4)	(\$6)	\$1	(\$9)	(\$81)	\$10	(\$380)	(\$355)	(\$192)	(\$590)	(\$484)	(\$252)
Market capitalization				\$415	\$551	\$898	\$5,416	\$13,150	\$5,426	\$2,258	\$5,619	\$3,714
Net cash/(debt)	\$4	\$1	\$11	50	90	158	224	1,313	1,339	998	708	504
Number of full-time employees	na	na	na	359	520	730	952	1,330	1,900	2,079	1,530	1,477
Revenue growth			187%	39%	183%	49%	37%	7%	25%	43%	23%	3%
% of Revenues												
Sales, general and administrative		41%	14%	25%	18%	18%	18%	25%	34%	48%	41%	44%
Research & development		138%	78%	110%	83%	85%	87%	137%	163%	145%	113%	90%
Operating income		(79%)	8%	(35%)	(4%)	(6%)	(7%)	(90%)	(122%)	(116%)	(77%)	(57%)
Net income		(80%)	6%	(28%)	(90%)	8%	(207%)	(181%)	(78%)	(167%)	(112%)	(56%)

Note: Net cash (debt) defined as: cash + short term investments – short term debt – long term debt.

Millennium's war chest included funds from alliances, \$58 million raised in an Initial Public Offering (IPO) in May of 1996, and over \$1.2 billion raised in the capital markets in 2000.

Source: Compiled from SEC filings and casewriters estimates, May – August 2009. Number of employees via Capital IQ, accessed March 2009. Market capitalization via Thomson One Banker, accessed September 2009.

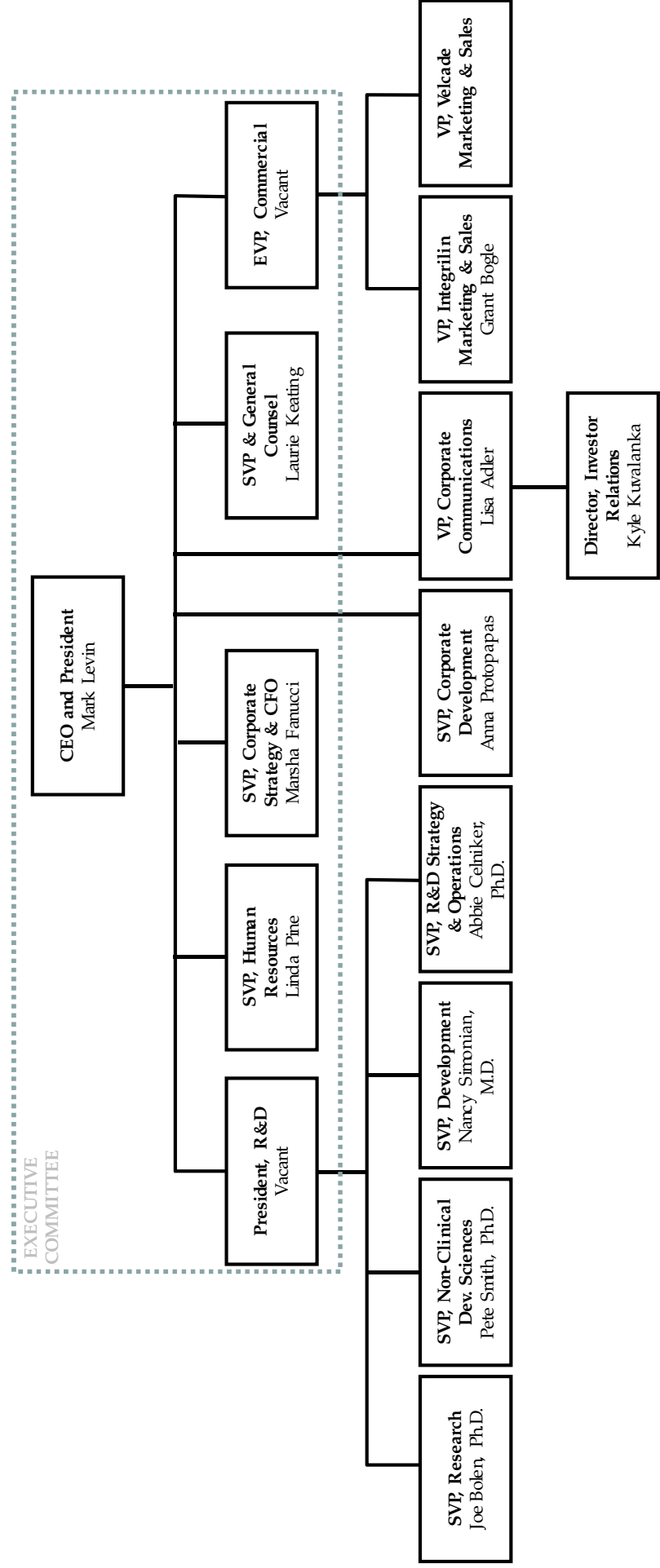
Exhibit 7 Selected Millennium Operating Metrics Prior to Dunsire' Arrival
(in U.S.\$ millions, except as noted)

