

HOWARD B. ROSEN

SUMMARY

Technically trained executive with over 30 years of success growing startup and mid-size biopharmaceutical companies. Broad experience includes serving on boards of directors, senior-level general management positions, functional roles in strategy, marketing, finance, business development, and R&D. Therapeutic area experience in anti-infectives, oncology, pain, cardiovascular, respiratory, CNS diseases, urology, ophthalmology and metabolic diseases. Expert in the design, development and commercialization of drug delivery systems.

BOARD OF DIRECTORS EXPERIENCE

ACELRX PHARMACEUTICALS, INC. (NASDAQ:ACRX), Redwood City, CA **2008 – Present**
Developing novel drug delivery systems for acute pain management. Member audit committee 2008-15. CEO 4/15 – 3/17.

ENTREGA, INC., Boston, MA **2011 – Present**
Developing oral drug delivery systems for proteins and peptides.

KALA PHARMACEUTICALS, INC. (NASDAQ:KALA), Waltham, MA **2014 – Present**
Developing products for ophthalmology. Chairman 1/14 – 3/15. Chair audit committee 2017 – Present. \$103.5 million IPO 7/17.

HAMMERTON, INC., Salt Lake City, UT **2017 – Present**
Designs and manufactures decorative lighting for commercial and residential customers.

ALCOBRA, LTD., Tel Aviv, Israel **2013 – 2017**
Public company developing products for ADHD and Fragile X. Chairman 2/14 – 5/17. Merged with Arcturus Therapeutics 11/17.

PAXVAX, INC., Menlo Park, CA **2007 – 2015**
Developing vaccines for infectious diseases. Chairman 1/11 – 5/15. Majority interest sold to Cerberus Capital for \$105 million 12/15.

ALDEA PHARMACEUTICALS, INC., Redwood City, CA **2012 – 2015**
Developed small molecule enzyme activators for metabolic disorders.

PEARL THERAPEUTICS, INC., Redwood City, CA **2009 – 2013**
Developing inhaled products for COPD. Chair audit committee. Interim CEO 6/10 – 3/11. Sold to AstraZeneca for \$1.1 billion 7/13.

CNS THERAPEUTICS, INC., St. Paul, MN **2009 – 2012**
Developed and commercialized CNS disease drugs. Sold to Covidien for \$100 million 10/12.

PHARSIGHT CORPORATION, Mountain View, CA **2004 – 2008**
Public company that provided software solutions to biopharmaceutical companies to support pharmacokinetic and clinical trial design and analysis. Member audit committee 2005-08. Chair compensation committee 2007-08. Sold to Tripos International for \$57 million 10/08.

COTHERIX, INC., South San Francisco, CA **2005 – 2006**
Public company that commercialized Ventavis® for PAH. Member audit committee. Sold to Actelion Ltd for \$420 million 11/06.

PROFESSIONAL EXPERIENCE

GILEAD SCIENCES, INC., Foster City, CA **2004 – 2008**

Vice President, Commercial Strategy

Responsible for global brand management and strategic marketing for anti-infective, cardiovascular, respiratory, and hematology/oncology therapeutic areas, health economics, competitive intelligence, market research and Gilead's overall portfolio and business planning.

- Built new commercial strategy department to 23 employees to support growing R&D pipeline
- Revamped and led the strategic planning process presenting results annually to board of directors and leading to two acquisitions
- Improved coordination across 21 countries for global launches by designing and implementing a new commercial planning process
- Increased product prices in multiple countries by hiring and managing health economics professionals and chairing Pricing Committee
- Sharpened marketing programs by developing and leading Gilead Excellence in Marketing (GEM) training

ALZA CORPORATION (acquired by Johnson & Johnson in 2001), Mountain View, CA **1994 – 2004**

President **2003 – 2004**

Managed all activities of 1000-person R&D organization focused on drug delivery products including formulation, clinical, pre-clinical, regulatory, project management, HR, IT and finance. \$350 million annual budget.

- Continued commercialization of IONSYS®, a novel post-operative transdermal pain management product, by filing NDA
- Streamlined organizational structure by transferring 1300 manufacturing, business development and strategic marketing employees into J&J corporate groups while retaining dotted line responsibility
- Addressed top request from employee survey by developing a new goal setting and dashboard program
- Improved cost-efficiency in support of overall J&J corporate needs by reducing headcount by 10%
- Helped manage overall J&J pipeline as a member of the New Product Development and Drug Evaluation Executive Committees
- Supported community activities by representing ALZA on Silicon Valley Leadership Group, leading ALZA United Way campaign (Silicon Valley growth award in 2003) and co-hosting J&J 2003 diversity conference

ALZA CORPORATION (Continued)**Vice President, Product Development**

2002 – 2003

Oversaw oral and transdermal drug delivery products from concept to launch. Also responsible for company-wide analytical chemistry, process excellence and strategic marketing functions.