For the last twelve months ending:	Dec 2002	Jan 2005
Selected expense detail		
Discovery research & development		
Early-stage discovery research	\$254	\$119
Downstream development		
Non-clinical development sciences ⁽¹⁾	116	104
Medical	141	119
Commercial	61	122
Corporate operations	92	58
Subtotal expenses	\$664	\$523
Average Headcount		
Discovery research & development		
Early-stage discovery research	712	368
Downstream development		
Non-clinical development sciences ⁽¹⁾	190	191
Medical	270	251
Commercial	59	304
Corporate operations	302	242
Other	44	2
Total average headcount	1,577	1,357
Assets		
Marketed products	1	2
Products in pipeline	10	8
Therapeutic areas	4	3

Note: - (1) Non-clinical development sciences bridge early-stage drug discovery work to later-stage development in clinical, medical and regulatory areas.
- January 2005 data are estimates adapted for the twelve month period then ended.

Source: Adapted from company estimates.

Exhibit 8 Selected Members of Millennium's Senior Management Team, Early-2005



Source: Adapted from company management.

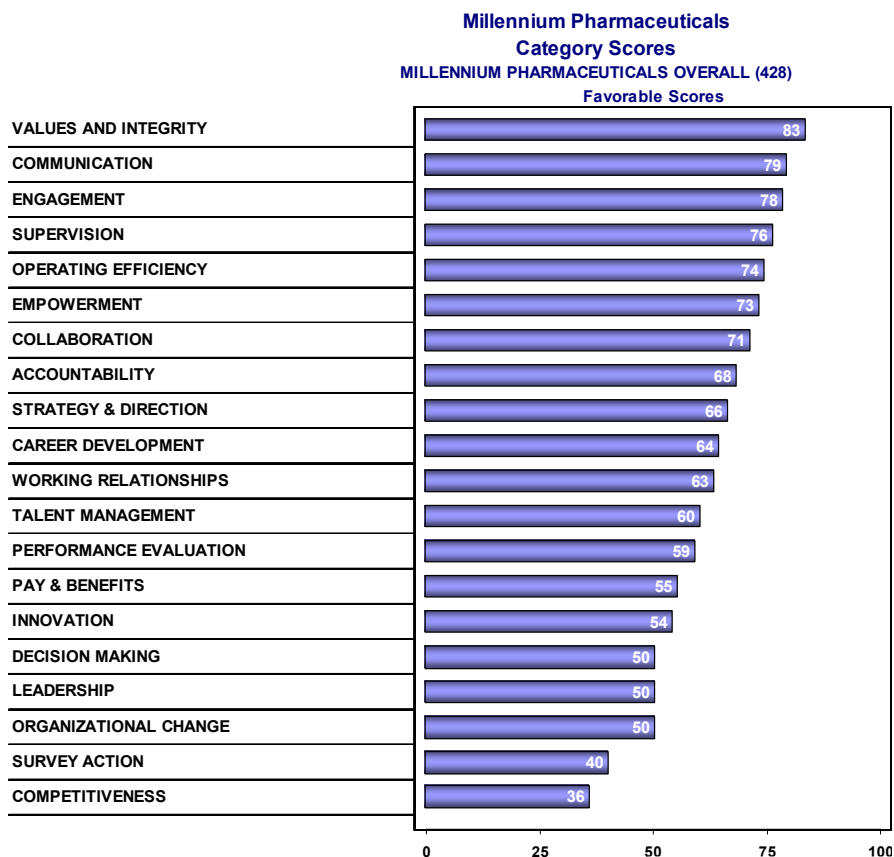
Exhibit 9 Selected Millennium Employee Stock Options Activity, 2000 – 2004 (in thousands of options, except as noted)

For the year ending December 31,	2000	2001	2002	2003	2004
Options granted during the year⁽¹⁾					
Total number of options granted	13,611	10,173	17,902	9,790	9,082
Strike price ⁽²⁾	\$47.52	\$29.19	\$14.02	\$11.12	\$14.70
Memo: Percentage of options granted to top 4 or 5 executives	7%	10%	7%	10%	18%
Number of options outstanding at year-end	29,539	33,786	43,848	36,818	35,706
Year-end market price of Millennium's stock	\$61.88	\$24.51	\$7.94	\$18.65	\$12.14

Note: (1) Millennium's stock options typically vested over four years.
(2) Weighted average price in U.S.\$.

Source: SEC filings and casewriters estimates, August 2009.

Exhibit 10 Employee Satisfaction Survey – Early-2005



Source: Company management draft report titled, "Recap of the 2005/2006 Employee Survey and Pulse Survey Results."

Endnotes

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¹¹ Millennium Pharmaceuticals, December 31, 1996 10-K (Boston: Millennium Pharmaceuticals, 1997), via U.S. Securities and Exchange Commission, accessed August 2009.

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¹³ Millennium Pharmaceuticals, December 31, 1998 10-K (Boston: Millennium Pharmaceuticals, 1999), via U.S. Securities and Exchange Commission, accessed August 2009.

¹⁴ Mark Levin, interview by casewriters, Boston, MA, June 5, 2009.

¹⁵ Anna Protopapas, interview by casewriters, Cambridge, MA, June 5, 2009.

¹⁶ Mark Levin, interview by casewriters, Boston, MA, June 5, 2009.

¹⁷ Marsha Fanucci, interview by casewriters, Boston, MA, May 13, 2009.

¹⁸ Millennium Pharmaceuticals, December 31, 1997 10-K (Boston: Millennium Pharmaceuticals, 1998), via U.S. Securities and Exchange Commission, accessed August 2009.

¹⁹ Millennium Pharmaceuticals, December 31, 1999 10-K (Boston: Millennium Pharmaceuticals, 2000), via U.S. Securities and Exchange Commission, accessed August 2009.

²⁰ Marsha Fanucci, interview by casewriters, Boston, MA, May 13, 2009.

²¹ Marsha Fanucci, interview by casewriters, Boston, MA, May 13, 2009.

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- ²² Mark Levin, interview by casewriters, Boston, MA, June 5, 2009.
- ²³ Mark Levin, interview by casewriters, Boston, MA, June 5, 2009.
- ²⁴ Kyle Kovalanka, interview by casewriters, Boston, MA, November 23, 2009.
- ²⁵ Mark Levin, interview by casewriters, Boston, MA, June 5, 2009.
- ²⁶ Kimberly Blanton, "Biotech's Pied Piper," *Boston Globe*, June 13, 1999, p. F1.
- ²⁷ David Champion, "Mastering the Value Chain: An Interview with Mark Levin of Millennium Pharmaceuticals," *Harvard Business Review* (June 2001), p. 115.
- ²⁸ David Champion, "Mastering the Value Chain: An Interview with Mark Levin of Millennium Pharmaceuticals," *Harvard Business Review* (June 2001), pp. 114-115.
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- ³¹ Deborah Dunsire interview by casewriters, Cambridge, MA, November, 19, 2008.
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- ³³ Millennium management, interview by casewriters, Cambridge, MA, 2009.
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- ³⁵ Mark Levin, interview by casewriters, Boston, MA, June 5, 2009.
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- ³⁷ Anna Protopapas, interview by casewriters, Cambridge, MA, June 5, 2009.
- ³⁸ Millennium management interview by casewriters, Boston, MA, 2009.
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- ⁴¹ Pamela Tublin, M.D., David Molowa, Ph.D. and Andrew Fein, "Millennium Pharmaceuticals, Guidance a Bit Disappointing; Lung CA Signal a Positive," JP Morgan, January 13, 2004, p. 1, via Thomson One Banker, accessed March 31, 2009.
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