- Increased focus on research for new drug delivery technologies by reorganizing 500-person R&D organization
- Co-chaired Product Portfolio Review Meeting which evaluated development programs at key decision points
- Expanded J&J pipeline through projects in schizophrenia, diabetes, pain management and women's health

Vice President, Strategic Planning

1997 – 2002

Responsible for new product planning, strategic planning, R&D portfolio management and mergers & acquisitions. Promoted from Executive Director in 2000.

- Grew pipeline by initiating 21 projects in oncology, urology, CNS and pain management
- Supported larger pipeline by growing staff from three to 17 employees
- Helped grow product revenues from less than \$100 million to \$1 billion by designing and leading planning activities including 10 and 3-year plans and R&D portfolio management
- Expanded oncology franchise by working with bankers and senior management on \$580 million acquisition of SEQUUS
- Rationalized product portfolio by divesting Amphocil® to InterMune for \$9 million
- Broadened sales reach for Concerta® to pediatricians by establishing co-promotion agreement with J&J
- Reduced product development cycle times receiving ALZA's Gerstel Award for Excellence

Executive Director, Technology Ventures

1996 – 1997

Managed 12-person technology incubation group. Co-inventor on new drug delivery system for pediatrics (subsequently introduced in Europe). Led negotiations with six potential partners. ALZA's TOPS Award for outstanding performance.

Senior Director, R&D Planning

1994 – 1996

Created and led process for evaluating external technologies. Arranged collaborations with five gene therapy companies. Promoted from Director in 1995.

INTEGRAL, INC., San Francisco, CA

1993 – 1994

Manager at product strategy consulting firm founded by Professors Wheelwright and Clark of Harvard Business School. Developed west coast practice selling over \$1 million in projects.

GENPHARM INTERNATIONAL, INC., Mountain View, CA

1989 – 1993

Director, Corporate Development at start-up biotechnology company located in the US and The Netherlands. Created business plans for venture capital financings totaling \$27 million. Negotiated 12 in-licensing agreements. Alongside CEO, established partnerships with BMS, Collagen, Eisai, Eli Lilly and Merck. Wrote prospectus and road show for planned IPO. Prepared marketing plans and launched laboratory supply business. Promoted from Manager in 1992.

MCKINSEY AND COMPANY, INC., San Francisco, CA

1987 – 1989

Associate at management consulting firm. Developed biotech strategy for Unilever and home computer strategy for Apple. Improved corporate staff effectiveness for Boise Cascade.

ENGENICS, INC., Menlo Park, CA

1982 – 1985

Project Manager at start-up biotechnology company focused on bio-process development.

EDUCATION

MBA, Stanford Graduate School of Business, Stanford, CA, 1987

Henry Ford II Scholar (first in class); Arjay Miller Scholar; GSB Orientation '86 Co-director

MS, Chemical Engineering, Massachusetts Institute of Technology, Cambridge, MA, 1982

Invented and patented a new class of biopolymers (used in Gliadel® Wafers); Sigma Xi Honor Society

BS, Chemical Engineering, Stanford University, Stanford, CA, 1980

Graduated with distinction; Tau Beta Pi Honor Society; Varsity Ski Team Captain; *Daily* Photographer

OTHER ACTIVITIES

Elected to National Academy of Engineering 2005; Chair Bioengineering Section 2013-2015

Elected Fellow, American Institute of Medical and Biological Engineers, 2014

City College of New York Biomedical Advisory Council 2005-Present

University of North Carolina/North Carolina State Joint Biomedical Engineering Department Industrial Advisory Board 2015-Present

Stanford Advisory Councils on Interdisciplinary Biosciences 2003-11; School of Engineering 2004-07

Lecturer, Graduate School of Business, Stanford 2011-Present

Lecturer, Dept. of Chemical Engineering, Stanford 2000-03, 2009-Present

PATENTS, PUBLICATIONS AND SELECTED PRESENTATIONS

US Patents 4,891,225 and 4,906,474 Bioerodible Polyanhydrides for Controlled Drug Delivery (used in Gliadel® Wafers for brain tumors)
US Patents 5,780,058, 5,989,590, 6,106,845, 6,210,713 and 6,333,050 Oral Delivery of Discrete Units (used in Clarosisip® for delivery of antibiotics in Europe)

Rosen, HB, et al., Bioerodible Polyanhydrides for Controlled Drug Delivery, *Biomaterials*, Vol. 4, Issue 2, April 1983, p 131-133.

Rosen, HB., et al. "Bioerodible polymers for controlled release systems." *Controlled Release Systems: Fabrication Technology 2* (1988): 83-110.

Rosen, H. and T. Aribat, "The rise and rise of drug delivery." *Nature Reviews Drug Discovery* 4, p. 381-385 (May 2005).

Rosen, HB, "Ouch! "The Role of Drug Delivery in Pain Management." presented at The 10th US-Japan Symposium on Drug Delivery Systems, December 16-20, 2009

Rosen, HB, "What's New in Cystic Fibrosis Therapy." presented at The 9th US-Japan Symposium on Drug Delivery Systems, December 16-20, 2007